



(86) Date de dépôt PCT/PCT Filing Date: 1992/07/28

(87) Date publication PCT/PCT Publication Date: 1993/03/04

(45) Date de délivrance/Issue Date: 2003/09/30

(85) Entrée phase nationale/National Entry: 1993/10/15

(86) N° demande PCT/PCT Application No.: US 1992/006257

(87) N° publication PCT/PCT Publication No.: 1993/003644

(30) Priorité/Priority: 1991/08/16 (07/747,876) US

(51) Cl.Int.⁵/Int.Cl.⁵ A44B 18/00, B29C 43/28, B29C 59/04

(72) Inventeurs/Inventors:

KENNEDY, WILLIAM J., US;
PROVOST, GEORGE A., US;
ROCHA, GERALD F., US

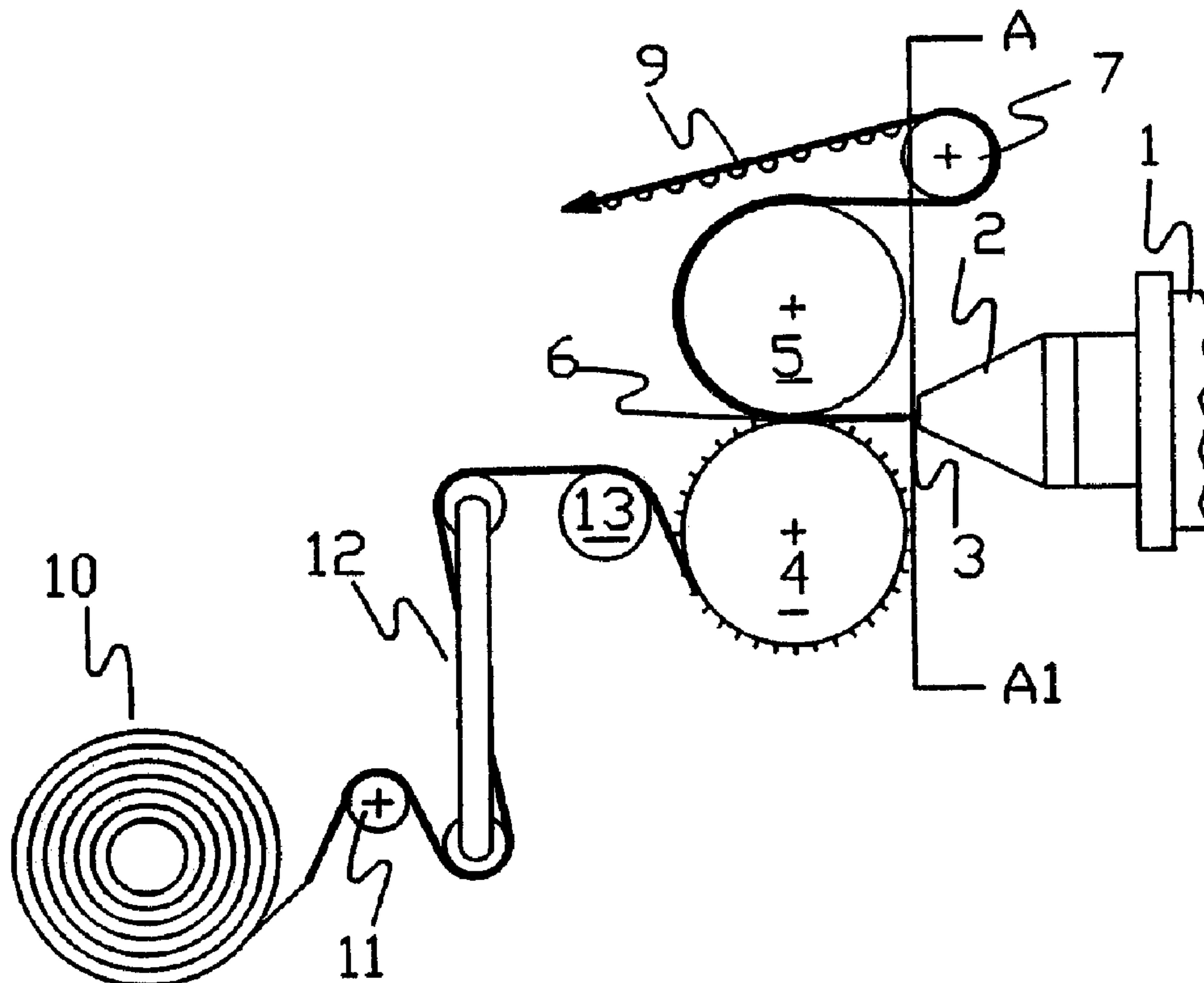
(73) Propriétaire/Owner:

VELCRO INDUSTRIES B.V., NL

(74) Agent: GOWLING LAFLEUR HENDERSON LLP

(54) Titre : FIXATION A CROCHET STRATIFIE ET PROCEDE DE FABRICATION CONNEXE

(54) Title: LAMINATED HOOK FASTENER AND METHOD OF MAKING SAME



(57) Abrégé/Abstract:

A laminated hook fastener and a method for making a laminated extruded hook fastener strip on a roll having hook forming cavities in its surface by extruding plastic material into the interface between the forming roll and a second strip carried by a backing roll is provided. The second strip is firmly bonded to the fastener strip on the side opposite the formed hooks.

ABSTRACT

5 A laminated hook fastener and a method for making a laminated extruded hook fastener strip on a roll having hook forming cavities in its surface by extruding plastic material into the interface between the forming roll and a second strip carried by a backing roll is provided. The second strip is firmly bonded to the fastener strip on the side opposite the formed hooks.

1 LAMINATED HOOK FASTENER AND METHOD OF MAKING SAME

2 This invention relates to an improved fastener of the
3 hook and loop type and a method for producing the same
4 using a combined extrusion/roll forming process. The
5 assignee of this application is owner of U.S. Patent No.
6 4,775,310 which describes an apparatus for making a
7 separable fastener and U.S. Patent No. 4,872,243 which
8 describes the product produced by the apparatus of the
9 former patent. Striplike fasteners of the type described
10 in the subject patents comprise a great multiplicity of
11 closely spaced upstanding hooklike projections to
12 releasably engage loops of a companion fastener strip to
13 form a cyclable or semipermanent closure sold in the trade
14 under the brand name Velcro^R. Depending upon the
15 configuration of the multihook fastener, many different
16 types of material are adapted for coaction therewith to
17 effect joining of the structures to which the strip
18 fasteners are themselves joined. Such fastener devices
19 are finding broad usage in such diverse applications as
20 securing automotive seat covers to foamed seat buns,
21 closures for food bags, the application of armor to
22 military vehicles and holding down floor coverings to
23 floors.

24 Each of the recited applications and many more, well
25 known to those skilled in the art, require the fastener to
26 be permanently attached to a second article such as a
27 piece of textile fabric, a seat bun, a floor or the flap
28 of a paper bag. Sewing, however, is limited as to the
29 nature of the material to which the fastener may be
30 attached. Adhesive systems have long been used as a
31 principal method of attaching fasteners to other objects
32 as well. U.S. Patent No. 3,773,580 discloses a method of
33 securing a fastener member to a substrate by first
34 applying a synthetic resin adhesive to one side of the
35 base of a fastener, opposite the side containing the
36 upstanding engaging elements, and then applying an

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1 adhesive to the substrate. Thereafter the adhesive
2 coating on the fastener is activated. The two adhesive
3 coated surfaces are brought together in face to face
4 relationship to firmly affix the fastener member to the
5 substrate. The subject patent teaches that "in order to
6 securely bond an adhesive to the tape member it is
7 preferred that the opposite surface of the tape member
8 have a suitable base coat which would provide for a secure
9 bond between the tape member and the adhesive". U.S.
10 Patent No. 3,726,752 instructs that in preparing adhesive
11 laminates, wherein synthetic resin based adhesive is
12 laminated to a web of polyamide polymer, it was found that
13 strong bonding between the polyamine substrate and the
14 adhesive lamina were difficult to achieve, and the prior
15 art is "well-studded with attempts to overcome this
16 problem". This patent overcomes such difficulties by
17 treating the polyamide web with primer coating consisting
18 of a complex chemical mixture in a solvent medium to
19 render an improved bonding surface. Many patents,
20 including U.S. Patent No. 2, 349,290 and U.S. Patent No.
21 3,060,070 and U.S. Patent No. 3,111,448 and U.S. Patent
22 No. 2,766,164, describe methods for bonding poly(amide)
23 polymer to specific surfaces primarily natural or
24 synthetic rubber. All of these teachings rely upon
25 chemical means for enhancing the ability to bond to the
26 surface of a sheet or fibrous material.

27 Many plastic fastener tapes are produced from plastic
28 materials possessing the minimum strength and resiliency
29 essential to the proper functioning of the hooklike
30 projections. Customarily the side of the fastener tape
31 opposite the upstanding hooks is a smooth, flat, uniform
32 and regular surface difficult to bond, as is well
33 documented in the prior art. Such difficulties present
34 particular problems for hook and loop fasteners. This
35 class of products are convenience products and if it is
36 necessary to apply complex chemical treatments to the tape

1 prior to bonding the convenience advantage is lost. It is
2 known to apply pressure sensitive adhesives to such
3 fasteners by the application of corona treatments in the
4 manufacturing facilities where the fastener tapes are
5 manufactured but such treatments are not available for
6 many users and do not present a reasonable solution for
7 creating a fastener surface which is readily bondable to a
8 wide variety of surfaces using a wide range of adhesive
9 types. U.S. Patent No. 3,594,865 describes an apparatus
10 for continuously forming a flexible web with molded
11 protuberances of plastic material incorporated in a base
12 web. The base of the web is either a porous woven or
13 nonwoven fabric, or an extruded film. The supporting
14 fabric is impregnated with molten plastic simultaneously
15 as hooks are formed. While U.S. Patent No. 3,594,865 is
16 sparse in detail concerning the nature of the product
17 formed from the apparatus it does characterize the
18 impregnation of the base fabric as complete, stating in
19 appropriate part, "a liquid moldable plastic material, for
20 example a molten plastic, is injected into the hook
21 molding recesses of the wire and also onto the surface and
22 into the interstices of the base fabric which lies on the
23 surface of the drum." The base fabric passes under a
24 nozzle which impregnates it with the same plastic used to
25 inject the dies used to form the plastic hooks with the
26 clear implication the porous base web is completely
27 saturated with the plastic. This is considerably
28 different from the products of the present invention
29 wherein the process controls the distribution of plastic
30 into the backing material to a degree necessary to firmly
31 hold the backing material to the base of the hook sheet
32 but does not encase the backing to destroy it's aesthetic
33 characteristics as a functioning backing material to
34 modify the back surface of the fastener. The backing of
35 U.S. Patent No. 3,594,865 is primarily a support onto
36 which hooks are formed and does not modify the backing of

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1 the fastener to receive adhesives or gluing agents nor is
2 it possible to utilize loop materials as the backing
3 material to form back to back fasteners. It is also known
4 to use complex laminating methods to add a bondable
5 surface to many sheet materials but such methods are
6 expensive and often create a final product which has
7 undesirable characteristics such as bulk, stiffness, a
8 tendency to delaminate, operating temperature limitations
9 or other properties making the laminate undesirable.

10 A product using such techniques, well known in the art
11 of hook and loop fasteners, is the so called back to back
12 fastener. Such a product is created by taking a hook
13 fastener and a loop fastener and bonding the two together
14 in a back to back relationship such that the resulting
15 laminate has hooks on one side and loops on the other
16 side. Such a combination finds wide use in many strapping
17 operations such as wire ties, plant ties and fastener
18 straps for holding splints and the like in place. The
19 limitation of such products in the past has focused on the
20 method used to laminate the two components together as
21 described above. The bulk created by the adhesive bonding
22 of such laminates has clearly limited its usefulness.

23 Therefore it is the object of the present invention to
24 produce a hook portion of a hook and loop fastener system
25 which has a surface opposite the surface containing the
26 upstanding hooks substantially modified in its
27 characteristics from the customary flat, smooth, even
28 surface which has little compatibility for bonding to
29 other materials. A further objective of the invention is
30 to create a surface on the back of a base of a plastic
31 hook and loop fastener which will readily accept bonding
32 agents such as adhesives, glues, cements and the like
33 without special treatment of the surface. It is a further
34 objective of the invention to create a loop surface on the
35 back portion of the base of a plastic hook fastener which

1 is capable of engaging into hooks on the front surface
2 thereof to form a back to back laminate with less bulk,
3 stiffness and thickness.

