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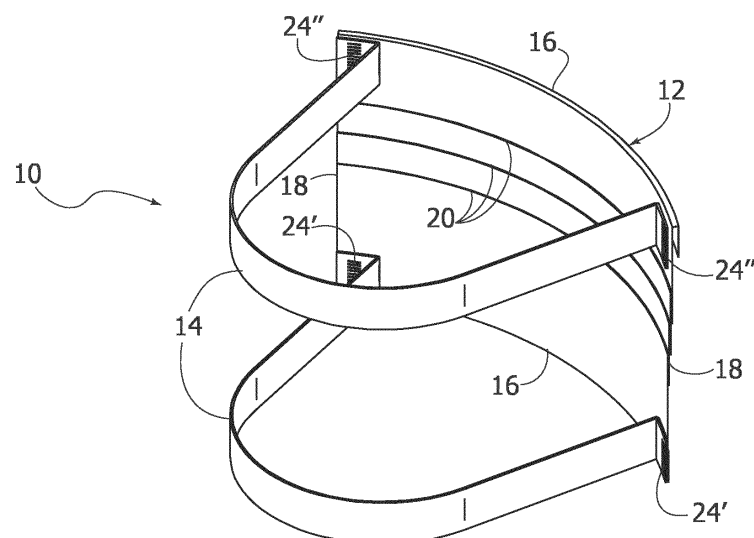
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(54) **A FACE PROTECTION MASK, A METHOD FOR PRODUCING FACE PROTECTION MASKS AND AN APPARATUS FOR PRODUCING FACE PROTECTION MASKS**

(57) A face protection mask (10) comprising a non-woven fabric mask body (12) and at least one elastic band (14) parallel to the longitudinal axis of the mask

body (12) and comprising at least one elastic element (28) fixed between two layers of non-woven fabric (26).

FIG. 2



Description

Field of the invention

[0001] The present invention relates to a face protection mask and a method for producing face protection masks.

[0002] The invention has been developed with particular regard to producing disposable surgical masks, however, the invention can also be used for producing face protection masks of other types, such as masks having a mask body to which at least one elastic element is fixed for its use.

Description of the prior art

[0003] A widely used type of disposable surgical mask comprises a mask body, typically formed of a multilayer rectangular panel of non-woven fabric with a series of parallel folds, and two C-shaped elastic threads attached to opposite sides of the mask body, which form two loops for the ears that are placed around the user's ears to hold the mask body in position in front of the user's mouth and nose. Further known embodiments envisage the mask body being connected to elastic bands which - in use - are arranged around the back of the head and/or around the back of the neck.

[0004] Most of the known apparatuses for producing masks of this type envisage stopping the mask bodies for applying the elastic loops for the ears in semi-automatic or manual mode. These apparatuses typically have a production speed in the order of 50 pieces/minute in manual mode and can reach speeds in the order of 175 pieces/minute in semi-automatic mode.

[0005] These production speeds are largely insufficient for articles of this kind, especially when compared with the production speeds of the most modern machines for producing disposable sanitary articles, for example, absorbent sanitary articles, which reach production speeds in the order of 800-1000 pieces/minute.

[0006] Another problem of the face protection masks according to the prior art is the difficulty of supplying the elastic threads used for producing the elastic loops for the ears.

[0007] Another problem of the known solutions is that it is not possible to quickly and efficiently produce masks having elastic threads with different elastic properties.

[0008] It is known that the elastic properties of elastic threads are fixed and depend mainly on the raw material and the geometry used. This implies that known solutions are scarcely flexible.

[0009] The known solutions typically only allow production of one type of mask having elastic threads with predefined characteristics on which it is not possible to intervene to produce different batches of masks.

[0010] If it is intended to obtain batches of masks with different elastic properties, it is necessary to replace the raw material of the elastic threads and possibly make

multiple changes to the apparatus for producing the masks.

[0011] US2015238783A1 discloses a mask including a mask body and one or more elastic straps that are secured to the mask body on opposing sides. The elastic straps have an openwork construction and include a netting that has an array of polymeric strands periodically joined together at bond regions throughout the array.

Object and summary of the invention

[0012] The present invention relates to a face protection mask according to claim 1 and a method for producing said protection masks according to claim 6 and aims to provide a face protection mask that can be produced with higher speeds than the face protection masks according to the prior art and that is not affected by problems of finding raw materials.

[0013] In particular, the invention has the object of making face protection masks by processing the elastic bands directly in line, adapting the specific elastic characteristics according to the specific batch to be made each time.

[0014] This increases production flexibility as it is possible to manage the elastic bands to be coupled to the masks directly in line and in the required manner.

Brief description of the drawings

[0015] The present invention will now be described in detail with reference to the attached drawings, given purely by way of non-limiting example, wherein:

- Figures 1 and 2 are perspective views of an embodiment of a face protection mask according to the present invention,
- Figure 3 is a plan view of the face protection mask of Figures 1 and 2,
- Figure 4 is a plan view of a second embodiment of a face protection mask according to the present invention,
- Figures 5 and 6 are plan views of two embodiments of the elastic bands of a mask according to the present invention,
- Figure 7 is a schematic view of an apparatus for producing face protection masks according to the present invention,
- Figures 8-14 are schematic views illustrating various method steps for producing face protection masks according to the present invention,
- Figure 15 is a schematic side view of an embodiment of an apparatus for forming elastic bands,
- Figure 16 is a schematic perspective view of an elastic band at the outlet of the apparatus in Figure 15, and
- Figure 17 is a schematic plan view illustrating an embodiment of a system for forming elastic bands.

[0016] It will be appreciated that the various figures may not be represented on the same scale. It will also be appreciated that in some figures certain elements or components may not be illustrated to better highlight others and to simplify the understanding of the figures.

Detailed description

[0017] A detailed description of the present invention is given below with some variations. This detailed description is exemplary and not limiting, as any further embodiments have also been inserted previously with reference to the synthesis of the invention.

[0018] With reference to Figures 1-3, numeral 10 indicates a face protection mask according to an embodiment of the present invention. The mask 10 comprises a mask body 12 and at least one elastic band 14.

[0019] In the examples illustrated in the figures, the mask 10 comprises two elastic bands 14, each of which is adjacent to a respective major side of the mask body 12. In use, the two elastic bands 14 are positioned at different heights on the user's head to keep the mask body 12 in position in front of the nose and mouth. The upper elastic band 14 is positioned on the nape and the lower elastic band 14 is positioned behind the user's neck.

[0020] In possible embodiments, the mask 10 may comprise only one elastic band 14. The single elastic band 14 may have a greater width than each of the elastic bands 14 illustrated in Figures 1-3, and can be arranged in a central area of the mask body 12. The single elastic band 14 may have a longitudinal cut that divides the elastic band into two branches that can be arranged at different heights on the user's head.

[0021] The mask body 12 is formed by one or more layers of non-woven fabric. In an extended position, the mask body 12 has a flat shape elongated along a longitudinal axis A, and has two longitudinal edges 16 and two side edges 18.

[0022] In a possible embodiment, the mask body 12 may be constituted by three layers of non-woven fabric superimposed on each other. For example, the inner layer may be made of a Thermal-Bond material, the intermediate layer of a Meltblown material and the outer layer of a Spunbond material.

[0023] The mask body 12 has a series of folds 20 parallel to the longitudinal axis A that extend for the entire length of the mask body 12.

[0024] The mask body 12 may comprise a nose clip 21 formed by a bar of plastically-deformable material, arranged parallel to the upper longitudinal edge 16 and having the object of shaping the upper edge of the mask body 12 around the user's nose. The nose clip 21 may, for example, consist of a thin metal bar coated with a plastic material, for example polyethylene. The nose clip 21 may be held inside a folded longitudinal edge 16 of the mask body 12. The folded longitudinal edge 16 may be attached to the outer face or the inner face of the mask

body 12 by ultrasonic welding, glue or thermal welding. In a possible embodiment, both longitudinal edges 16 of the mask body 12 can be folded and fixed to the outer face or the inner face of the mask body 12 by ultrasonic welding, glue or thermal welding.

[0025] In the example illustrated in Figure 1, the mask body 12 has a rectangular shape wherein the two longitudinal edges 16 are straight and parallel to the longitudinal axis A, and the two side edges 18 are straight and perpendicular to the longitudinal axis A. In this embodiment, the elastic bands 14 have the same length as the mask body 12.

[0026] In possible embodiments, the longitudinal edges 16 and/or the transverse edges 18 can be non-straight, and can be shaped in various ways. For example, in the embodiment illustrated in Figure 4, the side edges 18 of the mask body 12 may have respective central recessed sections 22, with a C-shape facing outwards. The central recessed portions 22 of the side edges 18 are comprised between the two elastic bands 14. In this embodiment, the elastic bands 14 have a length that is greater than the length of the central part of the mask body 12 comprised between the central recessed portions 22 of the side edges 18.

