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(54) **Strip brush**

(57) A strip brush (10) comprising: a plurality of elongate bristles (12) and a spine formation (14), the bristles having first and second free ends (16) and being gripped by the spine formation (20) between said ends. The spine formation comprises a length of material having

first and second spaced folds and the plurality of bristles are trapped between said folds such that the first and second folds define opposing ends of said spine formation. The spine formation is formed of a single sheet of planar material which is folded and/or otherwise deformed into the required profile.

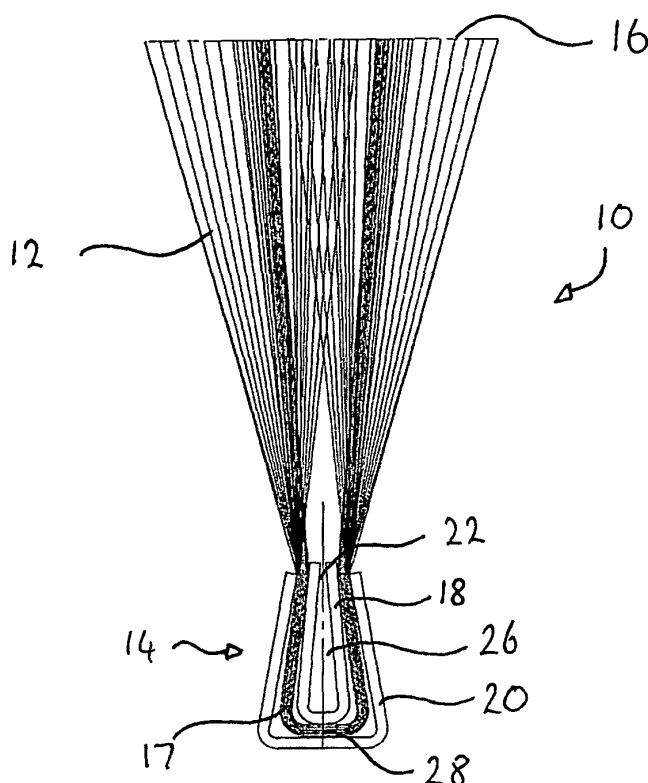


Fig. 1

Description

[0001] The present invention relates to strip brushes.

[0002] Strip brushes generally comprise an elongate spine member, within which a plurality of bristles are held such that a free end of each bristle depends therefrom.

[0003] Such strip brushes are conventionally manufactured in a continuous production flow in which a length of spine material is deformed so as to trap bristles therein. The resulting lengths of strip brush are then cut to the desired length and crimped at each end to form discrete brushes. The substantially rigid spine allows attachment of the brushes to machinery or manual tools.

[0004] The strip brushes produced by this method of manufacture are used for a broad variety of applications across different industries. Numerous applications provide for the use of this form of brush as a sealing member, for attachment to moving machinery. The plurality of tightly packed bristles form a mechanical barrier which substantially inhibits the flow of particulate and/or fluid materials therethrough, dependent on the bristle arrangement and material.

[0005] In one example, polymer bristles may be provided so as to provide a hygienic seal for use in food handling or processing machinery. In another example, the bristles may be formed of metallic strands. Such an arrangement finds one application in the oil and gas industry for use as a mechanical seal for machinery in pipelines. Regardless of the industry requirements, the strip brushes are manufactured in substantially the same manner, such that lengths of strip brush are cut to the required dimensions for the application at hand.

[0006] During use, the free ends of the bristles are typically maintained in contact with an adjacent surface. This causes a contact force such that the bristles can bend or flex in response thereto to maintain the required seal or brushing effect.

[0007] However it has been found that the application of contact forces and/or vibrations to the strip brush during use can result in a number of bristles towards the peripheral edges of the strip brush becoming loose and shedding from the ends of the brush.

[0008] The shedding of bristles in this manner causes a problem since they can enter the flow of material through the machinery or the moving parts of the machinery itself. When one considers the use of the strip brushes on food handling equipment or else within fuel pipelines, it will be appreciated that the entrainment of loose bristles into the material being processed is a significant disadvantage which can lead to processed materials being rejected or machine down time.

[0009] It is an object of the present invention to provide an improved strip brush for which the problem of shedding bristles is alleviated.