4 BRIEF SUMMARY OF THE PRESENT INVENTION

5 The process described in U.S. Patent No. 4,794,028 for
6 making plastic hooks utilizes an apparatus described in
7 U.S. Patent No. 4,775,310 comprising "a first cooled
8 unitary forming roller having a plurality of hook forming
9 cavities defined in the periphery thereof and extending
10 inwardly therefrom; a second pressure roller positioned
11 for coaction with said first forming roller; means for
12 concurrently rotating said first and second rollers in
13 opposite directions about their generally respective axis;
14 means for forming a striplike extrusion of molten plastic
15 material adjacent said first and second rollers to be
16 directed therebetween at an interface thereof such that
17 said plastic material fills said hook forming cavities and
18 forms a striplike member having a base portion and a great
19 multiplicity of hooklike projections extending from one
20 surface of said base portion and integral therewith; means
21 for removing said striplike member from said first forming
22 roller at a position spaced from the interface of said
23 first and second rollers such that said hooklike
24 projections are withdrawn from said hook forming cavities
25 without opening said cavities after being cooled by the
26 first forming roller to a desired temperature." I have
27 found it possible to introduce into the nip, formed by the
28 two cylinders, various sheet materials which will become
29 an integral part of the striplike material on the side
30 opposite the hooks. Surprisingly, introduction of such
31 materials into the nip along with the molten plastic does
32 not interfere with the operation of the process and while
33 certain cautions and limitations are, of course,
34 desirable, the formation of such in situ laminates
35 proceeds to great advantage. I have found a very wide
36 variety of materials, such as nonwoven fabrics, woven and

1 knitted textiles, reinforcing yarns, scrim and nettings,
2 sheets of paper, plastic films, metallic window screening
3 and almost any material in filmlike or thin sheet form can
4 be handled in this manner. The formation of the striplike
5 plastic fastener sheet insitu with a porous foreign
6 backing most often is accomplished by infusion of the
7 molten plastic into the structure of the web material
8 where there is an intimate intermingling of the plastic
9 within the pores of the web. In the case of nonporous
10 films, the films tend to melt on their surface forming an
11 intermolecular diffusion which forms a strong bond between
12 the sheets. The inclusion of such foreign materials
13 provides a substantial advantage over prior art methods of
14 creating laminates. Such striplike materials contain no
15 foreign material; the bonds are strong and a wide range of
16 materials may be joined in this way. Additionally, the
17 process of adding the backing at the time of creating the
18 hooks offers economic advantages over the more
19 conventional processes of creating a laminate using
20 adhesives or other bonding agents in second stage
21 processes.

22 SUMMARY OF THE INVENTION

23
24 According to one aspect of the invention, it is
25 provided a method for making plastic hooks utilizing an
26 apparatus comprising a first cooled unitary forming roller
27 having a plurality of hook forming cavities defined in the
28 periphery thereof and extending inwardly therefrom; a second
29 pressure roller positioned for coaction with said first
30 forming roller; means for concurrently rotating said first
31 and second rollers in opposite directions about their
32 generally respective axis; means for forming an extrusion of
33 molten plastic material adjacent said first and second
34 rollers to be directed therebetween at an interface thereof
35 such that said plastic material fills said hook forming
36 cavities and forms a striplike member having a base portion

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1 and a great multiplicity of hooklike projections extending
2 from one surface of said base portion and integral
3 therewith; means for removing said striplike member from
4 said first forming roller at a position spaced from the
5 interface of said first and second rollers such that said
6 hooklike projections are withdrawn from said hook forming
7 cavities without opening said cavities after being cooled by
8 said first forming roller to a desired temperature. The
9 improvement comprises a sheet material having an interface
10 surface and an exposed surface into said interface formed by
11 said rollers so that said sheet material becomes an integral
12 part of said striplike member on the side opposite said
13 hooklike projections, said sheet material being introduced
14 into said interface adjacent said second roller with
15 sufficient tension to prevent said sheet material from
16 interfering with the operation of the hook forming process,
17 to form an insitulate with said striplike member, said
18 exposed surface remaining substantially free of said plastic
19 material.

20 According to another aspect of the invention it is
21 provided an elongated, strip-form hook and loop fastening
22 member having a base member, a multiplicity of discretely
23 molded hook-shaped engaging elements in the form of
24 projections upstanding therefrom, and on the side of said
25 fastening member opposite said hook-shaped elements, a
26 fibrous surface configured for fastening engagement by said
27 hook-shaped elements, said molded hook-shaped projections
28 each having a stem supported at one end thereof on said base
29 member and a radial extension on the unsupported end of said
30 stem, said hook-shaped projections constructed to engage in
31 fastening relationship with surface elements of said fibrous
32 surface, said hook-shaped projections and said base member
33 being unitarily formed from the same polymeric, resinous
34 material, said fastening member comprising an in-situ
35 laminate wherein said base member of resinous polymer is
36 integrally and continuously joined over an extended region
37 to form a continuous interface with a porous, fibrous,
38 sheet-form material, without the use of adhesives, and on
39 the side of said base member opposite the side containing
40 said molded hook-shaped projections, said extended region at

6B

1 which said base member and sheet-form material are joined
2 lying in part directly opposite effective upstanding molded
3 hook-shaped projections, the resinous polymer which forms
4 said base member on the side opposite said molded
5 hook-shaped projections being co-mingled with and
6 encapsulating at least some of the surface fibers on one
7 side of said sheet-form fibrous material throughout the
8 continuous interface while leaving fibrous surface elements
9 on the opposite side of said sheet-form material free of
10 said polymer and exposed for fastening engagement with
11 hook-shaped projections of said fastening member.

12 According to a further aspect of the invention, an
13 apparatus for forming a fastener structure is provided. The
14 apparatus comprises an apparatus for forming a fastener
15 structure comprising: an extruder for delivering a
16 predetermined width of heated, moldable resin; a rigid
17 molding roll having inwardly extending, fixed mold cavities
18 defining fastener elements disposed about the periphery of
19 the molding roll, the molding roll disposed to receive the
20 resin on the periphery of the molding roll; a mechanism
21 arranged to introduce a running length of material to the
22 resin on the exterior of the molding roll, and a mechanism
23 for withdrawing the resulting product from the fixed
24 cavities of the molding roll.

25 DETAILED DESCRIPTION OF THE INVENTION

26 In order to more fully understand the invention,
27 reference should be had to the following detailed
28 description taken in conjunction with the attached drawings,
29 wherein:

30 Figure 1 is a schematic sectional view of the
31 apparatus used in the prior art for creating the plastic
32 fastener hook tape of the prior art.

33 Figure 2 is a schematic sectional view of the
34 apparatus of figure 1 which is modified in accordance with
35 the present invention.

36 Figure 3 is a schematic rear view of the forming roll
37 arrangement of Figure 2.

38 Figure 4 is a schematic cross-sectional view of the
39 hook fastener tape formed by the prior art process.

1 Figure 5 is a schematic cross-sectional illustration
2 of one embodiment of the invention.

3 Figure 5A is another schematic illustration of the
4 product of Figure 5.

5 Figure 6 is a schematic cross-sectional illustration
6 of another product of the invention.

7 Figure 7 is a schematic cross-sectional illustration
8 of yet another form of the invention.

9 Figure 8 is a schematic cross-sectional view wherein
10 the bottom layer of the product is a loop fastener.

11 Figure 9 is a schematic cross-sectional view wherein
12 the product includes a layer of foam.

13 Figure 9A shows how the foam layer of Figure 9 can be
14 sheared.

15 Figure 1 is a cross-sectional view of the apparatus
16 used in the prior art for creating the plastic fastener
17 hook tape of the prior art. Extruder barrel 1 melts and
18 forces the molten plastic 3 through die 2 into the nip 6
19 between base roller 4 and cavity roller 5 containing
20 cavities to form the hooks of a strip fastener of the well
21 known hook and loop type. The strip fastener material
22 formed in the nip 6 travels around the periphery of the
23 cavity roller 5 and around stripping roller 7, which
24 assists in pulling the formed hook sheet 8 from the cavity
25 roll, and thence to a windup device, not shown.

26 While many methods of feeding sheet material to the
27 forming section of the hook forming device are possible
28 Figure 2 illustrates a device particularly well adapted to
29 that purpose. I have found that by introducing a
30 preformed sheet material 10 into the nip 6 at the same
31 time molten plastic 3 is forced into the nip 6 to create
32 the strip fastener tape, the sheet material will bond
33 intimately with the fastener to become an integral part of
34 the structure of the strip fastener. As in Figure 1,
35 extruder 1 forces molten plastic 3 through die 2 into nip
36 6 between rolls 4 and 5. However, I have added at the

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1 edges and around the periphery of backing roller 4 a set
2 of pins which will carry the sheet material 10 into the
3 nip 6 in a flat, unwrinkled state. It is important to
4 maintain a smooth, wrinkle free, properly tensioned sheet
5 in order to form a smooth, even laminate backing for the
6 fastener. To assure proper tensioning and alignment of
7 the secondary sheet material, a roll of the secondary
8 material 10 is mounted on a let off device and threaded
9 around diversion roller 11 into a web straightening device
10 12, well known in the art as typically sold by the Fife
11 Manufacturing Company which assures the edge of the web of
12 sheet material is centered as it is fed onto backing
13 roller 4 around scroll roll 13, composed of ribs of
14 elastomeric material to firmly grip the sheet and impinge
15 it against the backing roller 4 and onto pins 14. Pins 14
16 and roller 4 deliver the web into nip 6 along with molten
17 plastic 3. As the molten plastic 3 is forced by the
18 pressure imposed upon it by the narrow space of the nip 6,
19 it flows into cavities in cavity roller 5 and also into
20 any pores present in the sheet material being carried by
21 the backing roller 4. In this way the web sheet 10 is
22 intimately joined to the forming hook sheet 8 and becomes
23 an integral part thereof to form a laminated sheet 9.

24 Figure 3 is a rear view of the forming roll stack along
25 line A,A1. The backing roller 4 is supported on shaft 15
26 which is held by bearing 16 in its proper place in side
27 plates, not shown. Bearing 16 is connected to hydraulic
28 lines 19 from a hydraulic pump located remotely from the
29 roll stack. The pins 14 are held by hub 18 which is
30 fitted to the shaft 15 holding the backing roller 4. It
31 is possible to incorporate the pins 14 directly into the
32 backing roller 4 but I prefer to utilize separate pin
33 holding hubs which afford some degree of flexibility in
34 utilizing various size and shape pins for differing sheet
35 materials.

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1 The customary procedure for operating the apparatus
2 described is to thread up the secondary backing 10 through
3 the machine, start the extruder 1 so that plastic 3 is
4 flowing smoothly through the die 2 and then move the lips
5 of the die 2 into proximity of the nip 6 between the two
6 forming rollers 4 & 5. The molten plastic is picked up by
7 the backing roller 4 and delivered into the nip 6 as
8 pressure from the hydraulic cylinders 17 raises the
9 backing roller 4 into position. As the gap 6 between the
10 backing roller 4 and the cavity roller 5 is reduced, the
11 molten plastic 3 flows into the nip 6 and is forced into
12 the open cavities in the forming roll 5. Molten plastic
13 is also forced into the pores of the backing material 22,
14 penetration depending upon the thickness of the backing,
15 the pore structure of the backing, the viscosity of the
16 molten plastic and the pressure of the plastic in the nip.
17 The pressure in the nip 6 is a function of the hydraulic
18 pressure used to close the rollers 4 & 5 and the quantity
19 of material delivered into the nip 6 relative to the
20 quantity consumed in forming the backing and filling the
21 cavities.

22 Figure 4 is a cross-section of the hook fastener tape
23 formed by the prior art process. The hook tape consists
24 of a base 20 and hooks 21 projecting from the base. The
25 plastic material forming the tape is essentially uniform
26 throughout. Figure 5 is one embodiment of a product of
27 this invention created by introducing a nonwoven fabric
28 into the nip of the forming rolls as described above.
29 Base 20 containing hooks 21 projecting therefrom is
30 attached nonwoven fabric 22. At the interface 23 between
31 the two layers the plastic from the fastener flows around
32 and entraps some of the fibers of the nonwoven 22 thereby
33 bonding the nonwoven fabric to form a laminate of the two
34 layers. The nonwoven may be light or heavy, thin or
35 thick, dense or open. The properties of the nonwoven, the
36 pressure exerted and the viscosity of the plastic in the

1 nip will determine the degree to which the plastic flows
2 into the fibrous network, or put alternately, the degree
3 to which the nonwoven will imbed into the plastic. Figure
4 5a is a schematic representation of the laminate of Figure
5 5 where the layer 23 represents the zone of mixed fabric
6 and plastic. It should be understood this layer is not of
7 uniform cross-section but rather there is a gradient
8 concentration across this layer ranging from no fibers at
9 the bottom of the plastic layer 20 to no plastic at the
10 top of the fiber layer 24. If, on the other hand, the
11 nonwoven web is thick and dense, the plastic will only
12 marginally penetrate into the nonwoven and the back side
13 of the fastener will have the appearance of the free
14 standing fibrous nonwoven. By carefully selecting the
15 fibrous nonwoven web, the plastic for forming the fastener
16 and the operating conditions of the process; it is
17 possible to generate a wide range of products with
18 different degrees of fibers projecting from the surface of
19 the plastic thus providing a wide variety of products
20 directed to many different applications.