[0027] Each elastic band 14 is parallel to the longitudinal axis A, and may have an outer longitudinal edge parallel and aligned with a corresponding longitudinal edge 16 of the mask body.

[0028] The elastic bands 14 have respective opposite ends which are fixed to the mask body 12 along respective attachment areas 24', 24" located in the vicinity of the respective side edges 18 of the mask body 12. The attachment of the opposite ends of each elastic band 14 to the mask body 12 may be carried out by means of glue, ultrasonic welding or thermal welding.

[0029] With reference to Figures 3 and 4, in a possible embodiment, the attachment areas 24' of the lower elastic band 14 (the one located along the longitudinal edge 16 opposite to the one bearing the nose clip 21) have an extension in the longitudinal direction greater than the attachment areas 24" of the upper elastic band 14 (the one located along the longitudinal edge 16 carrying the nose clip 21). In this way, the lower elastic band 14, which in use is positioned on the user's neck, has a lower effective length than the upper elastic band 14, which in use is positioned on the user's nape and must be lengthened to a greater extent than the lower elastic band 14. In the embodiment illustrated in Figure 4, the attachment areas 24' of the lower elastic band 14 can extend substantially for the entire length of the section of the mask body 12 that extends laterally beyond the recessed part 22.

[0030] The elastic bands 14 in addition to being fixed to the mask body 12 in the side attachment areas 24', 24" may also be fixed to the mask body 12 in intermediate areas between the side attachment areas 24', 24" by means of technical connecting points, for example, by means of technical welding points or by means of tech-

nical glue points, which form temporary connecting points intended to be interrupted with a weak release force. In this way, the elastic bands 14 remain adherent to the mask body 12 during production and packaging. The technical connecting points keep the elastic bands 14 neatly in the packaging and before use the technical connecting points can be easily detached.

[0031] In a possible embodiment, in an extended configuration of the mask body 12 the elastic bands 14 are in a non-tensioned state. Therefore, in the extended configuration of the mask body 12, the elastic bands 14 do not apply any force to the mask body 12. This prevents the mask body 12 from assuming an arcuate shape at rest. Therefore, at rest, the mask body 12 has a planar configuration, which simplifies the production and packaging operations.

[0032] Each elastic band 14 comprises two layers of non-woven fabric 26, and at least one elastic element sandwiched between the two layers of non-woven fabric 26.

[0033] In a possible embodiment, the two layers of non-woven fabric 26 of each elastic band 14 can be formed by a single sheet of non-woven fabric folded along a longitudinal edge.

[0034] The layers of non-woven fabric 26 may be of Spunbonded-Meltblown-Spunbonded (SMS) material, or of Thermal Bond material, and may have a grammage measured according to the EDANA NWSP 130.1 regulation between 10 and 20 g/cm², in particular, between 12 and 15 g/cm².

[0035] In a possible embodiment, in an extended condition of the mask body 12, the layers of non-woven fabric 26 of the elastic bands 14 can be pleated.

[0036] In the embodiment illustrated in Figure 5, each elastic band 14 comprises a plurality of elastic threads 28, parallel to each other, fixed to the two layers of non-woven fabric 26 by joining lines 30. The joining lines 30 may have a transverse trend and are spaced apart from each other in the longitudinal direction.

[0037] The joining lines 30 are formed by welding points that weld the two layers of non-woven fabric 26 together and anchor the elastic threads 28 to the two layers of non-woven fabric 26. The welding points are spaced apart from each other in a transverse direction by a distance smaller than the diameter of the non-tensioned elastic threads. The elastic threads 28 can be arranged between the two layers of non-woven fabric 26 in a tensioned state and, while the elastic threads 28 are tensioned, the two layers of non-woven fabric 26 are welded together by means of welding points arranged on opposite sides of the tensioned elastic threads 28, and spaced apart from each other by a distance smaller than the diameter of the non-tensioned elastic threads. When the tension of the elastic threads is released, the elastic threads remain anchored to the layers of non-woven fabric 26 at the welding points.

[0038] In a possible embodiment, the layers of non-woven fabric 26 may be welded together with a welding

pattern comprising anchor welds spaced apart in a transverse direction by a distance less than the diameter of the non-tensioned elastic wires, and welds of containment spaced apart from each other in a transverse direction by a distance greater than the diameter of the non-tensioned elastic threads.

[0039] In a possible embodiment, the layers of non-woven fabric 26 can be fixed to each other by means of transverse glue lines spaced apart from each other in the longitudinal direction.

[0040] The elastic threads 28 can be made of Lycra® and may have a denier between 480 and 1500 dtex, or between 800 and 1200 dtex.

[0041] In the embodiment illustrated in Figure 6, each elastic band 14 comprises a laminar elastic element 32 arranged sandwiched between the two layers of non-woven fabric 26, and fixed thereto by means of a plurality of welding points 34, which join together the two layers of non-woven fabric 26 on opposite sides of the laminar elastic element 32. The welding points 34 may form corresponding through-holes 36 through the laminar elastic element 32 that make the elastic band 14 breathable.

[0042] The laminar elastic element may consist of an elastic polyolefin film.

[0043] With reference to Figure 7 and Figures 8-14, an apparatus not forming part of the present invention and a method for producing face protection masks 10 of the type described above will now be described.

[0044] In Figure 7, numeral 40 indicates a continuous flow apparatus for producing face protection masks 10. "Continuous flow apparatus" means an apparatus in which the semi-finished products move continuously without pauses or stops until the finished product is obtained.

[0045] The apparatus 40 may comprise a first forming unit 42 configured for the in-line formation of a sheet of multilayer non-woven fabric 44, for example, by overlapping three layers of non-woven fabric 45. Alternatively, the non-woven fabric sheet 44 could be supplied in reels and fed to the apparatus 40 by unwinding devices.

[0046] The apparatus 40 comprises a feed unit 46 configured to advance the continuous sheet of non-woven fabric 44 along a machine direction X.

[0047] The apparatus 40 comprises a folding device 48 configured to form continuous folds on the continuous moving sheet 44 parallel to the machine direction X. Downstream of the folding device 48, a pressure device 50 can be arranged to compress the continuous sheet 44 on which the continuous longitudinal folds 20 have been formed.

[0048] A continuous thread 52 of plastically-deformable material is unwound from a reel 54 and is fed in the machine direction X parallel to a longitudinal side of the continuous fabric 44. A cutting and applying device 56 cuts the continuous thread 52 so as to form a succession of clips for the nose 21, which are applied to the continuous sheet 44 in the vicinity of one of its longitudinal edges. A longitudinal folding device 58 folds the longitu-

dinal edges of the continuous sheet 44. Downstream of the longitudinal folding device 58, a second pressure device 60 can be provided to compress the continuous sheet 44. Then, the continuous sheet 44 passes through an ultrasonic welding device 62, which carries out the ultrasonic welding of the folded longitudinal edges. Alternatively, the apparatus could be equipped with a glue applicator for attaching the folded longitudinal edges with glue or with a thermal welding device.

[0049] Figure 8 illustrates the continuous sheet of non-woven fabric 44 at the outlet of the forming unit 42. Figure 9 illustrates the continuous sheet of non-woven fabric 44 after the formation of the longitudinal folds 20 and the application of the nose clips 21, and Figure 10 illustrates the continuous sheet of non-woven fabric 44 after folding and welding of the longitudinal edges 16. The continuous sheet of non-woven fabric 44 in the configuration of Figure 10 is formed by a continuous succession of mask bodies 12.

[0050] With reference to Figure 7, the apparatus 40 comprises a second forming unit 64 configured for the in-line formation of at least one continuous elastic band 66. In a possible embodiment, the second forming unit 64 is configured to form two continuous elastic bands 66 parallel to each other.

[0051] The second forming unit 64 is configured to enclose at least one continuous elastic element 68 between two continuous layers of non-woven fabric 70. The continuous elastic element 68 can be formed by a plurality of continuous elastic threads parallel to each other or by a film of continuous laminar material. The second forming unit 64 may comprise two applicator rollers 72, which apply the two continuous layers of non-woven fabric 70 on opposite sides of the continuous elastic element 68. The continuous elastic element 68 may be fed to the applicator rollers 72 by means of a feeding device indicated schematically with 74, which can be configured to feed the continuous elastic element 68 in a tensioned state.

[0052] The apparatus 40 comprises a fastening device 76 arranged downstream of the second forming unit 64, configured to attach the two continuous layers of non-woven fabric 70 together and anchor the continuous elastic element 68 between the two continuous layers of non-woven fabric 70. The fastening device 76 may, for example, be formed by an ultrasonic welding apparatus.

[0053] In a possible embodiment, the two continuous layers of non-woven fabric 70 of each continuous elastic band 66 may be formed by a single continuous sheet of non-woven fabric folded along a longitudinal edge.