[0010] According to a first aspect of the present invention there is provided a strip brush comprising a plurality of elongate bristles and a spine formation, the bristles having first and second free ends and being gripped by

the spine formation between said ends, wherein the spine formation comprises a length of material having first and second spaced folds and the plurality of bristles are trapped between said folds such that the first and second folds define opposing ends of said spine formation, and wherein the spine formation is formed of a single sheet of planar material which is folded and/or otherwise deformed into the required profile.

[0011] The present invention allows for continuous folded ends of the strip brush in contrast to the discontinuity formed by cut and crimped brush ends. The folded ends of the strip brush are particularly advantageous since the bristles cannot be worked free of the ends during use. Thus the spine forms a loop about the plurality of bristles, trapping the bristles within the spine during use.

[0012] In one embodiment, the first and second folds are substantially parallel with the bristles. The length of spine material may comprise a spine member which may be elongate in shape. The spine member may have a longitudinal axis and the spine member may be folded about first and second axes or fold lines which are substantially perpendicular to the longitudinal axis so as to form the first and second folds.

[0013] The spine member may have opposing edges which meet or overlap part way along the length of the strip brush once formed. The spine formation may therefore comprise a single discontinuity part-way along the length of the spine member rather than at the ends of the brush once formed.

[0014] The spine member may be shaped to provide a first and second opposing wall portions extending between said folds with the bristles disposed therebetween.

[0015] In one embodiment the spine formation is shaped in the form of a trench or channel within which the bristles are held. The first wall portion of the spine member may comprise an outer wall of the channel and the second wall portion may comprise an inner wall of the channel. The channel typically has a base and opposing side walls which define an elongate slot or opening through which the bristles protrude. The channel may be substantially U-shaped in section. The opening may be of smaller width dimension than the base of the channel.

[0016] The bristles are typically bent or otherwise deformed within the spine.

[0017] The spine member may be formed of a strip of material of substantially uniform width which is folded or otherwise formed into the required shape. Alternatively the spine member may have a first section which forms the first wall portion which is of greater width than one or more further portions which form the second wall portion.

[0018] In one embodiment spine support member is provided. The spine support member may take the form of an outer wall member shaped to surround the spine formation. The spine support member is typically of greater strength and or stiffness than the spine formation material and may be shaped to provide for attachment of

the strip brush to machinery for use.

[0019] According to a further embodiment of the present invention there is provided a method of manufacture of a strip brush comprising: arranging a plurality of bristles relative to a spine member, formed of a single sheet of planar material, such that first and second ends of the bristles protrude outwardly from the spine member; and providing first and second spaced folds in the spine member such that the spine member surrounds said bristles at a location between said first and second bristle ends wherein said first and second folds define opposing ends of the spine member.

[0020] The spine member may comprise a length of material having opposing first and second edges, wherein the edges meet or overlap when the first and second folds are provided.

[0021] The first and second folds may be positioned so as to provide a strip brush of predetermined length without the need for cutting the brush to size.

[0022] In one embodiment, the spine member is further folded or deformed in an orientation substantially perpendicular to the first and/or second folds. The third fold or deformation may be substantially along the length of the spine. The spine member may be deformed such that it is substantially channel shaped in section. The cross-sectional shape of the spine once formed may be substantially V-shaped or U-shaped or rounded in the form of a partial ellipse or a horseshoe shape.

[0023] Further preferable features of the present invention are defined within the claims.

[0024] One or more specific embodiments of the present invention are described in further detail below with reference to the accompanying drawings, of which:

Figure 1 shows a cross sectional view of a strip brush according to the present invention;

Figure 2 shows a plan view of a spine member for use in the manufacture of a strip brush according to the present invention;

Figure 3 shows a sectional view through the spine member of figure 2 during manufacture of a strip brush according to the present invention;

Figure 4 shows a plan view of the spine and bristles when arranged for manufacture of a strip brush according to the present invention;

Figure 5 shows an above view of the spine after formation of the strip brush;

Figure 6 shows a cross sectional view of a strip brush according to a further embodiment of the present invention;

Figure 7 shows a plan view of a spine member for use in the manufacture of a strip brush according to

a further embodiment of the present invention; and,

Figure 8 shows a cross sectional view of a strip brush according to the present invention having the spine member of figure 5.

[0025] Turning firstly to figure 1, there is shown a strip brush 10 according to the present invention in section. The brush 10 generally comprises a plurality of bristles 12 protruding from a spine formation 14.