21 Figure 6 is a cross-section diagram of yet another
22 product of the present invention where an open, woven,
23 textile reinforcing scrim 25 has been added into the nip 6
24 of the calendar with a slight overfeed to create an excess
25 of the backing fabric. Because of the open structure the
26 plastic 20 has encapsulated large sections of the fabric
27 scrim 25 yet sections of the fabric come to the surface 26
28 of the fastener. Such a combination can be used to add
29 strength to the plastic tape, but also provide substantial
30 modification of the plastic surface of the fastener.

31 Figure 7 again shows the plastic hook fastener 20 with
32 upstanding hooks 21 laminated to a sheet of paper 27
33 containing on the surface thereof an adhesive layer 28.
34 The adhesive may be any convenient type depending upon the
35 intended use of the product. In this way it is possible
36 to apply reactivatable adhesives, pressure sensitive

1 adhesives or contact adhesives as the bottom layer of the
2 laminate. Depending upon the nature of the adhesive
3 laminate being applied, care must be taken to prevent the
4 adhesive from being squeezed or distorted by the action of
5 the pressure of the nip.

6 Figure 8 shows yet another embodiment of the technique
7 of the present invention wherein the backing layer 29 is
8 the loop side of a hook and loop fastener. Molten plastic
9 3 flows through die 2 and is forced into the pores of the
10 backing of the loop 29 at the interface 27 encapsulating
11 some of the yarns of the loop backing integrally holding
12 the backing with the plastic sheet. In this way is
13 created a product which is well known when created by
14 adhesive bonding but in this embodiment the laminate is
15 created without foreign materials required to hold the
16 layers together. Such back to back products are useful
17 for the manufacturer of so called backstraps well known in
18 the art of hook and loop materials.

19 Figure 9 shows an embodiment of the invention wherein
20 the sheetlike material is a thin polyurethane foam 30.
21 The thin foam 30 can be introduced into the nip of the
22 calender as previously described. The surface of the foam
23 30 is intimately bonded to the plastic of the striplike
24 fastener 20. Figure 9a shows the same arrangement as
25 Figure 9 with the foam 30 attached to the back of the
26 fastener 20 but also illustrates what happens when
27 attempting to remove the foam 30. The bond attaching the
28 foam 30 to the plastic fastener 20 member is greater than
29 the cohesive strength of the foam 30. When attempt is
30 made to separate the foam from the back of the fastener
31 20, the foam 30 splits or tears within the body of the
32 foam 31 leaving a substantial portion of the foam on the
33 back of the plastic strip fastener.

34 The following examples will aid in further
35 understanding the range and uniqueness of this invention.

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1 EXAMPLE I

2 The apparatus described in U.S. Patent No. 4,775,310
3 was set up to produce a plastic hook product, designated
4 as hook type CFM-15 by the Velcro Group Corporation, using
5 a nylon 12 resin, identified as resin L-2121 sold by the
6 Hercules Chemical Corporation. The melt temperature of
7 the resin measured at the exit end of the extruder was
8 454°F (234°C). The die head temperature was 460°F
9 (238°C). Line speed was 30 feet (9.14 meters) per minute;
10 tape width was 10 inches (25.4 centimeters); calendering
11 pressure was 2000 # gage. The top roll temperature was
12 31°F (-1°C); the forming roll temperature was 55°F (13°C);
13 and the bottom roll temperature was 37°F (3°C). A roll of
14 nonwoven fabric, Pellon 850 a nylon nonwoven fabric sold
15 by the Freudenberg Company, slit to a 10 inch (25.4
16 centimeters) width was introduced into the calender at the
17 nip formed between the bottom and forming rolls. After a
18 short initial start up period the fabric processed
19 smoothly through the forming section without difficulty.
20 The nonwoven fabric was intimately integrated into the
21 plastic of the hook sheet. The laminate thus formed could
22 not be separated into its constituents, one from the
23 other, without destroying the fiber layer. The back of
24 the hook product manifested a smooth, soft fibrous surface
25 substantially different from the surface of the product
26 without the laminated layer.

27 EXAMPLE II

28 The apparatus described in U.S. Patent No. 4,775,310
29 was set up to produce a plastic hook product designated as
30 hook type CEM-15 by the Velcro Group Corporation, using a
31 co-polyester resin sold by the DuPont Company, a Hytrel^R
32 8238 with 10% of a master batch fire retardant added to
33 provide fire resistance to the final product. The melt
34 temperature of the polymer, at the end of the extruder,
35 was 475°F (246°C) and the die temperature was 476°F
36 (247°C). The line speed was 30 feet (19.4 meters) per

1 minute. A roll of spunbonded nonwoven fabric, sold as
2 Remay^R 2016, weighing 1.35 ounces per square yard with a
3 thickness of 0.009 inches (0.023 centimeters) was slit to
4 10 inches (25.4 centimeters) width and introduced into the
5 nip formed by the bottom and forming rolls of the device
6 as described in Example I. The bottom roll temperature
7 was 50°F (10°C), the forming roll temperature was 50°F
8 (10°C) and the top roll temperature was 90°F (32°C). A
9 tension of 100 pounds (45.36 kilograms) was exerted
10 against the spun bonded fabric in order to prevent
11 wrinkles from developing as the sheet passed into the nip
12 of the calender, and the bottom roller was overdriven at
13 8% relative to the forming roller. The spunbonded fabric
14 showed minor wrinkling and folding. The tension on the
15 fabric was reduced to 35-40 pounds (15.88-18.14 kilograms)
16 and the overfeed increased to 8.5% which reduced the
17 wrinkles to an acceptable level.

18 The laminated product formed consisted of an integral
19 bond between the plastic base of the hook sheet and the
20 upper layer of the spunbonded fabric. The plastic forming
21 the underside of the base of the hook tape was intimately
22 merged with the interstices of the fabric. The spunbonded
23 nonwoven layer could not be separated from the plastic
24 without being destroying. Even when tearing the laminated
25 sheet, the two layers would not separate. Because of the
26 heavy weight of the spunbond, fibers were apparent on the
27 under surface of the laminate and it was possible to
28 disrupt and loosen fibers from the surface by vigorous
29 rubbing. Even after substantial rubbing, however, a great
30 quantity of fibers, primarily from the upper surface of
31 the spunbond remain attached to the surface of the
32 plastic.

33 EXAMPLE III

34 Exactly the same configuration as used in Example II
35 was utilized but the spunbonded nonwoven used was a
36 lighter weight version of Remay, designated as Remay^R

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1 style 2006, weighing 0.6 ounces per square yard with a
2 thickness of 0.006 inches (0.015 centimeters). In order
3 to eliminate wrinkles and folds from the web, tension was
4 reduced to 25 pounds and the same overfeed was used on the
5 bottom roller. The product formed by this combination was
6 similar to that of Example II but the mingling of the
7 polymer into the interstices of the nonwoven was greater
8 than in that example, but it was still possible to raise
9 fibers from the surface by vigorous rubbing, and there
10 were many fibers on the surface of the plastic projecting
11 as a very fine fuzz above the surface.

12 EXAMPLE IV

13 Exactly the same configuration as used in Examples II
14 and III were utilized but the spunbonded nonwoven used was
15 even lighter than in the previous examples. The version
16 of Remay in this example was designated as Remay^R style
17 2250, weighing 0.5 ounces per square yard with a thickness
18 of 0.004 inches (0.010 centimeters). In order to
19 eliminate wrinkles and folds from the web, tension was
20 reduced to 20 pounds (9.07 kilograms) and the overfeed was
21 increased to 9% on the bottom roller. The product formed
22 by this combination was similar to those of Examples II
23 and III but the mingling of the polymer into the
24 interstices of the nonwoven was marginally greater than in
25 Example III. This mingling was enhanced to the extent it
26 was difficult to raise fibers from the surface by vigorous
27 rubbing even when using a coin to abrade the surface. Yet
28 it was possible to clearly see the fibers on the surface
29 as an integral part of the surface and even projecting as
30 a very fine fuzz from the surface.

31 EXAMPLE V

32 The apparatus described in U.S. Patent No. 4,775,310
33 was set up to produce a plastic hook product, designated
34 as hook type CFM-15 by the Velcro Group Corporation, using
35 a polyester copolymer resin, Hytrel 8238, sold by the
36 DuPont Company. The melt temperature of the polymer at

1 the end of the extruder was 475°F (246°C) and the die
2 temperature was 470°F (243°C). The line speed was 35 feet
3 (8.89 meters) per minute and the tape width was 8-9 inches
4 (20.32-22.86 centimeters). The bottom roll temperature of
5 the calender was 85°F (29°C), the forming roll was 40°F
6 (4°C) and the top roll was 40°F (4°C). The calender
7 pressure was 2500 pounds per lineal inch. a roll of
8 tricot knitted fabric, sold by Velcro USA as Loop 3200,
9 was slit to a width of 10 inches (25.4 centimeters) and
10 fed into the calender at the nip formed by the bottom and
11 forming rolls. As the hook product was formed the molten
12 plastic backing flowed into the interstices of the knitted
13 fabric. The layers forming the laminate between the
14 plastic hook and the tricot fabric could not be separated
15 without destroying the material making up the layer. In
16 spite of the fact that Loop 3200 is a very open structure
17 and the plastic from the hook portion of the laminate
18 surrounded and encapsulated many of the ground yarns of
19 the fabric, a sufficient number of loops remained
20 extending upwards from the back of the product to enable
21 hooks from the face to tightly engage when a tape of the
22 product was turned such that the hooks were made to face
23 the loops on the reverse side of the structure. In this
24 manner was formed a product commonly known in the trade of
25 hook and loop fasteners as back to back closure.

26 EXAMPLE VI

27 A sample of the Loop 3200 described in Example V was
28 laminated to a 1/8 inch (0.3175 centimeter) thick
29 polyether urethane foam using flame lamination techniques
30 well known in the art. The foam laminate thus formed was
31 slit into a 10 inch (25.4 centimeters) wide roll of
32 material which was fed into the hook forming device
33 described in Example V. In this instance, however, the
34 resin used was a polyethylene resin produced by the EXXON
35 Chemical Company sold as Escorene LL6301.57. The melt
36 temperature of the polymer at the end of the extruder was

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1 420°F (216°C) and the die temperature was also 420°F
2 (216°C). The calender pressure was 1250 pounds per lineal
3 inch and the bottom roll temperature was 70°F (21°C), the
4 forming roll temperature was 50°F (10°C) and the top roll
5 temperature was 90°F (32°C). The line speed was 30 feet
6 (7.62 meters) per minute. The foam side of the foam loop
7 laminate was orientated to join with the plastic backing
8 of the hook portion of the product and the loop portion
9 faced outwardly from the bottom side of the product. A
10 tenacious laminate resulted. The layers of the laminate
11 could be separated by tearing the loop portion away from
12 the plastic portion and the rupture between the layers
13 occurred along the foam interface leaving a thin layer of
14 foam on both the plastic and the loop. The force
15 necessary to separate the layers was approximately 2
16 pounds per inch of width. The use of the foam as an
17 intermediate layer yielded a product with soft loop
18 backing which readily engaged the hooks on the face side
19 of the product when turned in back to face relationship.
20 The degree of contamination of the loop structure as
21 occurred in Example II was essentially eliminated and the
22 presence of the foam layer provided a soft cushioning to
23 assist in the hook loop engagement.

24 EXAMPLE VII

25 Using the process configuration of Example VI a sample
26 of a different loop, Velcro loop style 3610, was
27 introduced in place of the loop used in Example V. Loop
28 3610 is a relatively heavy weight loop fabric weighing in
29 the range of 8.02 to 9.95 ounces per square yard and
30 having a nominal thickness range of 0.062 to 0.087 inches
31 (0.1575 to 0.2210 centimeters). The loop passed through
32 the nip without difficulty using a tension of 100 pounds
33 (45.36 kilograms) on the loop fabric, on overfeed on the
34 bottom roll of 8% and a nip pressure of 1250 pounds per
35 lineal inch. The plastic from the forming hooks mingled
36 and encapsulated many of the fibers on the back side of
37 the loop fabric thus creating a substantial bond holding

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1 the loop fabric thus creating a substantial bond holding
2 the two layers together. Because Loop 3610 is such a
3 substantial product it was possible to work loose one
4 corner of the fabric from the plastic and by so doing test
5 the bond strength of the laminate. The peel separating
6 force averages 6 pounds (2.72 kilograms) to delaminate the
7 two layers. The loop face of the Loop 3610 appeared to be
8 unaffected by the laminating process and when the laminate
9 was turned on itself such that the hooks engaged the loop
10 in face to face relationship substantial gripping was
11 achieved. The performance of the back to back closure
12 thus formed was comparable to the performance of an
13 independently formed hook product formed from the same
14 polymer against Loop 3610.