[0054] With reference to Figure 11, downstream of the fastening device 76 two continuous elastic bands 66 parallel to each other are obtained, each of which comprises an elastic element 68 enclosed between two continuous layers of non-woven fabric 70, wherein the continuous elastic element 68 and the layers of non-woven fabric 70 are attached together along joining lines 30. The joining lines 30, which can be formed by ultrasonic welding spots, can be oriented in the transverse direction and

can be spaced apart from each other in the longitudinal direction.

[0055] In possible embodiments, the attachment of the elastic element 68 between the two continuous layers of non-woven fabric 70, for example, by means of joining lines 30, to form the continuous elastic bands 66, can be obtained in the ways previously described with reference to Figure 5.

[0056] With reference to Figure 7, the apparatus 40 comprises a slowing device 78 arranged downstream of the fastening device 76, and configured to slow down the continuous elastic bands 66. The slowing device 78 may comprise a roller 80 on which the continuous elastic bands 66 are wound and driven in rotation with a rotation speed such that the peripheral speed of the roller 80 is less than the speed at which the continuous elastic bands 66 are fed to the roller entrance 80. At the outlet of the slowing device 78, the feed rate of the continuous elastic bands 66 is lower than the speed of advancement of the continuous elastic bands 66 upstream of the slowing device 78. During the passage through the slowing device 78 the elastic tension of the continuous elastic elements 68 decreases in proportion to the reduction in the feed rate of the continuous elastic bands 66. The slowing device 78 can be controlled so that the elastic tension of the continuous elastic bands 66 at the outlet of the slowing device 78 has a value close to zero.

[0057] With reference to Figure 12, the reduction of the tension of the continuous elastic bands 66 causes - at the outlet of the slowing device 78 - the layers of non-woven fabric 70 of the continuous elastic bands 66 to assume a pleated or wavy shape. In the configuration of Figure 12, the continuous elastic bands 66 are formed by a continuous succession of elastic bands 14 intended to be applied to respective mask bodies 12.

[0058] With reference to Figure 7, the apparatus 40 comprises a welding unit 82 configured to weld together the continuous sheet of non-woven fabric 44, formed by a continuous succession of mask bodies 12, and the continuous elastic bands 66, formed by a continuous succession of elastic bands 14. The welding unit 82 comprises an anvil wheel 84 rotating around its axis, and an ultrasonic welding device 86 cooperating with the outer surface of the anvil wheel 84. The continuous sheet of non-woven fabric 44 and the continuous elastic bands 66 are fed jointly on the outer surface of the anvil wheel 84 in the machine direction X upstream of the ultrasonic welding device 86 in a superimposed condition, with the elastic bands continuous sheets 66 aligned with the respective longitudinal edges of the continuous sheet of non-woven fabric 44.

[0059] With reference to Figure 13, the ultrasonic welding unit 82 welds together the continuous elastic bands 66 and the continuous non-woven fabric 44 at regular intervals, and forms attachment areas 24', 24" between the elastic bands 14 and the respective mask bodies 12. The ultrasonic welding unit 82 can also carry out the transversal welding of the continuous sheet of non-woven fabric 44.

ven fabric 44 in the section between the two elastic bands 66 to form the welding of the side edges 18 of the mask bodies 12. As shown in Figure 13, the attachment areas 24' of the lower elastic bands 14 may have an extension in the longitudinal direction that is greater than the extension in the longitudinal direction of the attachment areas 24" between the upper elastic bands 14.

[0060] According to a characteristic, the ultrasonic welding unit 82 is configured to attach the elastic bands 14 to the respective mask bodies 12 with a complete absence of elastic tension of the elastic bands 14. According to an example, the cancellation of the elastic tension of the continuous elastic bands 66 is obtained by advancing the continuous elastic bands 66 upstream of the ultrasonic welding device 86 at a speed greater than the feed rate of the mask bodies 12. The difference between the feed rate of the continuous elastic bands 66 and that of the mask bodies 12 may be obtained by holding the continuous elastic bands 66 in contact with the outer surface of the anvil wheel 84, and by driving the anvil wheel 84 in rotation with a rotation speed such that the peripheral speed of the anvil wheel 84 is greater than the speed of advancement in the machine direction X of the continuous web of non-woven fabric 44.

[0061] Since the continuous elastic bands 66 downstream of the slowing device 78 are almost free of elastic tension, it is advisable for the continuous elastic bands 66 to be supported and guided in the path between the slowing device 78 and the anvil wheel 84. For this object, the apparatus 40 may comprise one or more conveyors 88 arranged between the slowing device 78 and the anvil wheel 84, and configured to guide the continuous elastic bands 66 towards the outer surface of the anvil wheel 84. Each of the conveyors 88 may comprise two closed-loop conveyor belts that tighten the elastic bands 66 together.

[0062] With reference to Figure 13, at the outlet of the welding unit 82, a continuous composite sheet is obtained formed by a succession of finished masks 10 joined together.

[0063] With reference to Figure 7, the apparatus 40 includes a cutting unit 90 configured to cut the continuous composite sheet to separate the finished individual masks 10 from each other. The cutting unit 90 cuts the continuous elastic bands 66 and the continuous non-woven fabric sheet 44 along cutting lines indicated by 92 in Figure 13. At the outlet of the cutting unit 90, individual masks 10 are obtained having the shape shown in Figure 14.

[0064] To form the masks 10 according to the embodiment illustrated in Figure 4, the cutting unit 90 makes the cut along a cutting path including two straight portions at the elastic bands 66 and a closed loop path at the continuous sheet of non-woven fabric 44 between the two elastic bands 66. In this way, a scrap is formed with a shape corresponding to that of the closed-loop cutting path between each pair of masks 10 adjacent to each other. The scraps can be evacuated by means of a suc-

tion device.

[0065] In possible embodiments, the continuous sheet of non-woven fabric 44 can be cut to form individual mask bodies 12 upstream of the welding unit 82. The continuous elastic bands 66 may be cut so as to form individual elastic bands 14 upstream or downstream of the welding device 86.

[0066] Figure 15 schematically illustrates a second embodiment of a unit 64 for forming elastic bands 66. The forming unit 64 comprises a pair of gears 94 cooperating with each other. Each of the gears 94 cooperates in turn with an additional gear 96. Two continuous sheets of non-woven fabric 70 are passed between each pair of wheels 94, 96. The toothed wheels 94, 96 impart a wavy shape to the respective sheets of non-woven fabric 70. A continuous elastic element 68 is fed by a feeding device 74 between the two gears 94, and is enclosed between the two corrugated sheets of non-woven fabric 70. The continuous elastic element 68 can be formed by a plurality of elastic threads 28 parallel to each other, as shown in Figure 16, or by a laminar film. At the outlet of the forming unit 64, the two wavy non-woven fabric sheets 70 are fixed together by welding or glue to anchor the elastic element 68 between the two wavy non-woven fabric sheets 70. At the outlet of the forming unit 64, a pleated elastic band 66 is thus obtained having the shape shown in Figure 16. The forming unit 64 can be configured to form two elastic bands 66 parallel to each other.

[0067] In a possible embodiment, the continuous elastic element 68 can be fed between the two wavy non-woven fabric sheets 70 in a non-tensioned state. In this way, at the outlet of the forming unit 64, at least one pleated elastic band 66 is obtained wherein the elastic elements 68 are tension-free. In this case, the at least one elastic band 66 may be fed directly to the anvil wheel 84 without first passing through a slowing device 78.

[0068] In a possible embodiment, the continuous elastic element 68 can be fed between the two wavy non-woven fabric sheets 70 in a tensioned state. This can be achieved by operating the feeding device 74 so that it feeds the continuous elastic element 68 at a speed lower than the speed of the two wavy non-woven fabric sheets 70. In this way, at the outlet of the forming unit 64, at least one wavy elastic band 66 is obtained in which the elastic elements 68 are tensioned. This allows obtainment of elastic bands 66 wherein the undulations of the non-woven fabric sheets 70 are particularly compact.

[0069] Figure 17 schematically illustrates a system that makes it possible to obtain two continuous elastic bands 66 starting from a single sheet of non-woven fabric 98. The non-woven fabric sheet 98 is cut in a longitudinal direction so as to form two longitudinal sections 100. On each of the two longitudinal sections 100 a continuous elastic element 68 is applied that can be formed by a plurality of elastic threads 28 parallel to each other or by a laminar elastic film. Each continuous elastic element 68 occupies only one half of the respective longitudinal section 100. Then, each longitudinal section 100 is folded

around a longitudinal line 102 so as to enclose the continuous elastic element 68 between two layers of non-woven fabric formed by two overlapping halves of the longitudinal section 100.

[0070] The apparatus not forming part of the present invention makes it possible to carry out a continuous cycle production process with a production speed in the order of 800-1000 pieces/1'.

[0071] The apparatus not forming part of the present invention and the method according to the present invention allow production of the finished masks without any direct human contact with the products. It is, therefore, possible to pack the masks in sterile packages and ensure the absence of contamination.