[0026] The bristles 12 are elongate in shape and have free ends 16 spaced from the spine formation 14. The spine formation comprises an inner 18 and outer 20 wall formed of a single piece of resilient material as will be described below. The outer wall 20 is substantially U-shaped or horseshoe shaped in section so as to form a channel or gulley within which the bristles 12 are located.

[0027] The inner wall 18 is positioned within the outer wall 20 and is correspondingly shaped. The inner wall 18 is substantially concentric within the outer wall 20 with the bristles trapped therebetween. It will be appreciated that the channel formed by the outer wall 20 is of slightly greater width than the inner wall such that it can accommodate the inner wall and the bristles therein. The channel of the outer wall 20 has an opening 22 which is elongate in form when viewed from above and through which the bristles extend.

[0028] A mid portion 17 of the bristles 12 is held tightly in the spine formation 14 between the inner 18 and outer 20 walls. In this embodiment the mid portion 17 is substantially equidistant from each end 16 of the bristles 12 such that each free end 16 of the bristles extends to substantially the same distance from the spine formation 20. The embodiment of figure 1 is thus substantially symmetrical about centerline or axis 26.

[0029] However it will be appreciated that the bristles may be held within the spine formation 14 at any point between the opposing ends of the bristle and need not be held about their mid point 28. The plurality of bristles 12 may be considered to be a collection or else a semi-ordered array in which the orientation of each bristle is substantially fixed, although the exact position of each bristle is subject to change dependent on the interaction between bristles during manufacture. The collection of bristles typically has a width dimension which is greater than its depth and, more typically, the collection has a width dimension (which corresponds to the length of the strip brush) which is an order of magnitude or more greater than the depth.

It will also be appreciated that, whilst the channel shape of the spine formation is formed by bending of the inner and outer walls at a pair of locations equidistant from the axis 26, a single bend could be provided or else two or more bends or folds which are not symmetrical about the axis 26.

[0030] The trapped section 17 of the bristles 12 is deformed within the outer wall 20 about the inner wall 18 such that it conforms substantially to the shape of the

channel.

[0031] In use the spine formation provides a substantially rigid portion of the brush which can be used to attach the brush 10 to machinery or the like.

[0032] The spine formation 14 is formed of a resiliently deformable material, which is typically a metal such as mild steel. Other materials can be used dependent on the brush specifications.

[0033] Turning now to figures 2 to 6, there is shown the strip brush components during various stages of manufacture. In figure 2, a generally rectangular sheet 30 of metal spine material is provided. For most applications, an elongate form of planar spine material 30 is provided in order to produce an elongate strip brush. However shorter strip brushes are also possible in which the length of the brush is closer to the width or height dimension.

[0034] A plurality of bristles 12 (see figure 4) are laid laterally across the spine material 30 such that the free ends 16A and 16B protrude beyond the perimeter of the sheet material 30. In this embodiment the bristles are arranged such that they are substantially perpendicular to a longitudinal axis 32 of the spine material 30. The bristles are arranged substantially across a middle portion of the spine material 30 between fold lines 34 and 36 such that the outer sections 38 and 40 of the spine material are exposed.

[0035] The spine material 30 is deformed about spaced fold lines 34 and 36 so as to produce folds 35 and 37, resulting in the profile shown in figure 3. It will be appreciated that the bristles 12 will thus be trapped within the interior 42 of the partially formed spine. However the bristles 12 are omitted from figure 3 for clarity.

[0036] The folds 35 and 37 are spaced by a distance A which defines the length of the spine formation 14. The outer regions 38 and 40 are folded over in the form of flaps which are folded back upon the central portion substantially about 180°. The length A and the length of the outer regions 38 and 40 are selected such that the formed flaps overlap when folded flat as shown in figure 3 so as to form an complete enclosure around the inner space 42. The inner space is generally elongate in form although its width may vary dependent on the depth of bristles to be held therein.

[0037] Figure 4 shows a plan view of the arrangement of figure 3, complete with bristles 12. A further pair of fold lines 44 and 46 are shown in figure 4. These fold lines are generally parallel with the longitudinal axis 32 of the spine material 30. In order to produce the sectional shape shown in figure 1, the spine material is folded about fold lines 44 and 46 by 90° or more such that, when viewed from above the spine formation appears as shown in figure 5.