15 EXAMPLE VIII

16 Using the process configuration of Example VI, a
17 sample of a different loop, Velcro loop, style 3003, was
18 introduced in place of the loop used in Example VII. Loop
19 3003 is a circular knit fabric with a substantially high
20 loop pile on one surface, a relatively heavy weight of 9
21 ounces per square yard and a nominal thickness of 0.10
22 inches (0.254 centimeters). The loop passed through the
23 nip with some difficulty due to its bulk but the sample
24 formed provided an extremely high degree of mingling of
25 the plastic resin with the backing fibers of the loop
26 fabric. The bond was sufficiently strong. The two layers
27 could not be separated for testing with destroying one or
28 both of the layers. The pile fibers of the loop fabric
29 did not appear to be affected by the laminating process
30 and the closure performance of the back to back product
31 thus formed was essentially the same as the closure
32 performance of a comparable hook product produced
33 independently tested against an independent loop of the
34 same style.

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EXAMPLE IX

1
2 The extrusion configuration of Examples VI through
3 VIII using Escorene polyethylene was used to create yet
4 another laminate in which the web introduced into the nip
5 between the bottom roll and the forming roll was kraft
6 paper. The paper bonded tightly to the back of the hook
7 tape and could not be separated from the laminate without
8 being destroyed. Penetration of the plastic into the
9 paper was limited as shown by the ability to delaminate
10 the paper from itself leaving a thin veil of paper fibers
11 still attached to the plastic.

EXAMPLE X

12
13 In place of the standard kraft paper of Example IX, a
14 length of kraft paper containing, on one surface, thereof,
15 a water activable adhesive was introduced into the nip
16 between the bottom roll and the forming roll with the
17 adhesive side of the paper away from the plastic of the
18 hook tape. The paper bonded tightly to the plastic of the
19 hook, in a manner the same as described in Example IX.
20 The paper could be torn from the laminate leaving a veil
21 of fine paper fibers on the plastic surface. The
22 interesting facet to this laminate was the fact the
23 adhesive layer on the back of the hook tape could be
24 activated by applying water to the adhesive and the
25 adhesive used to attach the hook laminate to other
26 objects. Small squares of the laminate so formed were
27 activated as one would activate a postage stamp, with the
28 tongue, and the small square of hook was easily attached
29 to other objects. Appropriate loops attached to other
30 objects were in this way releasably attached to each
31 other.

EXAMPLE XI

32
33 The extrusion configuration of Examples VI through IX
34 using Escorene polyethylene without any additives was used
35 to create yet another laminate in which the web,
36 introduced into the nip between the bottom roll and the

1 forming roll, was a printed high density polyethylene
2 film. The film bonded to the back of the hook tape but
3 could be peeled from the laminate with a relatively light
4 force of less than 0.5 pounds per inch of width. An
5 especially interesting aspect of this laminate was that
6 the printing could be read clearly through the slightly
7 opaque face of the hook tape. The HD polyethylene printed
8 message was in no way distorted and was only slightly less
9 bright than the original printed message of the film.

10 EXAMPLE XII

11 In place of the printed polyethylene film of Example
12 XI a page from a Rand-McNalley Road Atlas, made of paper
13 with a road map printed on each side, was introduced into
14 the nip between the bottom roller and the forming roller.
15 The paper bonded tightly to the plastic polyethylene hook
16 sheet that it could not be separated from the plastic
17 without destroying the paper. The fine lines of the map
18 were visible through the slightly opaque plastic film
19 forming the hook tape. The paper sheet was printed on
20 both sides and it was also possible to read the map on the
21 back side of the hook sheet. The assembly with the
22 printed matter on its reverse side could be attached to
23 display boards with loop material covers. The combination
24 formed an interesting method for affixing display material
25 to other objects. Conversely, it is possible to make a
26 display surface with the hooks extending outward from the
27 display surface which can be read through the hook tape to
28 which objects can be attached. In this way, the design
29 portrayed on the display is read through the hooks and
30 sections of the display can be covered up by attaching
31 loop material to the exposed hooks.

32 EXAMPLE XIII

33 The apparatus as described in previous examples was
34 set up to process polypropylene resin designated as Ferro
35 HDPS 0250D, a fire retardant polypropylene resin from
36 Ferro Chemical Company. The melt temperature was 400°F

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1 (204°C) and the die temperature was also 400°F (204°C).
2 The line speed was 30 fpm (19.14 mpm) and the nip pressure
3 was 1500 pounds per linier inch. After the process was
4 operating and forming an appropriate hook product a length
5 of ether type polyurethane foam .065 inches (0.165
6 centimeters) thick, was introduced into the nip formed
7 between the bottom roll and the forming roll. The foam
8 bonded tenaciously to the plastic underside of the hook
9 sheet and could not be removed without destroying the foam
10 layer. In the process of being laminated, the foam was
11 substantially compressed but remained tightly bonded to
12 the polypropylene and provided a soft, resilient backing
13 to the polypropylene hook tape which substantially changes
14 the aesthetic and tactile response to the hook product.

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The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A fastener product having a multiplicity of fastener elements extending from a strip-form base and a performed material bonded to at least part of the strip-form base, the product produced by the method comprising:

continuously introducing molten resin to a gap defined adjacent a peripheral surface of a rotating mold roll, such that the resin forms at least a part of the strip-form base of the product at the peripheral mold roll surface and fills an array of fixed cavities defined in the rotating mold roll to form portions of the fastener elements as projections extending from a side of the sheet-form base; while

introducing a preformed material to resin on the mold roll under conditions selected to cause the preformed material to become permanently bonded by the resin to at least a portion of the product;

solidifying the resin; and

stripping the solidified resin from the peripheral surface of the mold roll by pulling the projections from their respective cavities.

2. The product of claim 1 wherein the preformed material comprises a non-woven fabric.

3. The product of claim 1 wherein the preformed material is a reinforcing scrim.

4. The product of claim 1 wherein the preformed material is porous, the resin infusing into pores of the sheet material as the resin and material are bonded.

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5. The product of claim 1 wherein the preformed material comprises paper.

5 6. The product of claim 1 wherein the preformed material comprises foam.

10 7. The product of claim 1 wherein said material is lengthwise-continuous and introduced as at least one running length.

8. The product of claim 1 wherein the gap is defined between the mold roll and a counter-rotating pressure roll.

15 9. The product of claim 8 wherein the material is lengthwise-continuous and introduced as at least one running length which is delivered to and progresses along at least a portion of the pressure roll before being introduced to the resin.

20 10. The product of claim 1 wherein stripping the resin from the peripheral surface of the mold roll includes passing the product about a stripping roll.

25 11. The product of claim 1 wherein the cavities are shaped to form fastener elements and wherein the projections comprise an array of molded fastener elements.

30 12. The product of claim 1 wherein the cavities are shaped to form fastener elements adapted to engage loops.

13. The product of claim 1 wherein the preformed material forms a backing of the product.

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14. The product of claim 1 wherein the preformed material has a first region encapsulated within resin of the base of the product, and a second region free of resin of the base of the product.

15. The product of claim 1 wherein the preformed material has loops or fibers exposed in the product for engaging the fastener elements.

16. The product of claim 1 wherein the preformed material is laminated to resin of the base in the gap.

17. The product of claim 1 wherein the preformed material extends across the back of the product.

18. The product of claim 1 wherein the preformed material is selected from the group consisting of non-woven fabrics, woven and knitted textiles, reinforcing yarns, scrims and nettings, sheets of paper, plastic films and metallic window screening.

19. The product of claim 1 wherein the preformed material is introduced to the resin at the gap.

20. The product of claim 1 wherein the resin is solidified downstream of the point of introduction of the preformed material to the resin.

21. A fastener product comprising
resin forming both a portion of a strip-form base and an array of loop-engageable fastener elements having molded stems rising from a broad surface of the strip-form base; and

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5 a longitudinally continuous sheet material permanently bonded to the resin during formation of the strip-form base and the molding of the stems by introducing the sheet material to the resin before the base solidifies.

10 22. The product of claim 21 wherein the sheet material forms a backing of the product, on a broad side of the strip-form base opposite the side from which the stems extend.

23. The product of claim 21 wherein the sheet material carries loops for engagement by the fastener elements.

15 24. The product of claim 21 wherein the fastener elements are of form molded and cooled simultaneously with contiguous resin of the strip-form base.

20 25. A method of making a fastener product having a great multiplicity of fastener elements extending from a strip-form base, the method comprising:

25 continuously introducing molten resin to a gap formed along a peripheral surface of a rotating mold roll, such that the resin forms at least a part of the strip-form base of the product at the peripheral mold roll surface and fills an array of fixed cavities defined in the rotating mold roll to form portions of the fastener elements as projections extending from a side of the sheet-form base; while

30 continuously joining a preformed material to the resin forming the sheet-form base, while the resin forming the base is disposed in the gap formed along the peripheral surface of the mold roll and under conditions selected to cause the material to become permanently bonded to the

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resin of the base and become part of the strip-form base of the product;

solidifying the resin; and

5 stripping the solidified resin from the peripheral surface of the mold roll by pulling the projections from their respective cavities.

10 26. The method of claim 25 wherein said material is lengthwise-continuous and introduced as a running length.

27. The method of claim 25 wherein the gap is defined between the mold roll and a counter-rotating pressure roll.

15 28. The method of claim 27 wherein the material is lengthwise-continuous and introduced as a running length which is delivered to and progresses along at least a portion of the pressure roll before being introduced to the resin.

20 29. The method of claim 25 wherein stripping the product from the peripheral surface of the mold roll includes passing the product about a stripping roll.

25 30. The method of claim 25 wherein the cavities are shaped to form fastener elements and wherein the projections comprise an array of molded fastener elements.

30 31. The method of claim 25 wherein the cavities are shaped to form fastener elements adapted to engage loops.

32. The method of claim 25 wherein the preformed material forms a backing of the product.

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33. The method of claim 25 wherein the preformed material has a first region encapsulated within resin of the base of the product, and a second region free of resin of the base of the product.

34. The method of claim 25 wherein the preformed material has loops or fibers exposed in the product for engaging the fastener elements.

35. The method of claim 34 wherein the preformed material comprises a non-woven fabric.

36. The method of claim 25 wherein the preformed material is laminated to resin of the base in the gap.

37. The method of claim 25 wherein the preformed material is selected from the group consisting of non-woven fabrics, woven and knitted textiles, reinforcing yarns, scrims and nettings, sheets of paper, plastic films and metallic window screening.

38. The method of claim 25 wherein the preformed material is porous, the resin infusing into pores of the sheet material as the resin and material are bonded.

39. The method of claim 25 wherein the preformed material is introduced to the resin at the gap.

40. The method of claim 25 wherein the resin is solidified downstream of the point of introduction of the preformed material to the resin.

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41. A method of making a fastener product having a great multiplicity of fastener elements extending from a strip-form base, the method comprising:

5 continuously introducing molten resin to a gap formed along a peripheral surface of a rotating mold roll, such that the resin forms at least a part of the strip-form base of the product at the peripheral mold roll surface and fills an array of fixed cavities defined in the rotating
10 mold roll to form an array of molded projections extending from a side of the sheet-form base; while

continuously joining a preformed material to the resin forming the sheet-form base while the resin forming the base is disposed in the gap formed along the peripheral
15 surface of the mold roll and the cavities are filled with resin, under conditions selected to cause the preformed material to become permanently bonded to resin of the base and become part of the product;

cooling the resin; and
20 stripping the cooled resin from the peripheral surface of the mold roll by pulling the projections from their respective cavities.

42. In a method for making plastic hooks utilizing an
25 apparatus comprising a first cooled unitary forming roller having a plurality of hook forming cavities defined in the periphery thereof and extending inwardly therefrom;

a second pressure roller positioned for coaction with said first forming roller; means for concurrently rotating
30 said first and second rollers in opposite directions about their generally respective axis;

means for forming an extrusion of molten plastic material adjacent said first and second rollers to be directed therebetween at an interface thereof such that
35 said plastic material fills said hook forming cavities and

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forms a striplike member having a base portion and a great multiplicity of hooklike projections extending from one surface of said base portion and integral therewith;

5 means for removing said striplike member from said first forming roller at a position spaced from the interface of said first and second rollers such that said hooklike projections are withdrawn from said hook forming cavities without opening said cavities after being cooled
10 by said first forming roller to a desired temperature, the improvement comprising, introducing a sheet material having an interface surface and an exposed surface into said interface formed by said rollers so that said sheet material becomes an integral part of said striplike member
15 on the side opposite said hooklike projections, said sheet material being introduced into said interface adjacent said second roller with sufficient tension to prevent said sheet material from interfering with the operation of the hook forming process, to form an insitulaminate with said
20 striplike member, said exposed surface remaining substantially free of said plastic material.