[0072] Of course, without prejudice to the principle of the invention, the details of construction and the embodiments can be widely varied with respect to those described and illustrated, without thereby departing from the scope of the invention as defined by the appended claims.

Claims

1. A face protection mask (10), comprising:
 - a mask body (12) having a longitudinal axis (A) and two side edges (18),
 - at least one elastic band (14) parallel to said longitudinal axis (A) and having opposite ends fixed to respective side edges (18) of the mask body (12), wherein said at least one elastic band (14) comprises at least one elastic element (28, 32),

characterized in that said at least one elastic band (14) comprises a plurality of elastic threads (28) trapped between two layers of non-woven fabric (26), wherein said two layers of non-woven fabric (26) are welded together by means of a plurality of anchor welds, and wherein each of said anchor welds comprises a pair of welds placed at the sides of each of said elastic threads (28) and spaced apart by a length less than the diameter of said elastic thread (28) at rest so as to trap the latter between said two layers of non-woven fabric (26).
2. A face protection mask (10) according to claim 1, wherein in a relaxed condition of the mask body (12), said at least one elastic band (14) is in a tension-free state.
3. A face protection mask (10) according to claim 1 or claim 2, comprising two elastic bands (14) adjacent to respective longitudinal edges (16) of the mask body (12) and having respective opposite ends fixed to the respective mask body (12) along attachment areas (24', 24") .

4. A face protection mask (10) according to any of claims 1-3, wherein said layers of non-woven fabric (26) of an elastic band (14) are formed by a single sheet of non-woven fabric folded along a longitudinal line.
5. A face protection mask (10) according to claim 1, wherein in an extended condition of the mask body (12) said layers of non-woven fabric (26) are pleated.
6. A method for producing face protection masks (10) according to claim 1, comprising:
 - forming a succession of mask bodies (12) each having a longitudinal axis (A) and two side edges (18),
 - forming a succession of elastic bands (14), each comprising at least one elastic element (28, 32) trapped between two layers of non-woven fabric (26),
 - attaching opposite ends of each of said elastic bands (14) to respective side edges (18) of a respective mask body (12).

FIG. 1

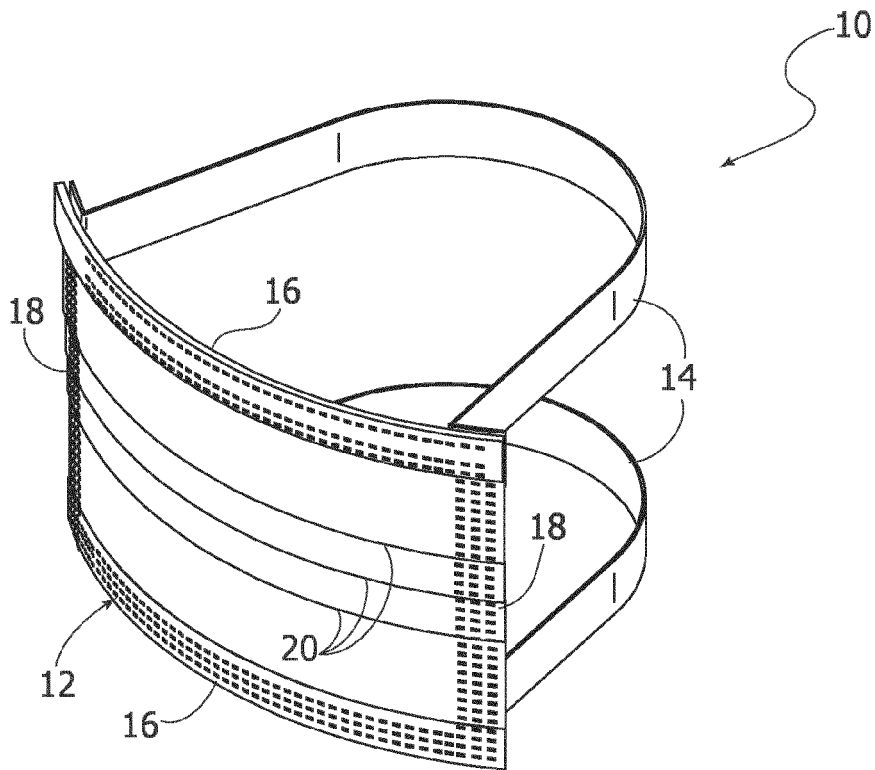
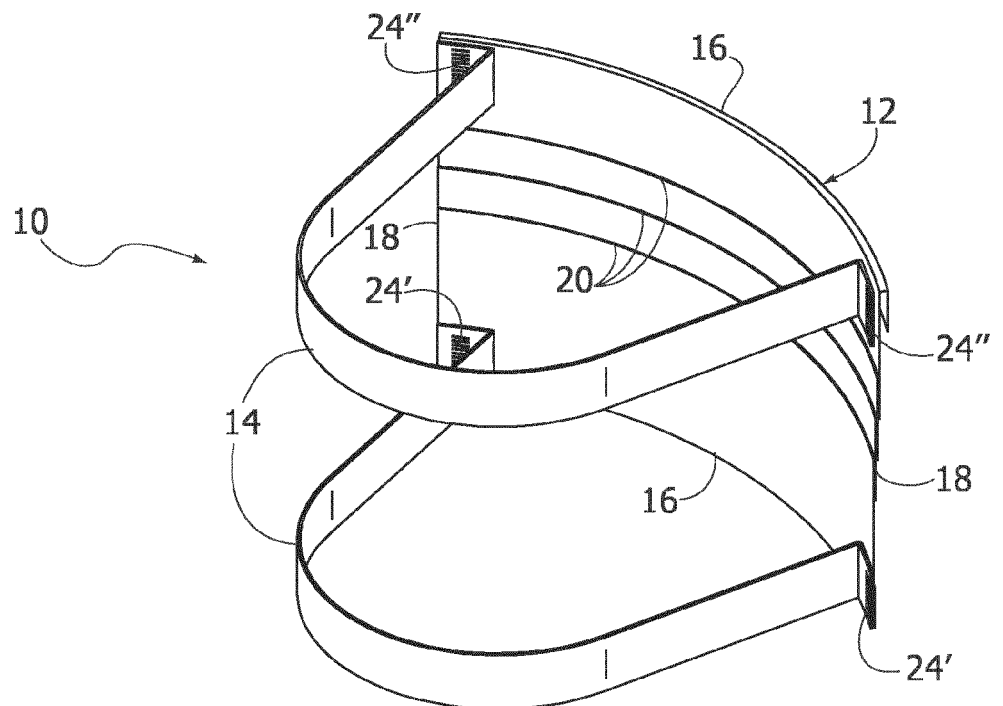
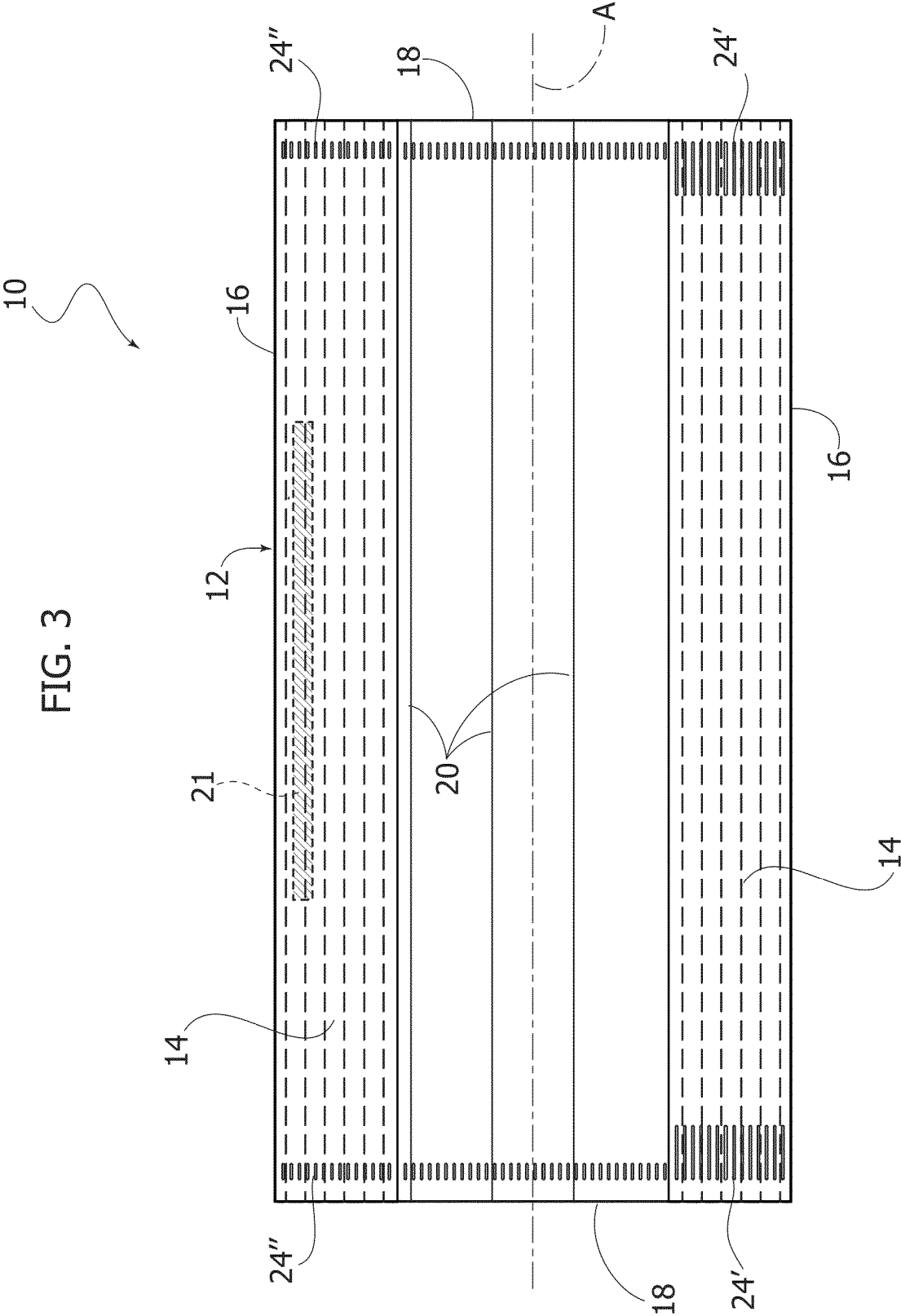