[0038] In one embodiment the spine material may be folded by approximately 95° or else until the opposing edges of the inner wall 18 touch. In alternative embodiments, the spine material may be longitudinally folded by less than 90° so as to form an open channel or V-shaped section.

[0039] The folding of the spine material in this manner causes the bristles to be bent back upon themselves such that the free ends 16A and 16B protrude from the spine formation 14 in substantially the same direction. Whilst two longitudinal folds 44 and 46 are preferably used to achieve this effect, a single longitudinal fold of approximately 180° may also be used. A single or a plurality of folds may also be tailored to deform the spine material about a curved sectional shape such that it is rounded in section. All such embodiments are intended to fall within the scope intended by the terms "fold", "folded" or "folding".

[0040] It will be appreciated that the inner 18 and outer walls 20 of the spine formation in figure 1 are formed by folding of the planar spine material 30 to the required shape.

[0041] The folds of figures 2 to 5 are typically achieved by mechanical pressing machinery as will be understood by a person skilled in the art. However the machine settings and angular degree of pressing may be calibrated to suit the required strip brush profile. In addition bespoke dies may be provided, against which the spine material can be pressed in order to achieve the required sectional shape.

[0042] Turning now to figure 6, another embodiment of the present invention is shown in which a spine support formation 48 is provided. The spine formation 14 is otherwise as described above in relation to figures 1 to 5. The spine support formation 48 may be formed of an elongate planar material such as a sheet metal which is shaped to surround the outer wall 20 of the spine formation 14. In this embodiment the spine support formation material is thicker than the spine material 30.

[0043] The support formation 48 provides additional strength and rigidity to the spine of the brush and may be provided with a particular profile in order to be fixable within a correspondingly shaped slot on a machine. In one embodiment, the shaping of the spine in this manner allows simple fixation of the strip brush to a machine or device for use without the need for additional fixing means. However it will be appreciated that conventional fixing means may also be provided.

[0044] In figure 6, the support formation has a neck region 50 of smaller dimensions than the body portion 52 in which the spine formation 14 is enclosed. The dimensions of the neck region 50 may be tailored to grip the spine formation 14 and/or bristles 12. The dimension of the neck can also be tailored to control the spread of the bristles 12. In this embodiment, a relatively weak spine formation 14 can be provided simply to hold the bristles within the spine, whilst the structural strength and sectional shape of the spine can be accommodated by the support member 48. The separation of these design features allows improved tailoring and flexibility of the strip brush design to meet particular bespoke applications.

[0045] The support member 48 may have straight or angled sides or else may be bulbous or rounded in section as shown in figure 6.

[0046] The spine support 48 may be preformed into an open tubular arrangement as shown in figure 6 and the spine formation 14 may be inserted longitudinally therein. Alternatively the spine support material may be deformed about the spine formation 14 during manufacture, for example by crimping pressing machinery. Alternatively the spine support may be deformed in a continuous or flow like manner by deforming elements as a length of support material is fed through machinery by conveying means. Thus the support formation can be formed and cut in a manner similar to that of conventional strip brushes without the drawback that bristles can be worked free of the brush once formed.

[0047] Turning now to figures 7 and 8, an alternative spine formation is shown to that of figure 1. The embodiment of figures 7 and 8 may be used either with or without a spine support formation.

[0048] Figure 7 shows a spine material 54 which folded in a manner similar to spine material 30. Indeed the end view of the spine material shown in figure 7 would match the profile shown in figure 3. The difference between the spine material 54 of figure 7 and the spine material 30 of figure 3 is the starting shape of the blank material.

[0049] The spine material 54 has a central region 56 and outer regions 58 and 60 which are folded about folds 62 and 64 to form overlapping flaps. However the outer regions or flaps 58 and 60 in figure 7 are of reduced width dimension compared to the central region 56. Thus when the spine material 54 is folded about longitudinal fold lines in a manner similar to that described in relation to figures 4 and 5, the sectional profile shown in figure 8 is formed.

[0050] The spine formation 66 of figure 8 thus has an outer wall 68 formed of the central region 56 of spine material 54 which is similar to the outer wall 20 of figure 1. However the inner wall 70 in figure 8 is smaller in dimension and comprises a base section only without inner side walls. This embodiment has the benefit over the embodiment of figure 1 that greater internal space is available within the spine for accommodation of the bristles 12. This can allow an increased number of bristles 12 to be accommodated or else can allow the longitudinal folds to be achieved with less internal resistance.