43. The method of claim 42 wherein the sheet material is a nonwoven fabric.

44. The method of claim 42 wherein the sheetlike material is a textile fabric.

45. The method of claim 44 wherein the textile fabric is woven.

46. The method of claim 42 wherein the sheet material is a polyurethane foam.

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47. The method of claim 42 wherein the sheet material is a plastic film.

5 48. The method of claim 42 wherein the sheet material is paper.

10 49. The method of claim 42 wherein the sheet material has loops on one side thereof said loops extending away from the base of said striplike member on the side opposite the side containing said hooklike projections.

15 50. The method of claim 42 wherein the sheet material contains printed matter and said plastic material is sufficiently transparent such that said printed matter is visible through said transparent plastic.

20 51. The method of claim 42 wherein the sheet material contains an adhesive on one side thereof said adhesive extending away from the base of said striplike member on the side opposite the side containing said hooklike projections.

25 52. In a method for making plastic hooks utilizing an apparatus comprising a first cooled unitary forming roller having a plurality of hook forming cavities defined in the periphery thereof and extending inwardly therefrom;

30 a second pressure roller positioned for coaction with said first forming roller; means for concurrently rotating said first and second rollers in opposite directions about there generally respective axis;

35 means for forming an extrusion of molten plastic material adjacent said first and second rollers to be directed therebetween at an interface thereof such that said plastic material fills said hook forming cavities and

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forms a striplike member having a base portion and a great multiplicity of hooklike projections extending from one surface of said base portion and integral therewith;

5 means for removing said striplike member from said first forming roller at a position spaced from the interface of said first and second rollers such that said hooklike projections are withdrawn from said hook forming cavities without opening said cavities after being cooled
10 by the first forming roller to a desired temperature, the improvement comprising passing sheet material having an exposed and an interface surface through web straightening means to assure said sheet material is properly centered relative to said backing pressure roller, impinging said
15 sheet material onto securing means located around the periphery of said backing pressure roller, and introducing said sheet material into the interface between said first and second rollers while conveying said sheet material with proper alignment and in a smooth, undistorted fashion but
20 sufficiently retaining said sheet material said backing pressure roll so that it is capable of withstanding the dynamic pressures created as said molten plastic flows and becomes an integral portion of said striplike fastening member on the side opposite from said hooklike projections
25 to form an insitu laminate with said striplike member, said exposed surface remaining substantially free of said plastic material.

30 53. The method of claim 52 wherein the sheet material is a nonwoven fabric.

54. The method of claim 52 wherein the sheet material is a textile fabric.

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55. The method of claim 54 wherein the textile fabric is woven.

5 56. The method of claim 52 wherein the sheet material is a polyurethane foam.

57. The method of claim 52 wherein the sheet material is a plastic film.

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58. The method of claim 52 wherein the sheet material is paper.

15

59. The method of claim 52 wherein the sheet material has loops on one side thereof said loops extending away from the base of said striplike member on the side opposite the side containing said hooklike projections.

20

60. The method of claim 52 wherein the sheet material contains printed matter and said plastic material is sufficiently transparent such that said printed matter is visible through the transparent plastic from the side containing the hooklike projections.

25

61. The method of claim 52 wherein the sheet material contains an adhesive on one side thereof said adhesive extending away from the base of said striplike member on the side opposite the side containing said hooklike projections.

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62. An elongated, strip-form hook and loop fastening member having a base member, a multiplicity of discretely molded hook-shaped engaging elements in the form of projections upstanding therefrom, and on the side of said fastening member opposite said hook-shaped elements, a fibrous

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surface configured for fastening engagement by said hook-shaped elements,

5 said molded hook-shaped projections each having a stem supported at one end thereof on said base member and a radial extension on the unsupported end of said stem, said hook-shaped projections constructed to engage in fastening relationship with surface elements of said fibrous surface, said hook-shaped projections and said base member being
10 unitarily formed from the same polymeric, resinous material, said fastening member comprising an in-situ laminate wherein said base member of resinous polymer is integrally and continuously joined over an extended region to form a continuous interface with a porous, fibrous,
15 sheet-form material, without the use of adhesives, and on the side of said base member opposite the side containing said molded hook-shaped projections, said extended region at which said base member and sheet-form material are joined lying in part directly opposite effective upstanding
20 molded hook-shaped projections, the resinous polymer which forms said base member on the side opposite said molded hook-shaped projections being co-mingled with and encapsulating at least some of the surface fibers on one side of said sheet-form fibrous material throughout the
25 continuous interface while leaving fibrous surface elements on the opposite side of said sheet-form material free of said polymer and exposed for fastening engagement with hook-shaped projections of said fastening member.

30 63. The elongated strip-form hook-and-loop fastening member of claim 62 wherein the fibrous sheet-form material is a nonwoven fabric.

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64. The elongated, strip-form hook-and-loop fastening member of claim 62 wherein the fibrous sheet-form material is a woven textile fabric.

5

65. The elongated, strip-form hook-and-loop fastening member of claim 62 wherein the fibrous sheet-form material is a loop-bearing fabric.

10

66. The elongated, strip-form hook-and-loop-type fastening member of claim 65 wherein the loop-bearing fabric is woven.

15

67. The elongated, strip-form hook-and-loop-type fastening member of claim 65 wherein the loop-bearing fabric is knitted.

20

68. A method of making a striplike hook fastener component comprised of plastic material, the component having a base portion and a great multiplicity of hooklike projections extending from and integral with one surface of said base portion, laminated with a sheet material capable of performing a function other than serving as structure of the hook fastener component, the method comprising:

25

providing a cooled, rigid rotating forming roller having inwardly extending, fixed, hook-forming cavities defined in its periphery, to the exterior of said forming roller, applying molten plastic material for filling the hook forming cavities and providing said base portion, introducing to said roller a sheet material having a function other than serving as structure of the fastener component to the molten plastic material on the exterior of the forming roller under pressure conditions that cause said sheet material to become united with said plastic

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material, thus forming an in situ laminate, the side of said sheet material directed oppositely from the side united with said plastic material remaining substantially free of said plastic material, and, after the molten plastic is cooled to a desired temperature, withdrawing said laminate from said forming roller including withdrawing said hooklike projections from said hook forming cavities without opening said cavities.

69. The method of claim 68 wherein the sheet material is a woven, nonwoven or knitted fabric, polyurethane foam, plastic film, paper, reinforcing yarns, scrims, nettings or metallic window screening.

70. The method of claim 68 wherein the sheet material has loops on one side thereof, said loops extending away from the base of said striplike hook fastener on the side opposite the side having said hooklike projections.

71. The method of claim 68 wherein the sheet material contains printed matter and said plastic material is sufficiently transparent that said printed matter is visible through said transparent plastic.

72. The method of claim 68 wherein the sheet material contains an adhesive on one side thereof said adhesive extending away from the base of said striplike hook fastener on the side opposite the side having said hooklike projections.

73. A method of continuously forming a fastener structure comprising:

delivering a predetermined width of heated, moldable, extruded resin to the surface of a rigid rotating molding

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roll under conditions causing the resin to fill inwardly extending, fixed cavities defining fastener elements disposed about the periphery of the rotating molding roll to form fastener elements integral with a sheet-form base layer of the resin lying on the exterior of the molding roll; and

delivering a running length of preformed material to resin forming the base layer to form a composite structure; and thereafter withdrawing the composite structure from the molding roll including withdrawing the fastener elements from the rigid cavities of the fixed molding roll.

74. The method of claim 73 further comprising cooling the molding roll and allowing the composite structure to progress along the molding roll to cool.

75. The method of claim 73 wherein the preformed material is delivered to the resin at the point that the resin is delivered to the molding roll.

76. The method of claim 75 wherein the molding roll and a pressure roll define a nip, and wherein the resin and the preformed material enter the nip simultaneously.

77. The method of claim 73 wherein the sheet-form material is delivered to and progresses along at least a portion of the pressure roll before being delivered to the resin.

78. The method of claim 73 wherein removing the composite structure includes passing the composite structure about a stripping roll.

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79. The method of claim 78 wherein the stripping roll is positioned to receive the composite structure from said molding roll at a point spaced a substantial arc along the molding roll from the point of delivery of the resin to the molding roll a distance away from the molding roll.

80. The method of claim 73 wherein the preformed material is delivered to the resin at a faster rate than the resin is delivered to the molding roll.

81. An apparatus for forming a fastener structure comprising:

an extruder for delivering a predetermined width of heated, moldable resin;

a rigid molding roll having inwardly extending, fixed mold cavities defining fastener elements disposed about the periphery of the molding roll, the molding roll disposed to receive the resin on the periphery of the molding roll;

a mechanism arranged to introduce a running length of material to the resin on the exterior of the molding roll, and a mechanism for withdrawing the resulting product from the fixed cavities of the molding roll.

82. The apparatus of claim 81 further comprising a pressure roll located so that the running length of material is pressed into the resin as the resin is received on the molding roll.

83. The apparatus of claim 81 further comprising a stripping roller positioned to receive the resulting product from said molding roll at a point spaced a substantial arc along the molding roll from the point of delivery of the resin to the molding roll.

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84. The apparatus of claim 81 further comprising a die disposed between the extruder and the molding roll to form the resin into a sheet form.

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85. The apparatus of claim 81 further comprising a roll for a running length of material disposed to deliver the running length of material to a pressure roll.

10

86. The apparatus of claim 85 wherein the roll for the running length of material is arranged to deliver the running length of material at a rate faster than the molding roll receives the resin.

15

87. The apparatus of claim 81 wherein the molding roll is maintained at a controlled temperature.

20

88. The apparatus of claim 87 wherein the molding roll is cooled, thereby cooling the resin delivered to the molding roll.

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89. The apparatus of claim 81 in which the mechanism arranged to introduce the running length of material is constructed to apply the material with pressure against resin on the periphery of the molding roll overlying the fixed mold cavities.

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90. A method of making a striplike fastener member of plastic material having a base portion and a great multiplicity of hooklike projections extending from and integral with one surface of said base portion, the method comprising:

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providing a cooled, rigid forming roller having inwardly extending, fixed hook forming cavities defined in its periphery, the fixed cavities defining fastener hooks

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constructed to engage loops or fiber for hook and loop fastening, providing an apparatus for coating with the forming roller, including an extruder, for extruding molten plastic material to fill the hook forming cavities and apply a layer of molten plastic material to the exterior of the forming roller, introducing a running length of a material to the molten plastic material on the exterior of the forming roller at a nip formed by a roller coating with said forming roller so that said material is applied under pressure and becomes united with said plastic material on the side of the plastic material opposite said hooklike projections, and

removing said striplike fastener from said forming roller at a position spaced from the nip of such that said hooklike projections are withdrawn from said hook forming fixed cavities in form suitable for hook and loop fastening.

91. The method of claim 90 wherein the running length of material is nonwoven fabric, woven textile, knitted textile, reinforcing yarns, scrim, netting, paper, plastic film, or metallic window screening.

92. The method of claim 90 wherein the running length of material is a sheet material having loops on one side thereof, said loops extending away from the base of said striplike member on the side opposite the side having said hooklike projections.

93. The method of claim 90 wherein the running length of material is printed matter and said plastic material is sufficiently transparent that said printed matter is visible through said transparent plastic.

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94. The method of claim 90 wherein the running length of material comprises a sheet material containing an adhesive on one side thereof said adhesive extending away from the base of said striplike member on the side opposite the side having said hooklike projections.