FIG. 2





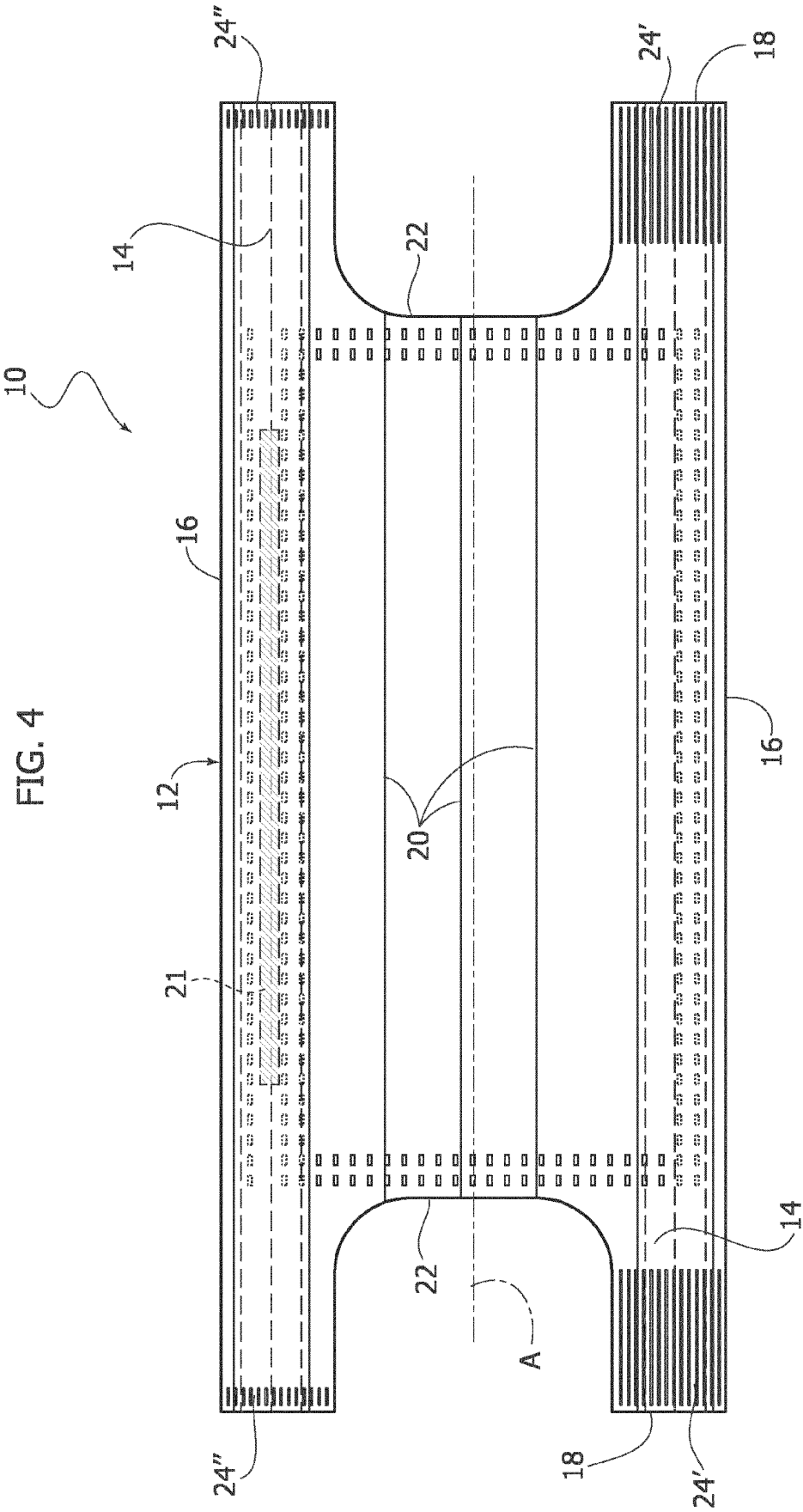


FIG. 5

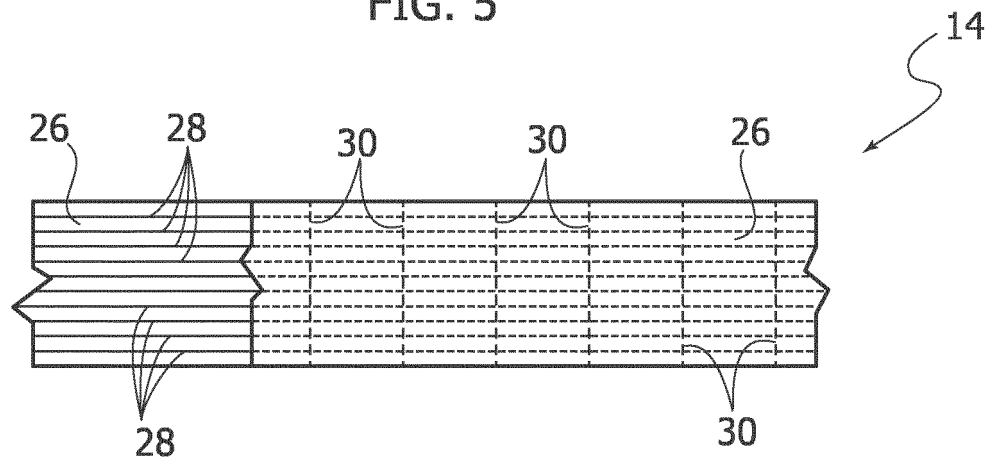


FIG. 6

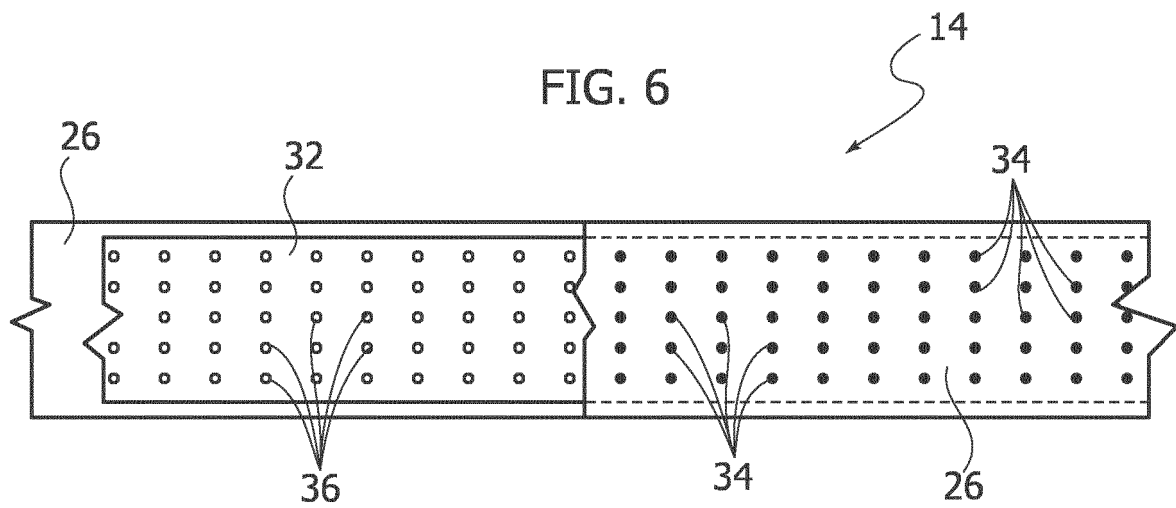


FIG. 7

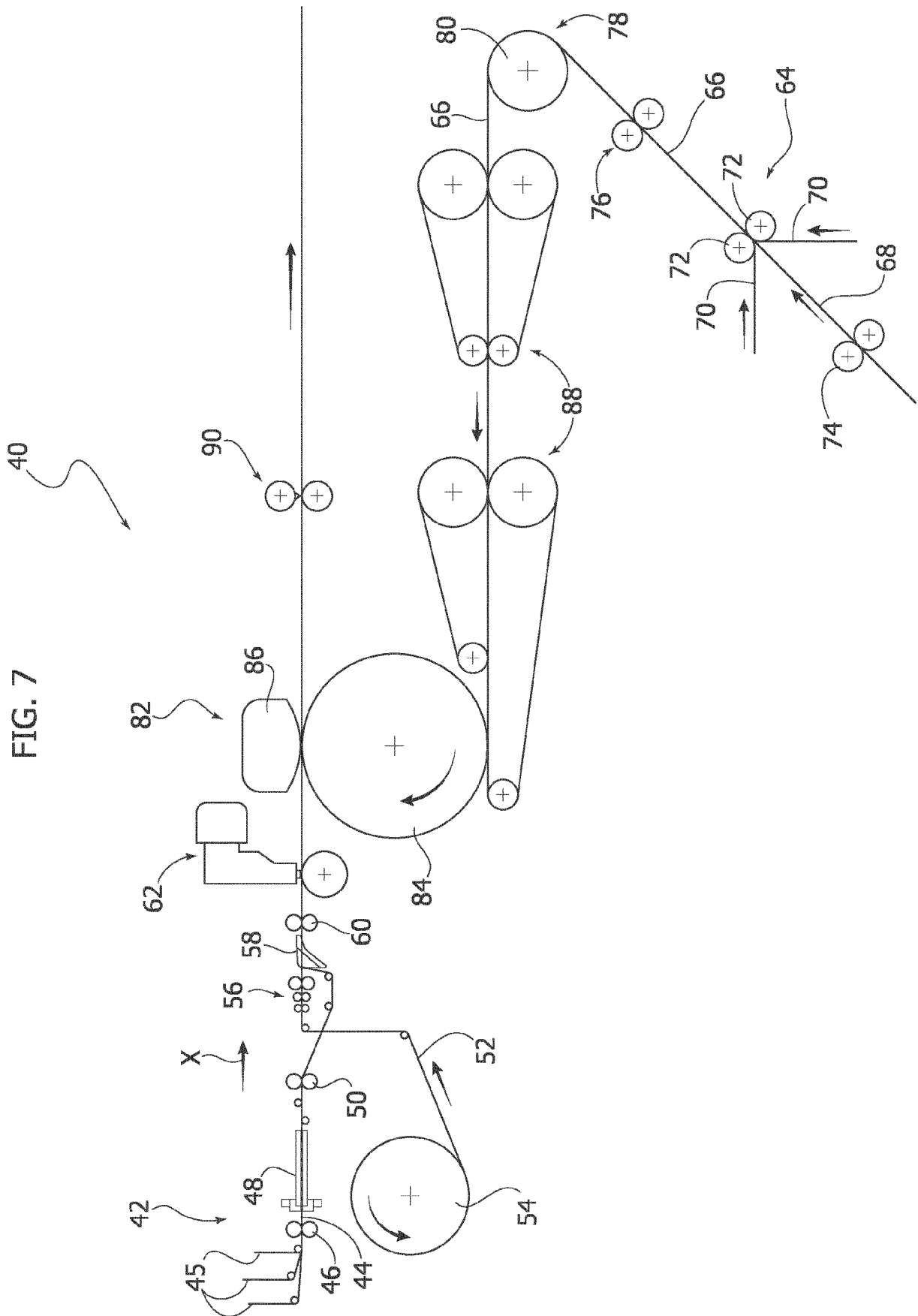