[0051] Other features of the embodiment of figures 7 and 8 are equivalent to those described above in relation to figures 1 to 5 and are interchangeable as far as practicable possible.

[0052] Any or all fold lines described above need not be marked or otherwise indicated on the spine material 30. Alternatively any or all fold lines may comprise marked lines of predetermined spacing or else may be embodied by physical features on the spine material such as by way of indents, lines of weakness, sections of increased thickness or the like.

Claims

1. A strip brush (10) comprising:

a plurality of elongate bristles (12) and a spine formation (14), the bristles having first and second free ends (16) and being gripped by the spine formation between said ends,

wherein the spine formation comprises a length of material (30) having first (35) and second (37) spaced folds and the plurality of bristles are trapped between said folds such that the first and second folds define opposing ends of said spine formation, and

wherein the spine formation is formed of a single sheet of planar material which is folded and/or otherwise deformed into the required profile.

2. A strip brush according to claim 1, wherein the spine material (30) forms a closed loop about the plurality of bristles (12), trapping the bristles within the spine formation (14) during use.

3. A strip brush according to claim 1 or 2, wherein said length of material (30) has opposing ends which meet or overlap part way along the length of the strip brush once formed

4. A strip brush according to any one of claims 1 to 3, wherein the first (35) and second (37) folds are substantially parallel with the bristles (12).

5. A strip brush according to any one of claims 1 to 4, wherein the spine formation has a longitudinal axis and the first and second folds are substantially perpendicular to said longitudinal axis.

6. A strip brush according to any preceding claim, wherein the spine formation has opposing side walls extending between said folded ends and arranged to trap the bristles therebetween.

7. A strip brush according to any preceding claim, wherein the spine formation is in the form of an elongate channel.

8. A strip brush according to claim 7, wherein the channel is substantially U-shaped in section.

9. A strip brush according to claim 7 or 8, wherein the spine formation is shaped to provide an outer wall (20; 68) of said channel and an inner wall (18; 70) of said channel, wherein the bristles (12) are trapped between said inner and outer walls.

10. A strip brush according to claim 1, wherein the spine formation comprises a rectangular sheet (30) of planar material.

11. A strip brush according to claim 1, wherein the spine

formation comprises a sheet material (54) having a central portion (56) and outer portions (58; 60) protruding from opposing sides of the central portion, the outer portions being arranged to be folded inward upon formation of the strip brush.

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oriented substantially along the length of the spine so as to produce a channel-shaped spine formation.

12. A strip brush according to claim 11, wherein the central portion has a width dimension which is greater than the width of the outer portions.

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13. A strip brush according to any preceding claim, wherein the bristles are held in a deformed configuration within the spine formation (14).

14. A strip brush according to claim 13, wherein the bristles are deformed substantially about 180° within the spine formation (14).

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15. A strip brush according to any preceding claim, comprising a spine support member (48).

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16. A strip brush according to claim 15, wherein the spine support member (48) takes the form of an outer wall member shaped to surround the spine formation (52).

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17. A strip brush according to claim 15 or 16, wherein the spine formation comprises a body portion (52) and a neck portion (50) of reduced dimension so as to retain the spine formation(14) within the body portion.

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18. A method of manufacture of a strip brush comprising:

arranging a plurality of bristles relative to a spine member formed of a single sheet of planar material such that first and second ends of the bristles protrude outwardly from the spine member; and

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providing first and second spaced folds in the spine member such that the spine member surrounds said bristles at a location between said first and second bristle ends wherein said first and second folds define opposing ends of the spine member.

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19. The method of claim 18, wherein the spine member comprises a length of material having opposing first and second ends, wherein the edges meet or overlap part way along the length of the spine formation when the first and second folds are provided.

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20. The method of claim 18 or 19, wherein the spine member is further folded or deformed in an orientation substantially perpendicular to the first and/or second folds.