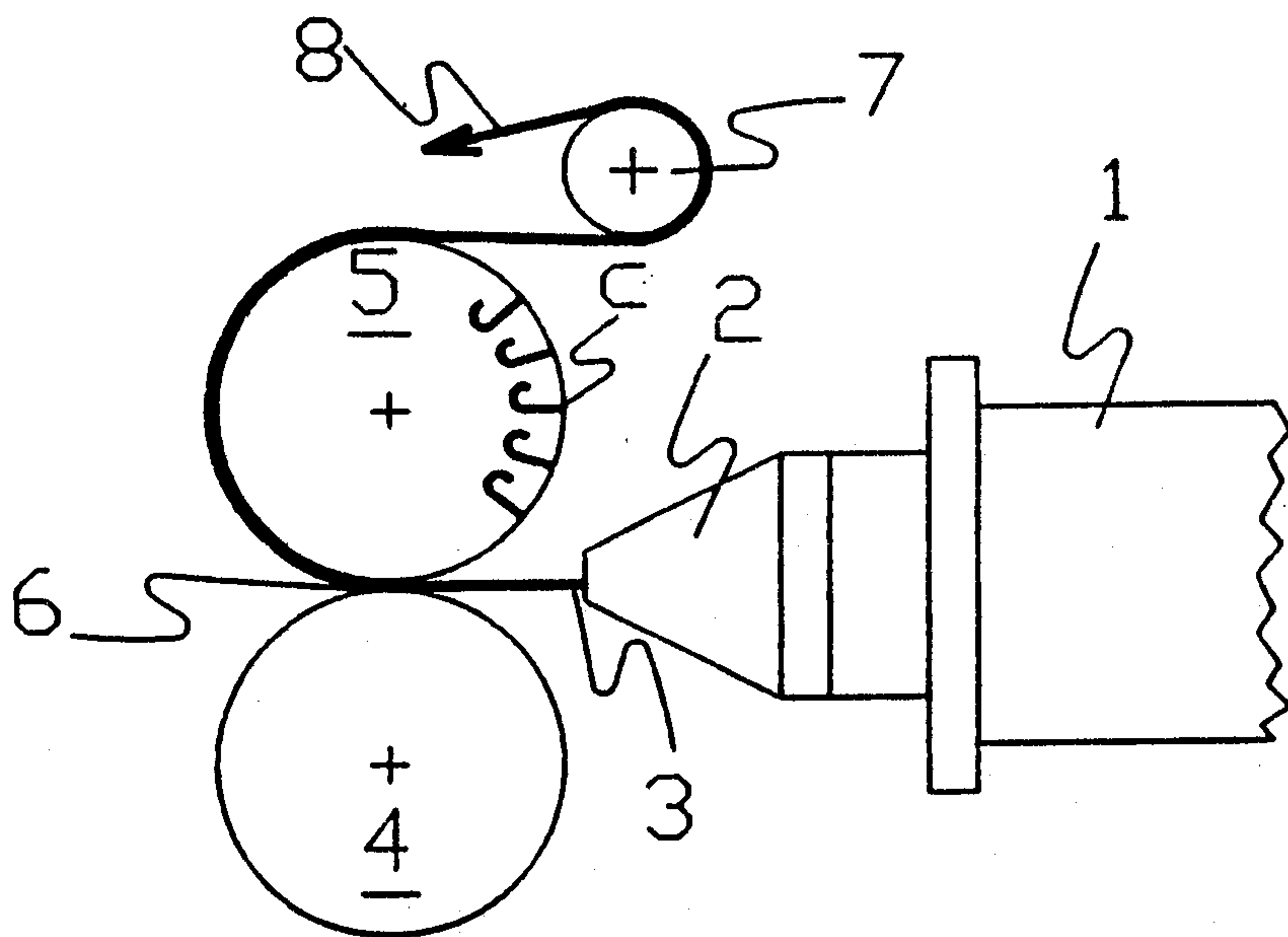


FIG. 1-PRIOR ART

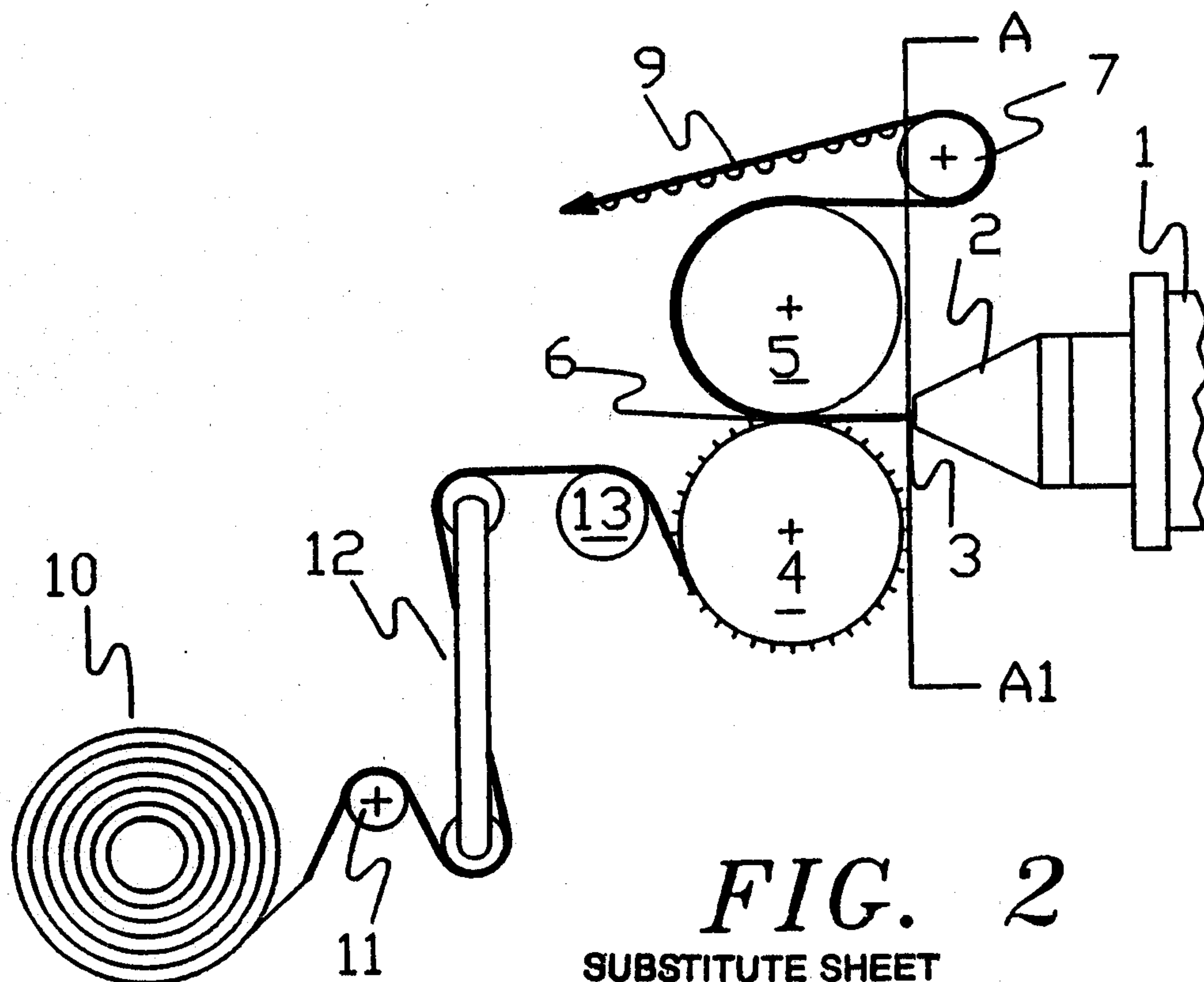


FIG. 2

SUBSTITUTE SHEET

2/42108550

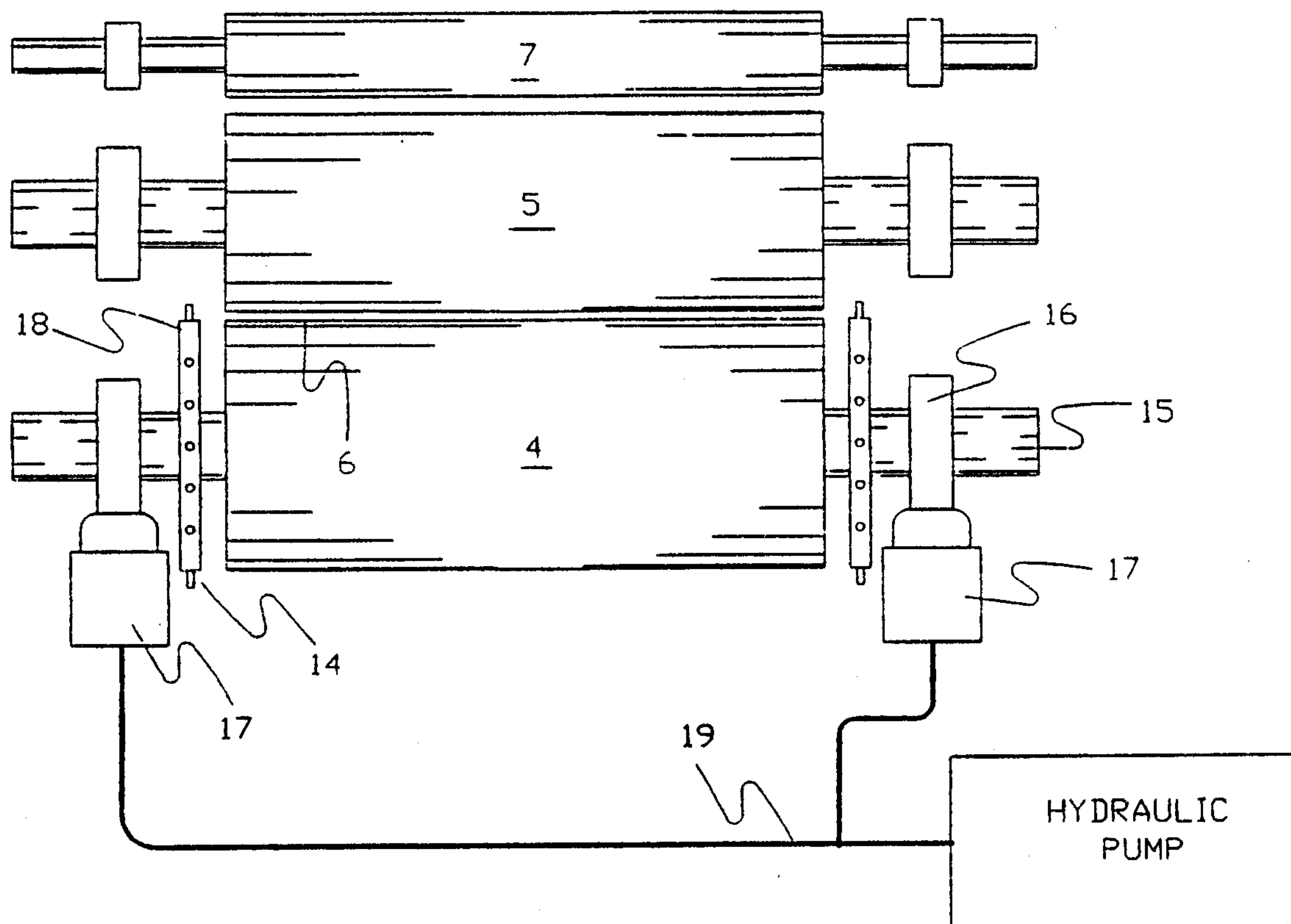


FIG. 3