FIG. 8

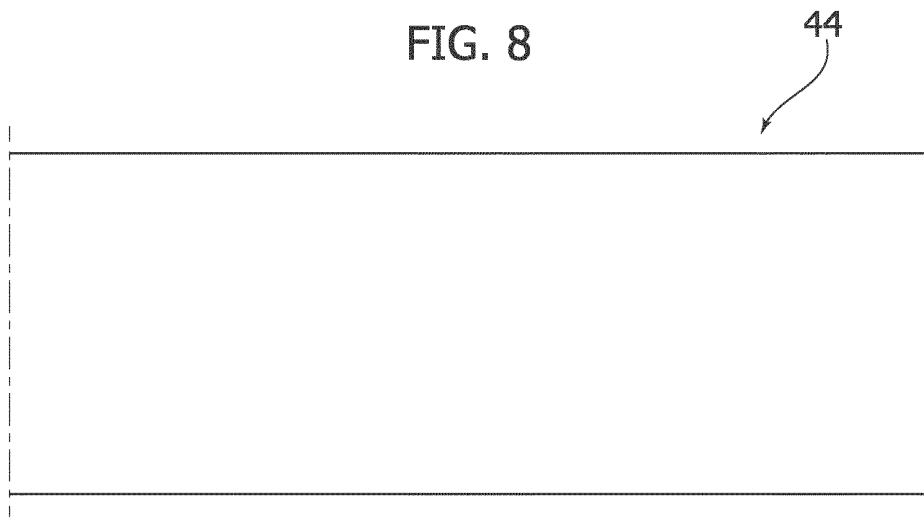


FIG. 9

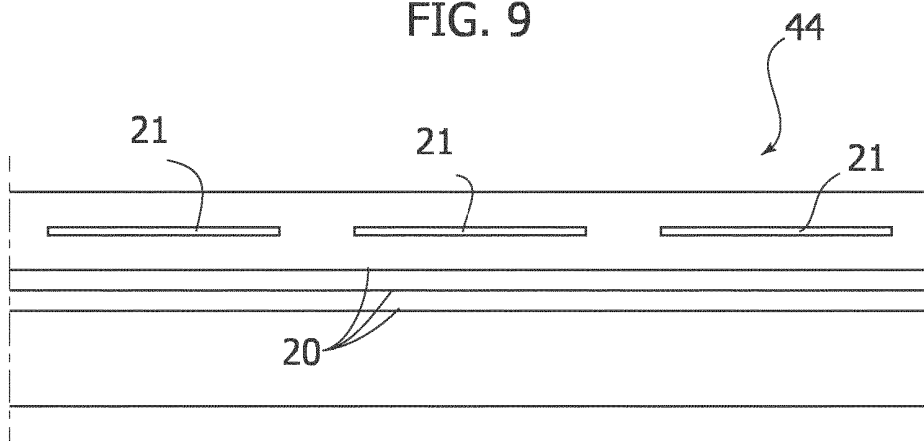


FIG. 10

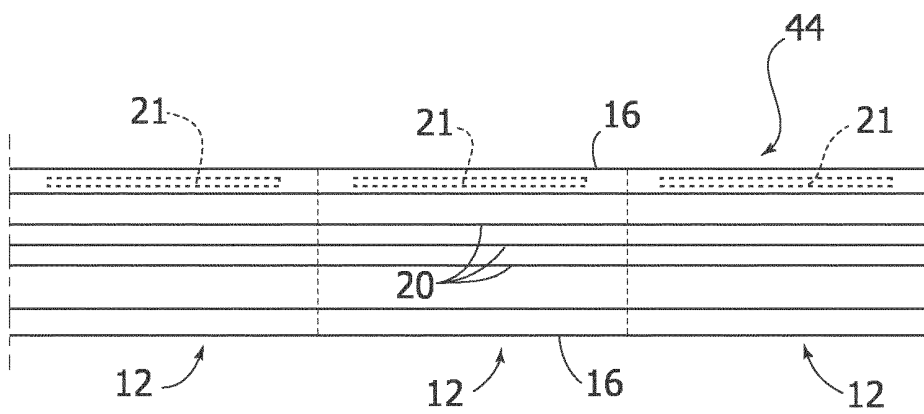


FIG. 11

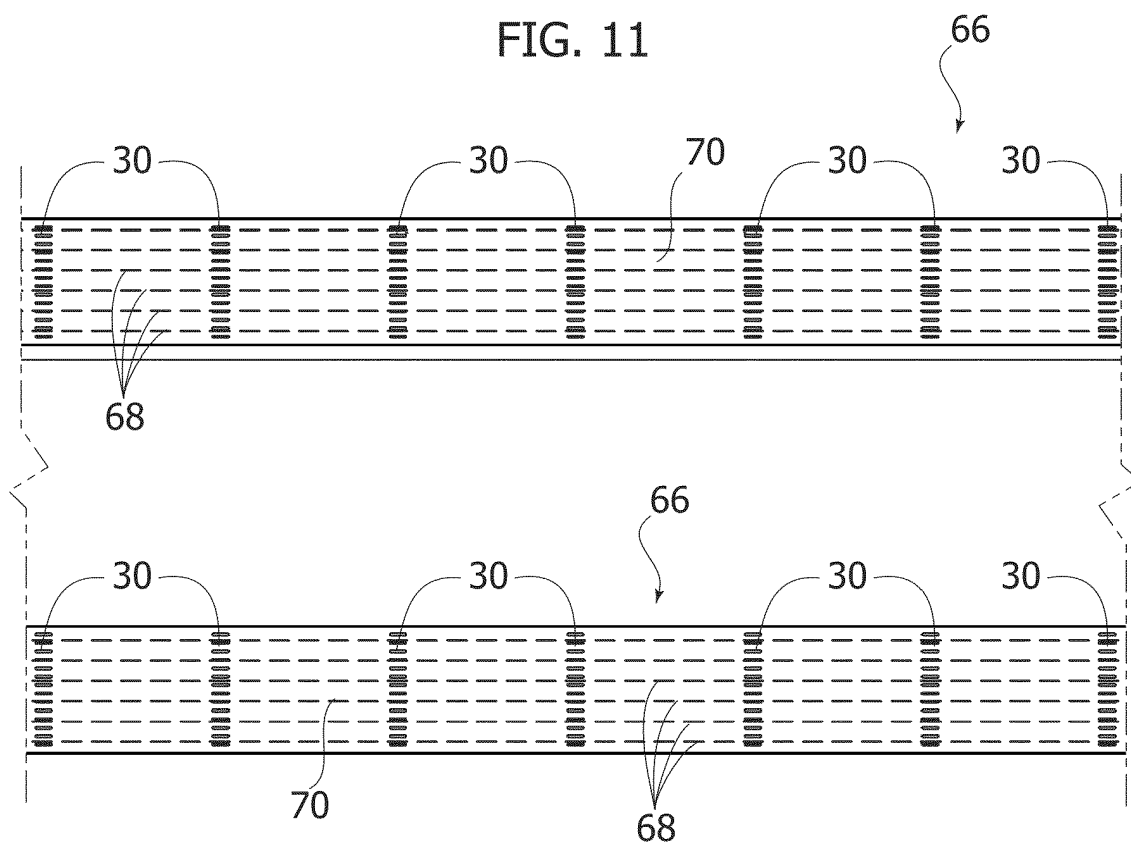