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21. The method of claim 20, wherein the further fold is

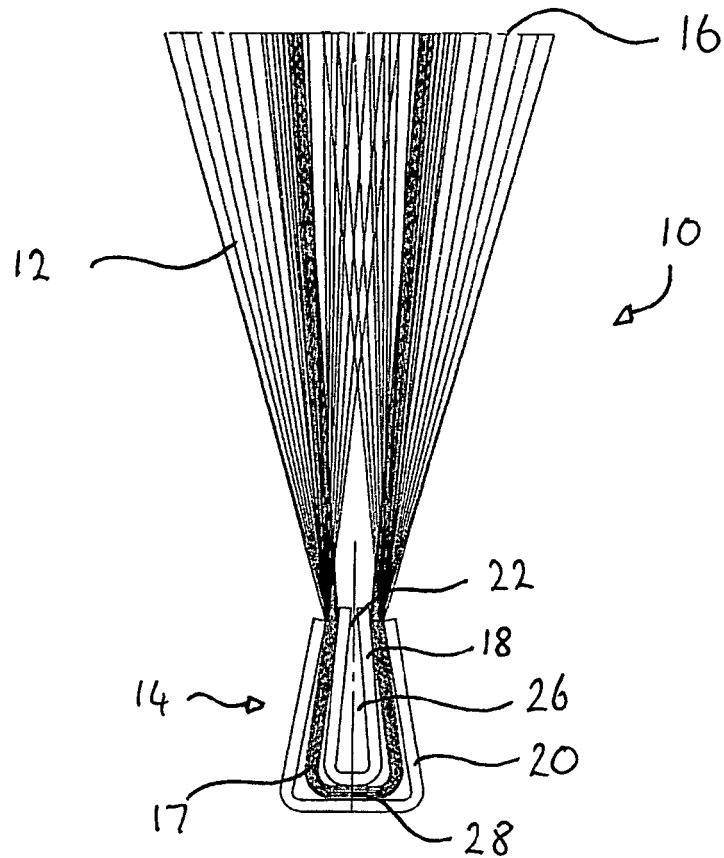


Fig. 1

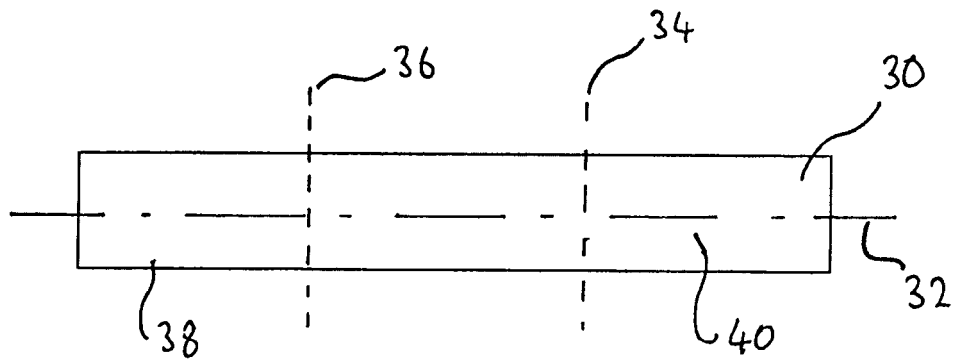


Fig. 2

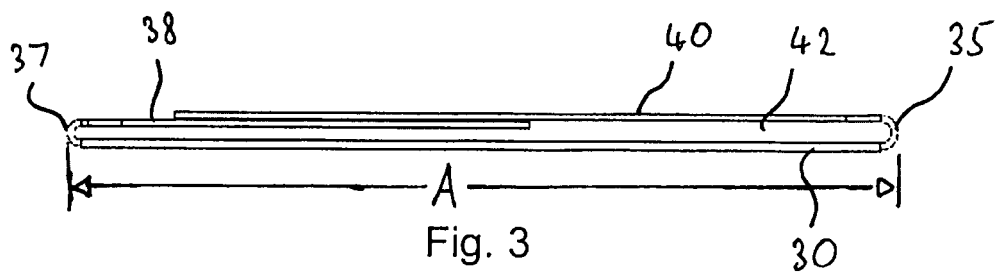


Fig. 3

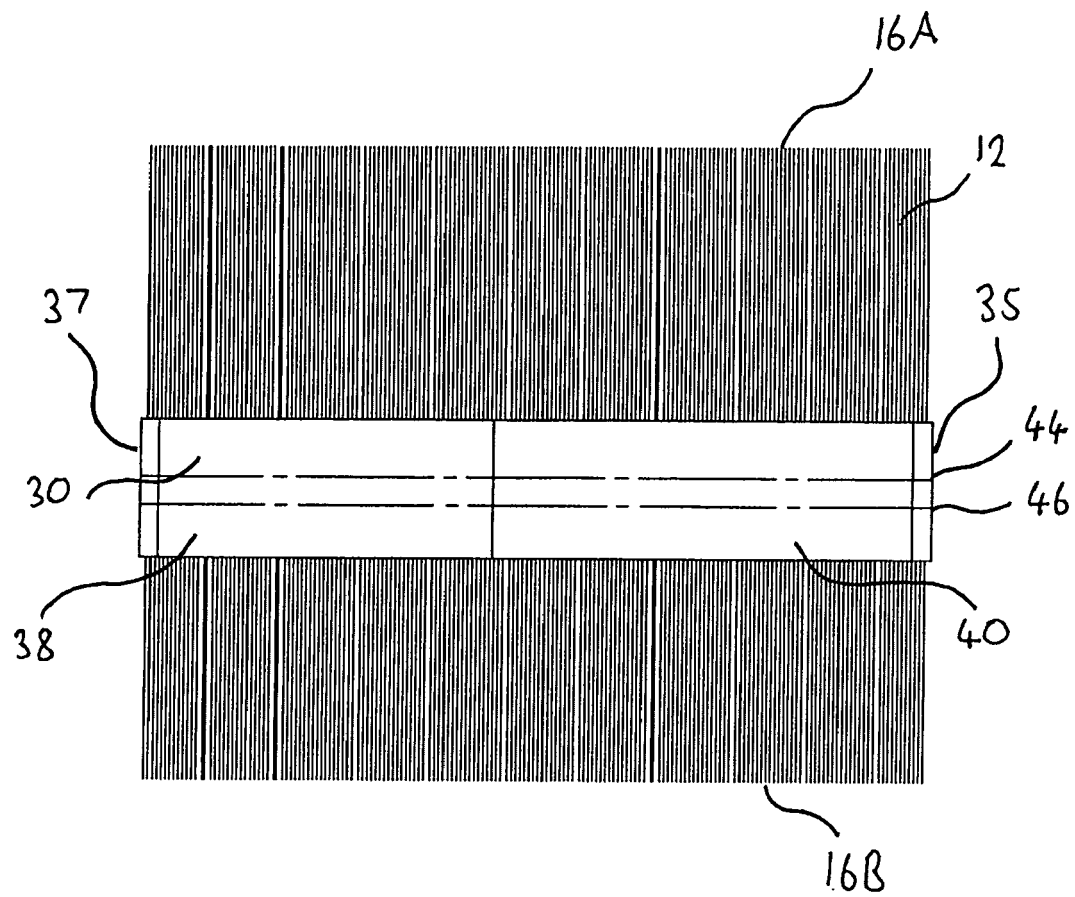