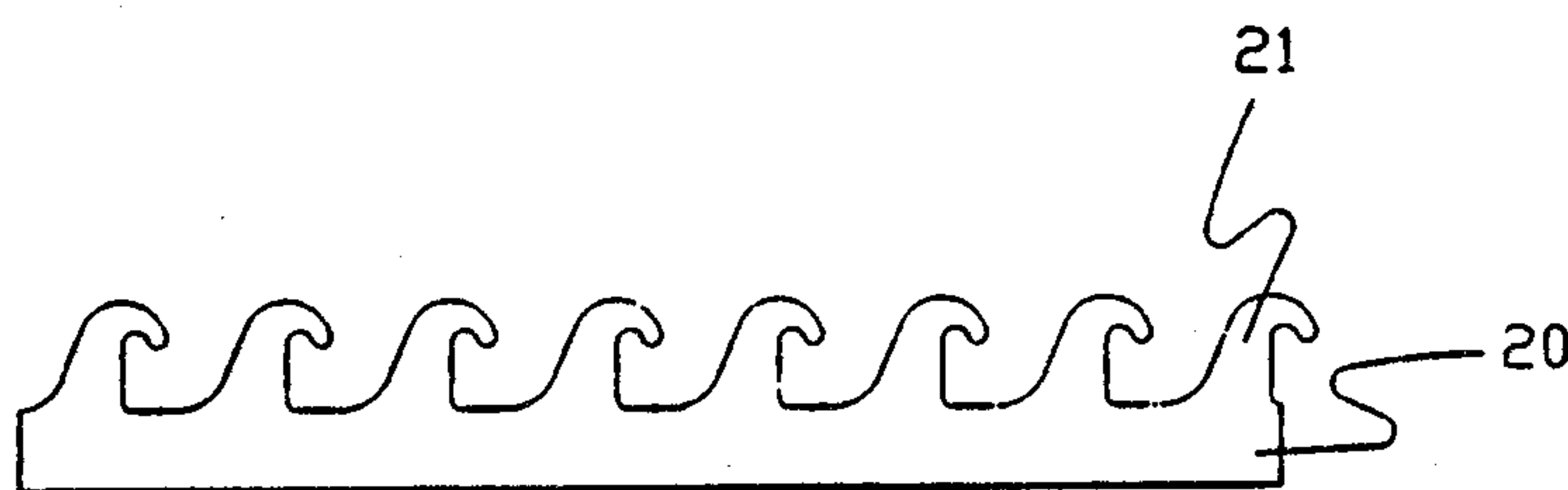


FIG. 4 - PRIOR ART

2108550

FIG. 5

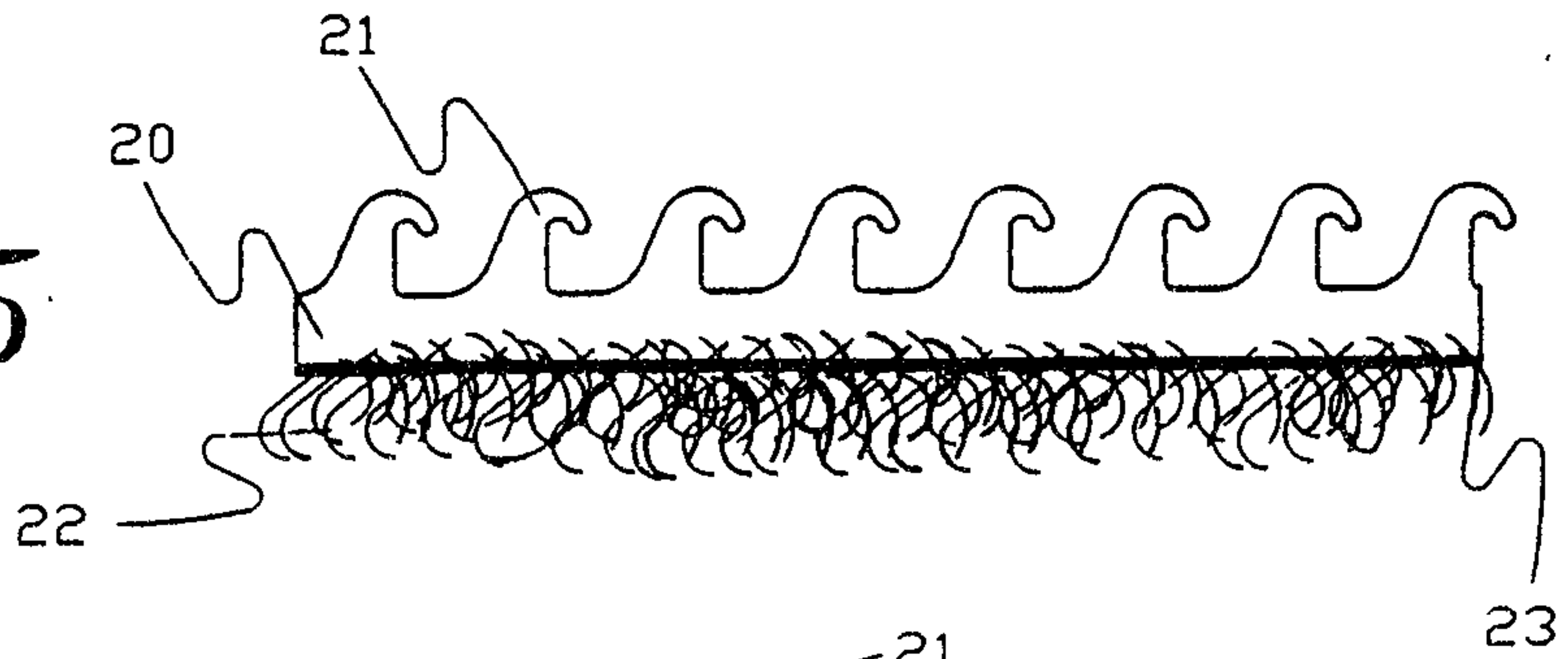


FIG. 5A

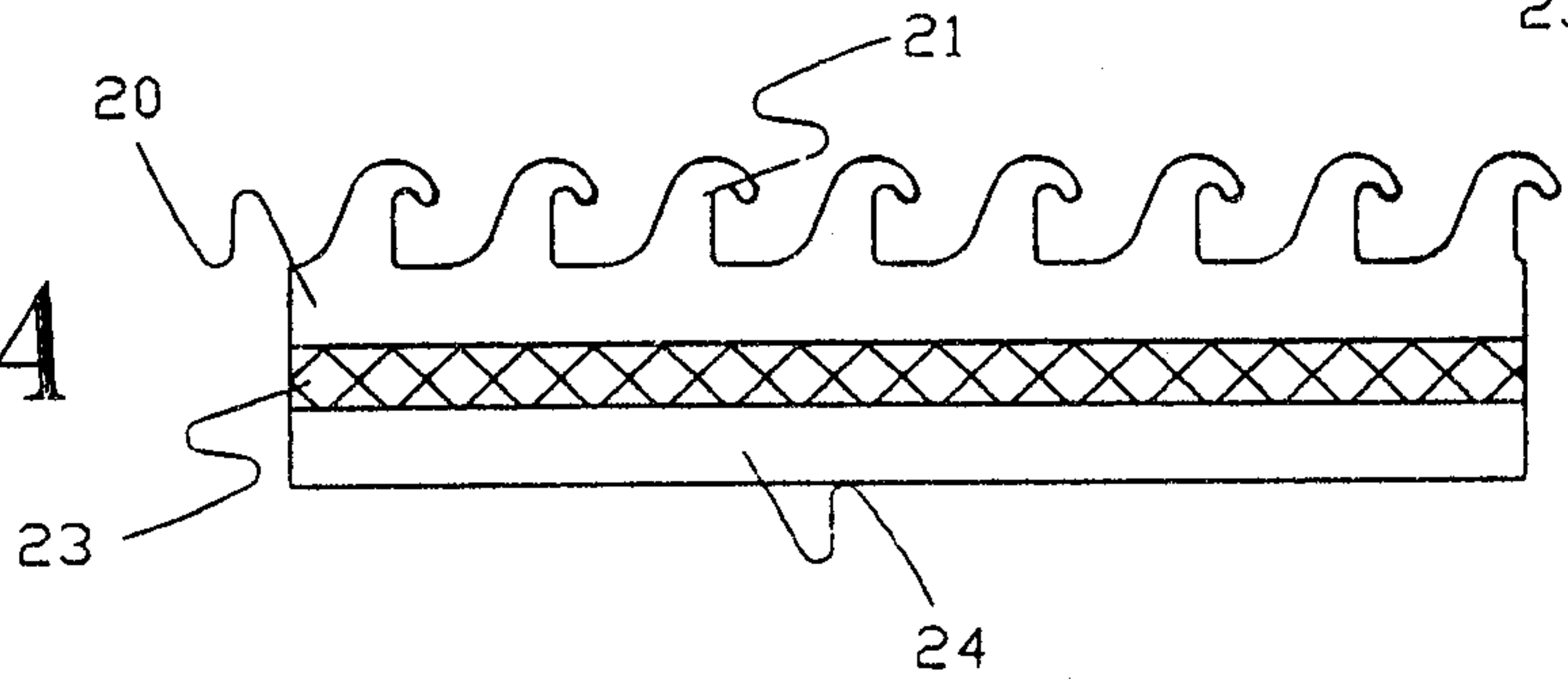


FIG. 6

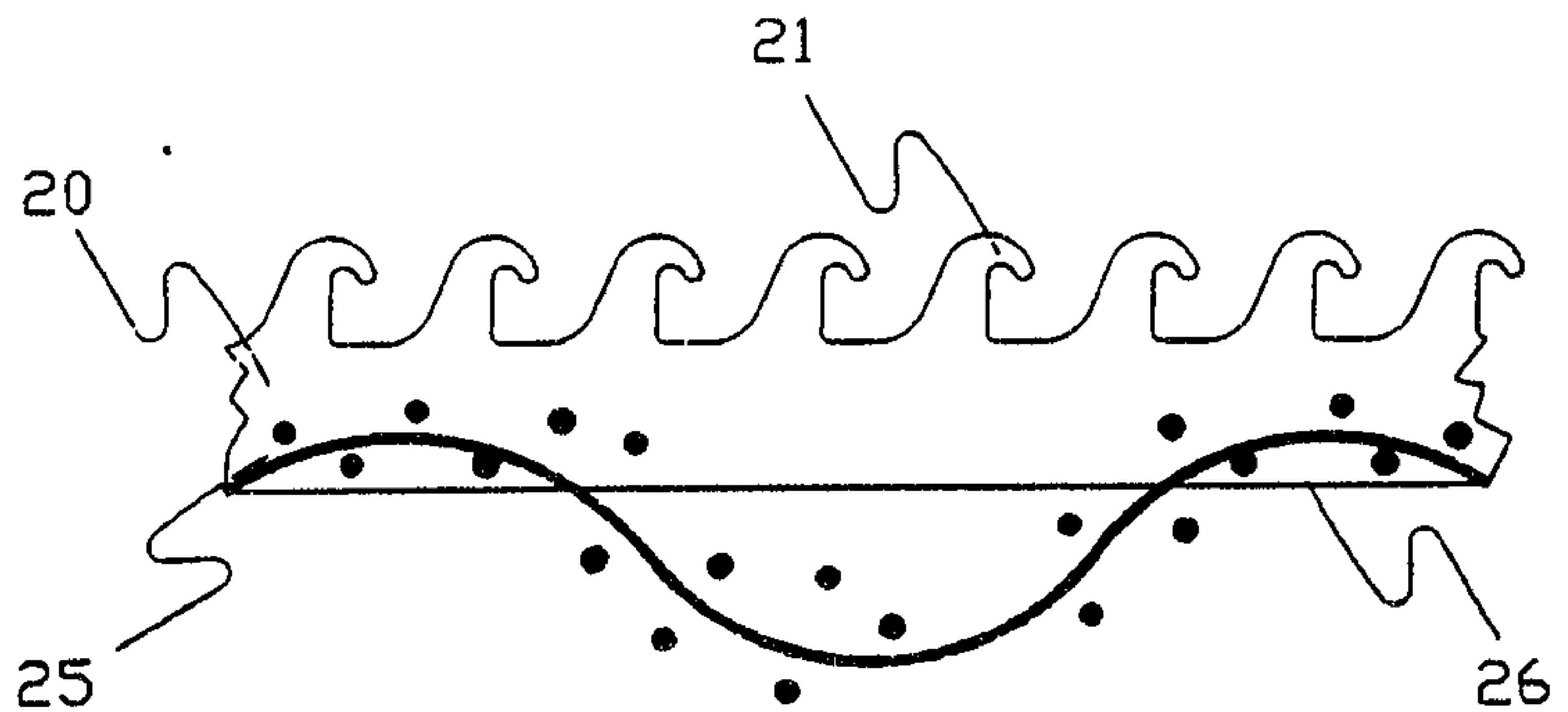