FIG. 12

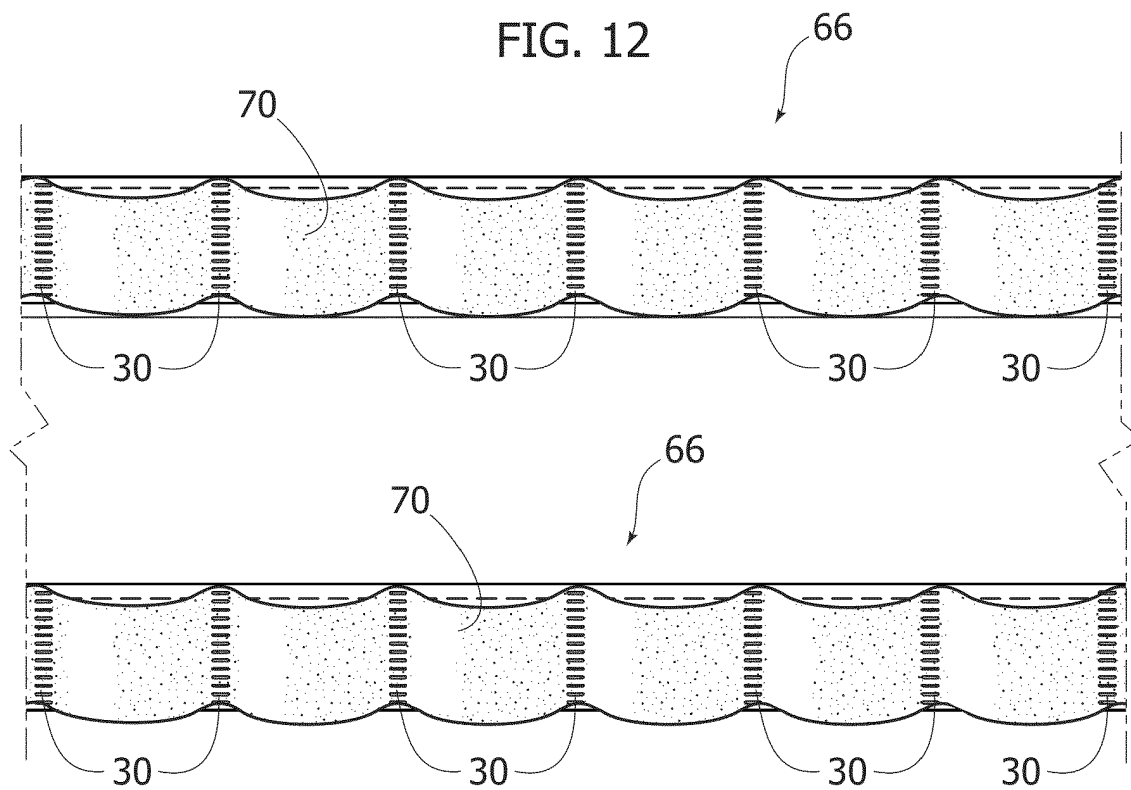


FIG. 13

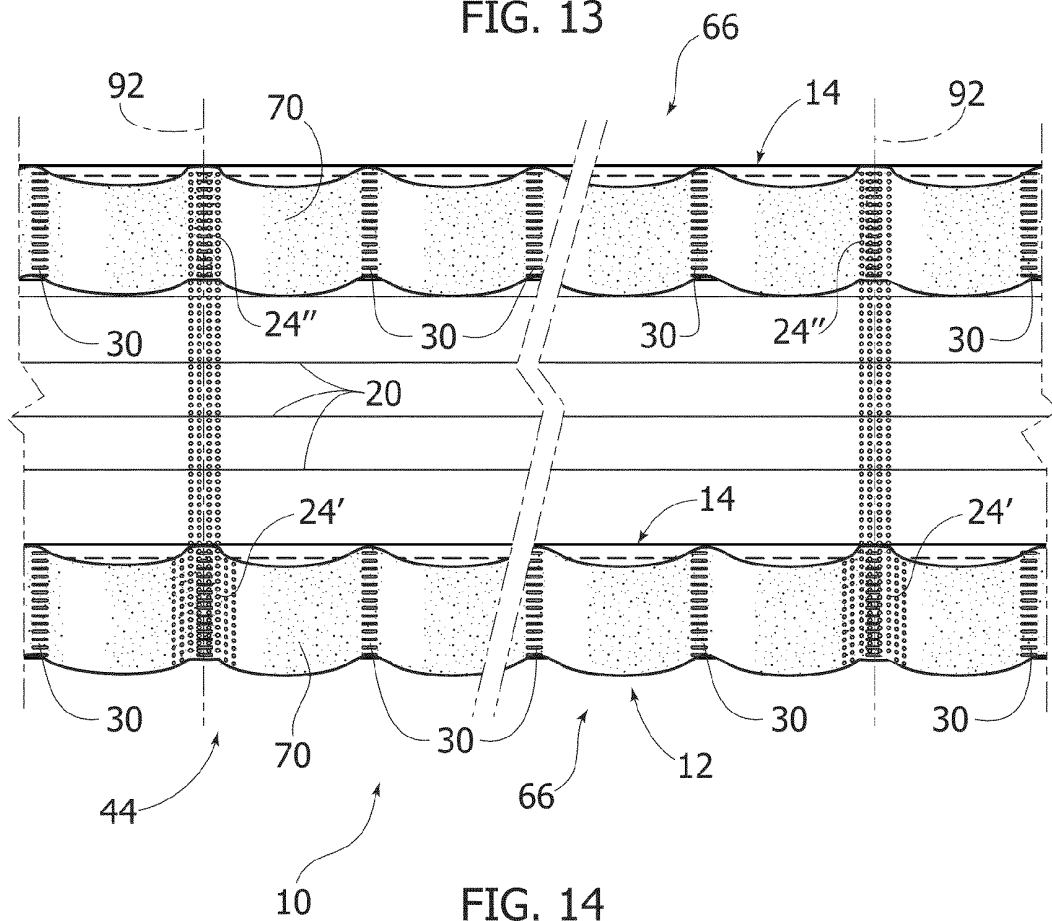


FIG. 14

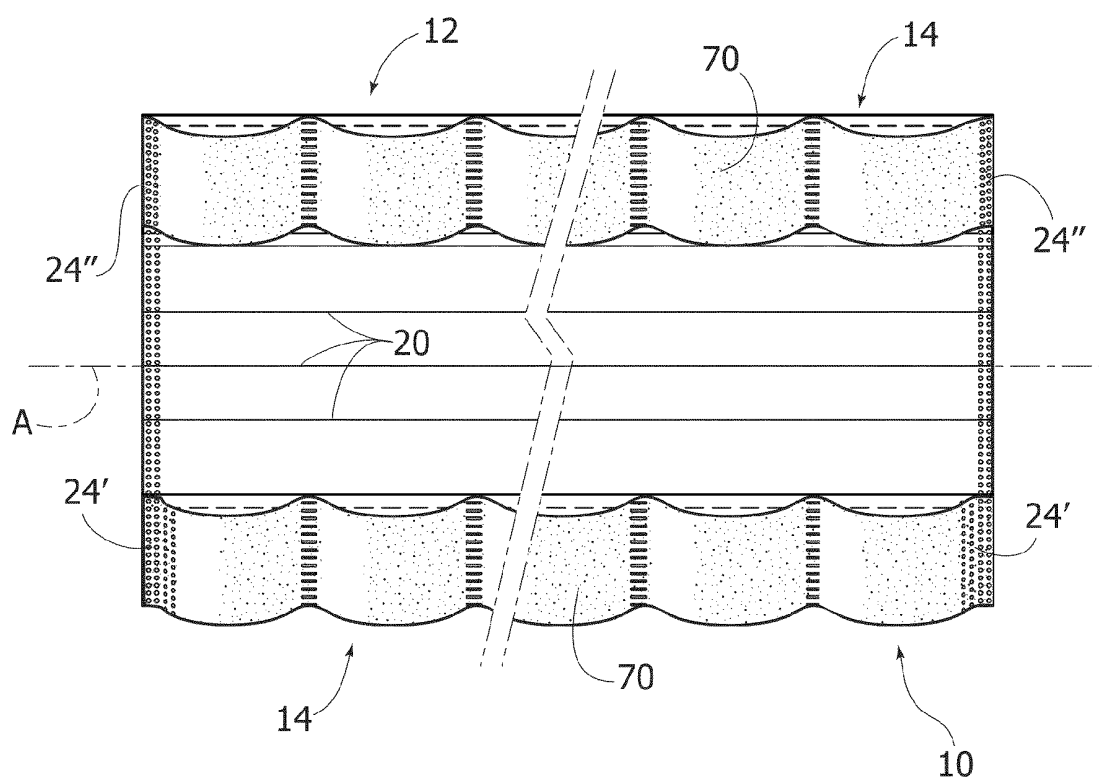


FIG. 15

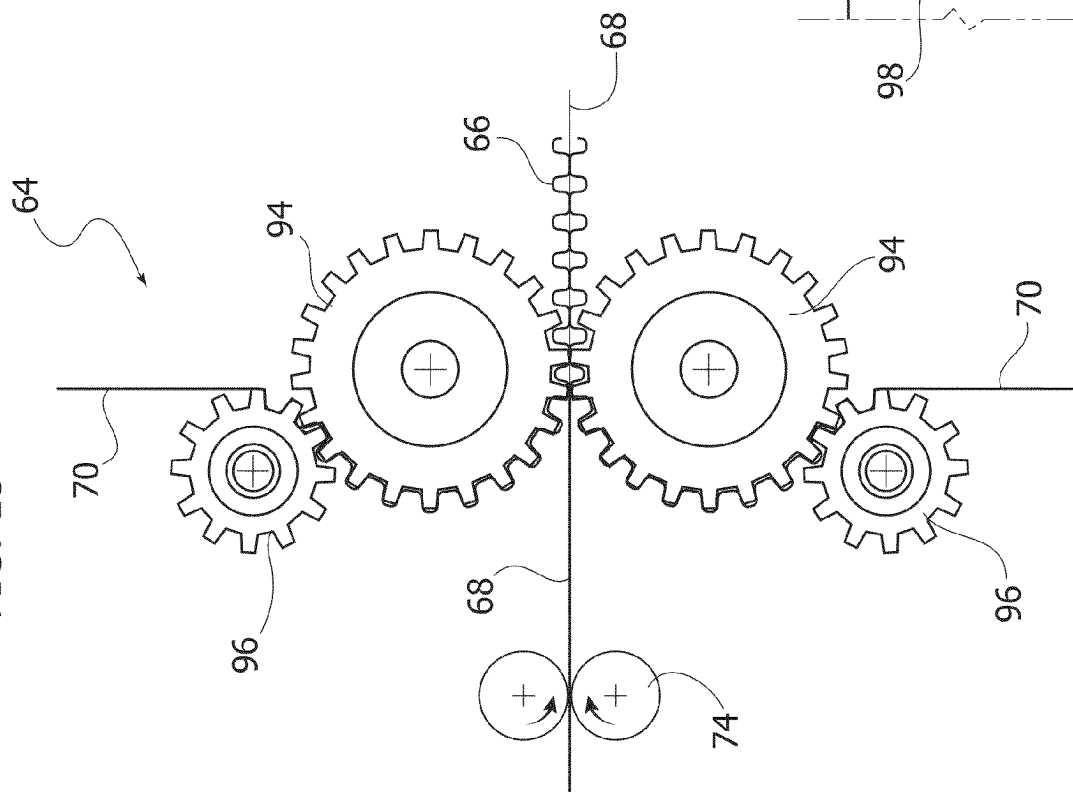