Fig. 4

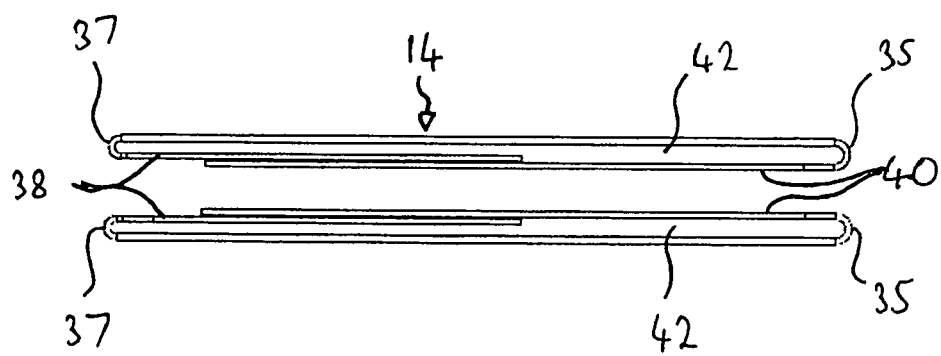


Fig. 5

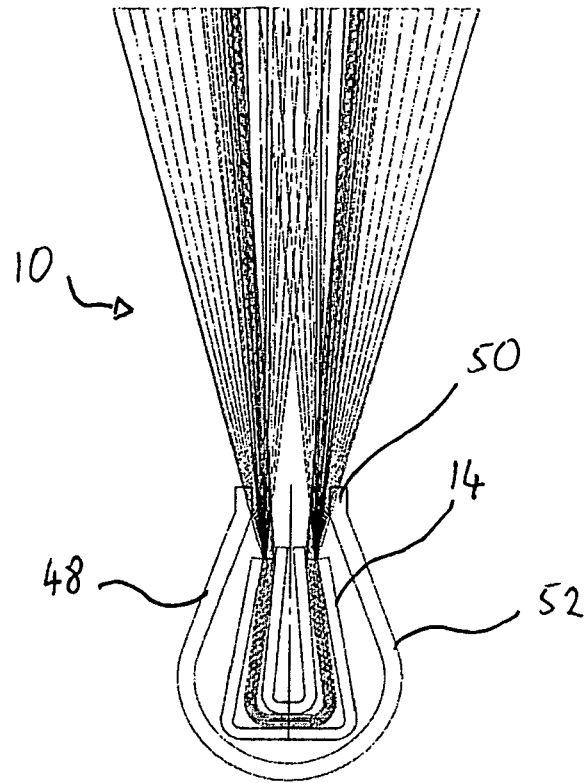


Fig. 6

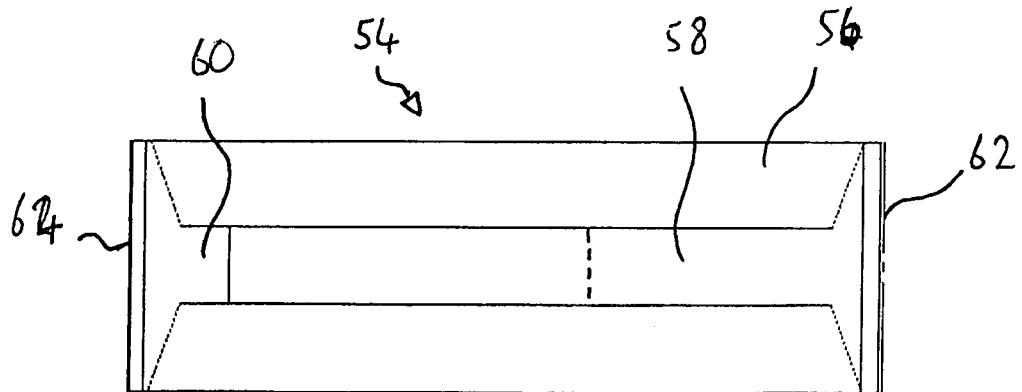


Fig. 7

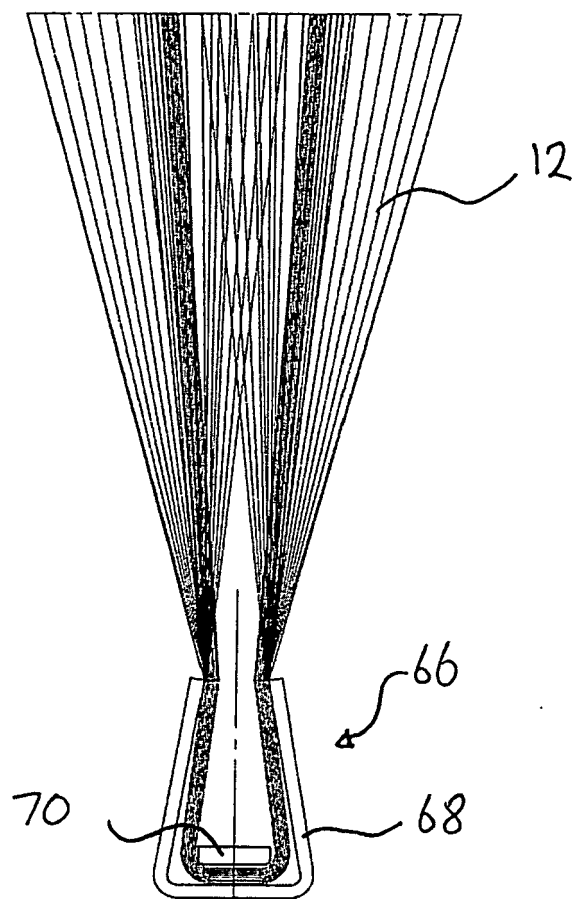


Fig. 8



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Application Number
EP 09 25 1297

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 10 November 2009	Examiner Brunie, Franck
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 09 25 1297

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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