FIG. 7

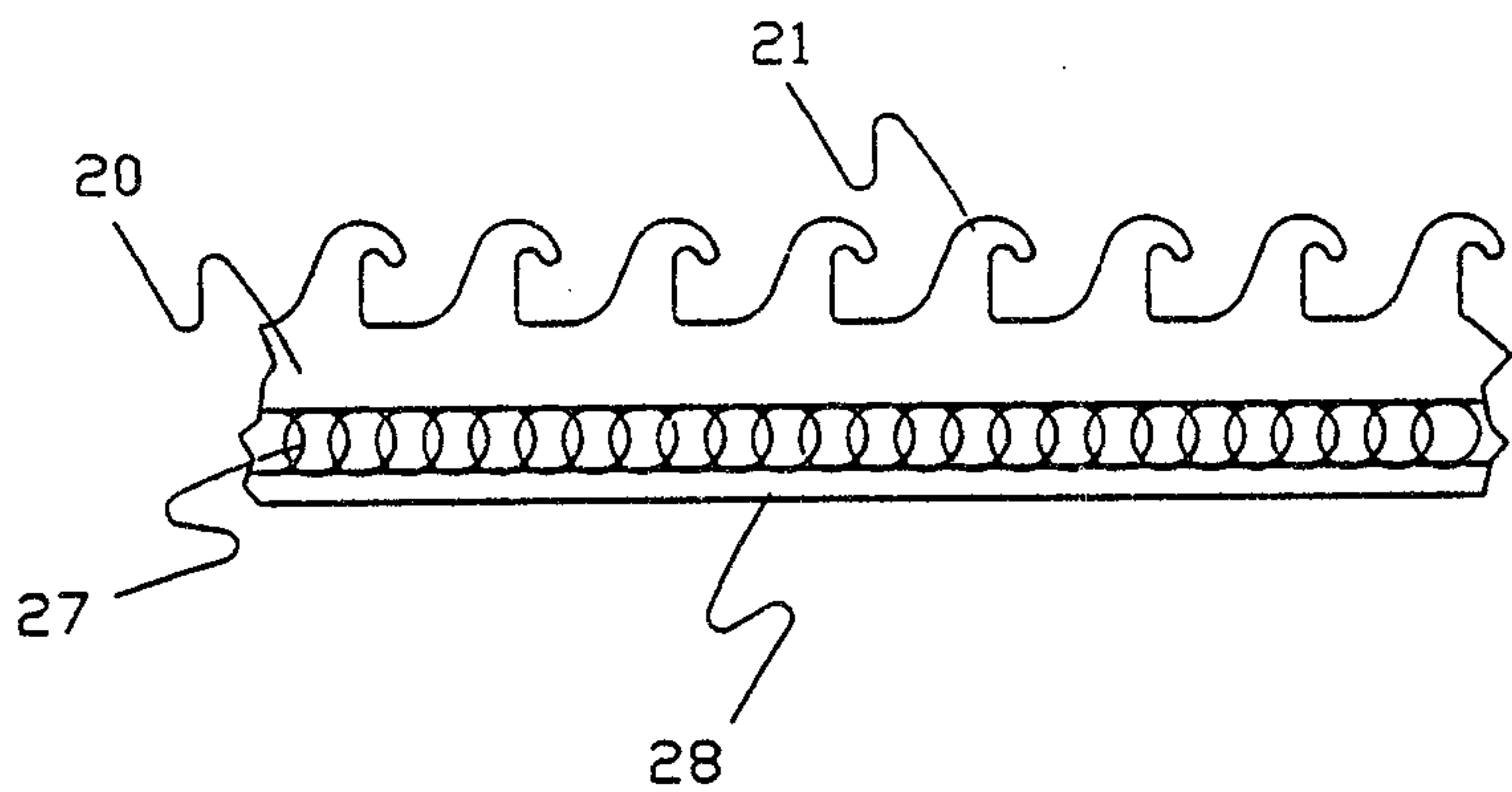
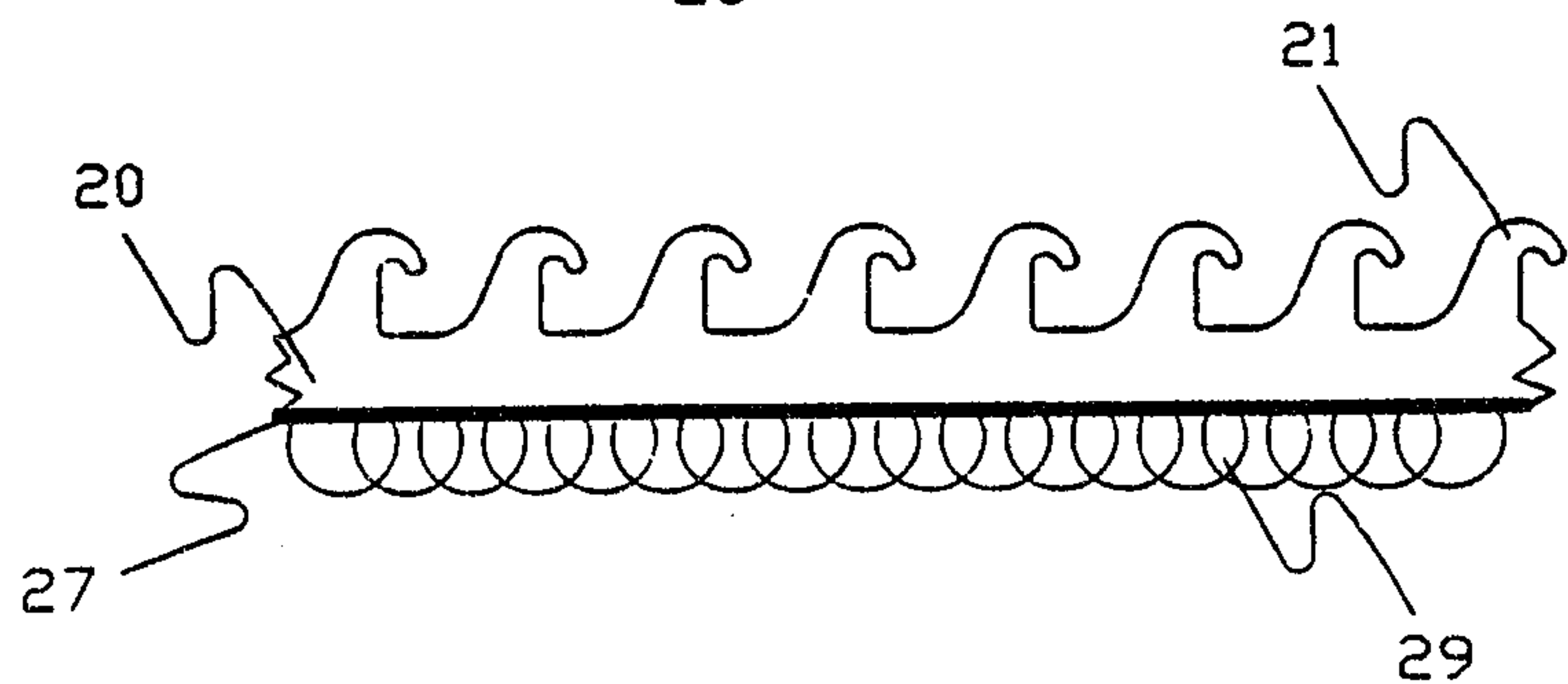
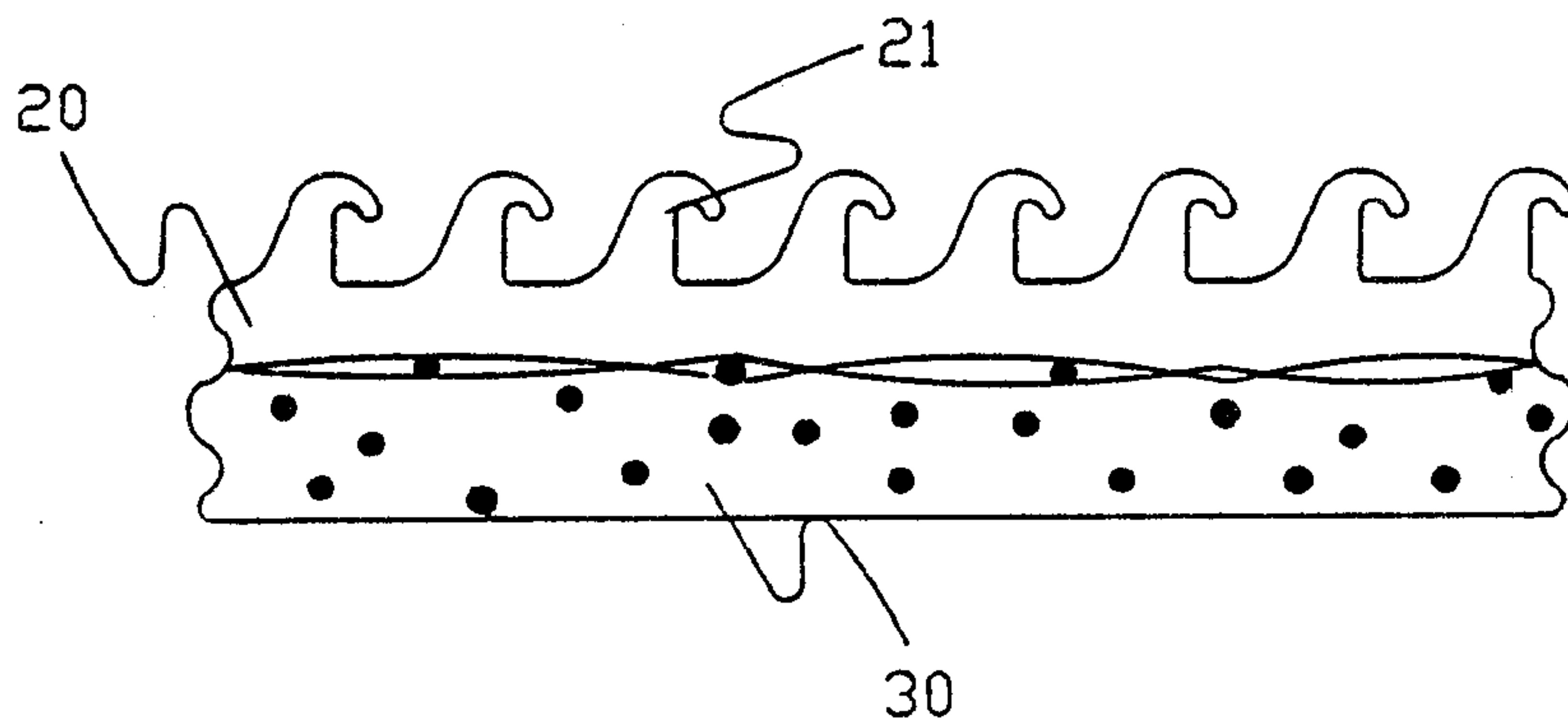
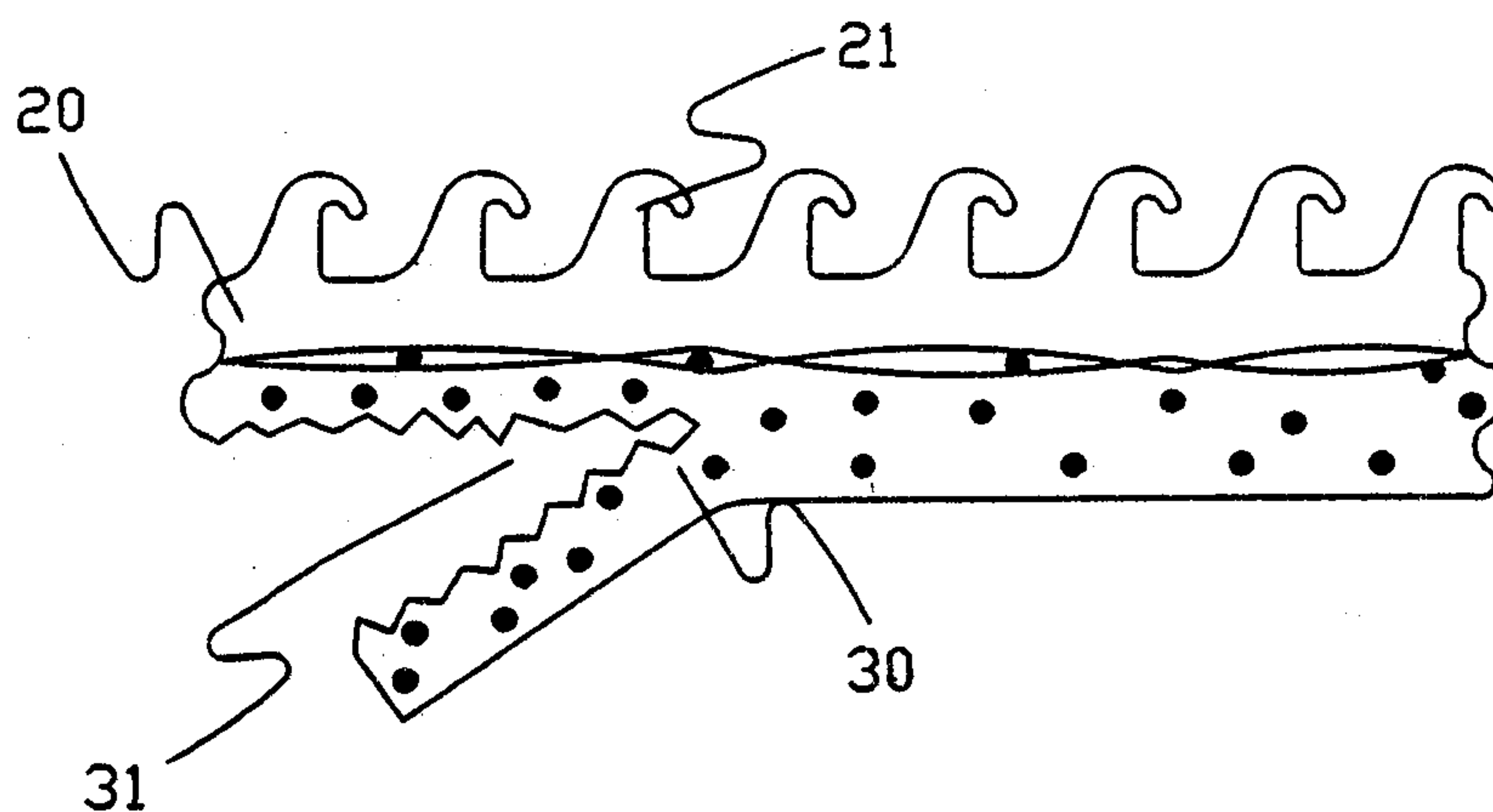


FIG. 8



*FIG. 9**FIG. 9A*