FIG. 16

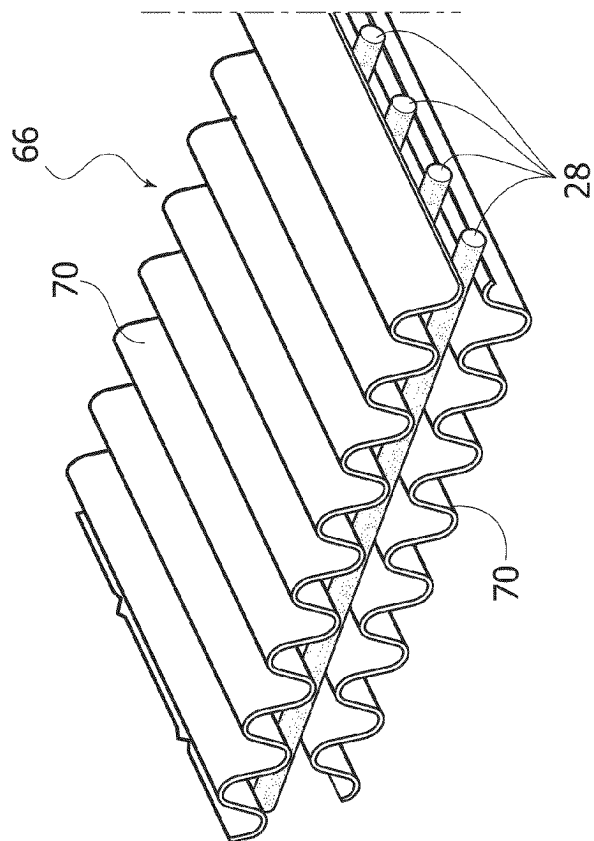
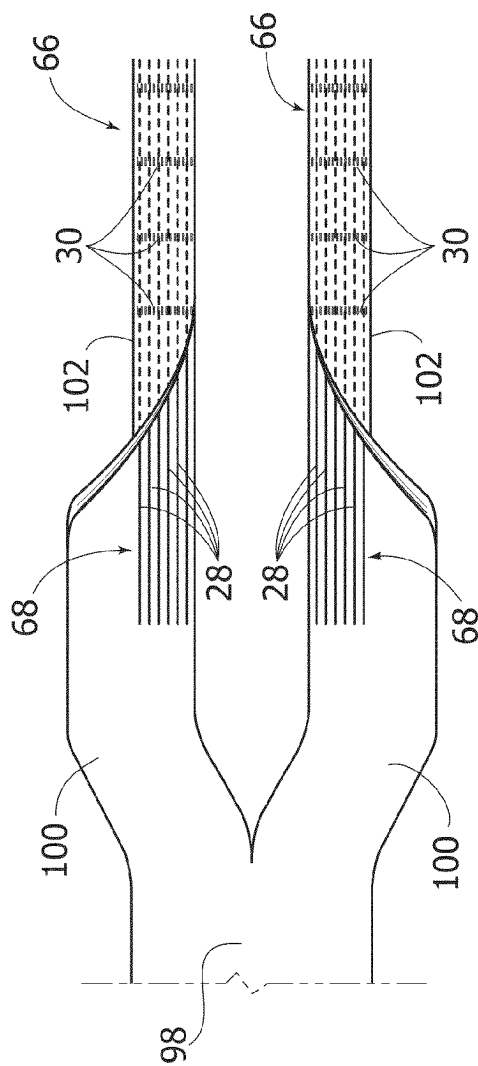


FIG. 17



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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