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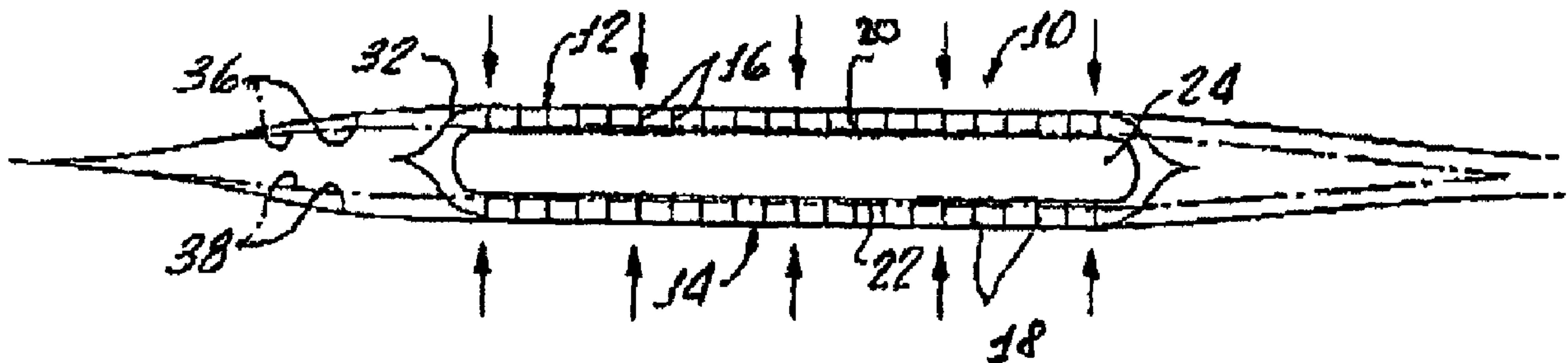
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(54) Title: NEEDLELESS MICROPROTRUSION ELASTOPLAST SYSTEM



(57) Abrégé/Abstract:

A needleless microprotrusion system for infusion of a medicament into a patient includes a plurality of microprotrusions having a length sufficient to penetrate a stratum corneum of the patient. A chemodenervating agent is disposed in a microprotrusion in a substrate is provided for supporting the microprotrusion and conforming the microprotrusions to a selected patient body part in order to enable uniform penetration of the microprotrusions into the corneum.



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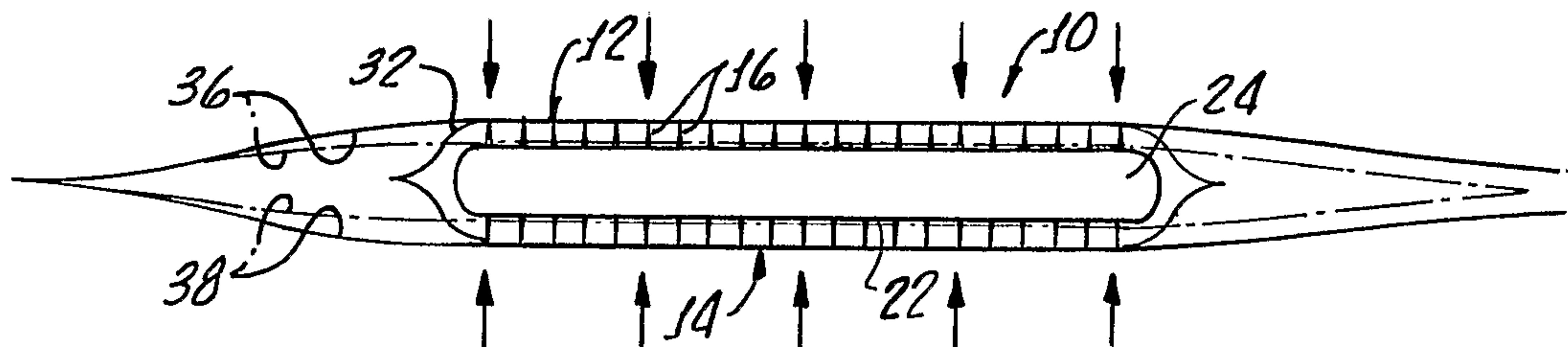
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(54) Title: NEEDLELESS MICROPROTRUSION ELASTOPLAST SYSTEM



(57) Abstract: A needleless microprotrusion system for infusion of a medicament into a patient includes a plurality of microprotrusions having a length sufficient to penetrate a stratum corneum of the patient. A chemodenervating agent is disposed in a microprotrusion in a substrate is provided for supporting the microprotrusion and conforming the microprotrusions to a selected patient body part in order to enable uniform penetration of the microprotrusions into the corneum.

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NEEDLELESS MICROPROTRUSION ELASTOPLAST SYSTEM

The present invention is generally directed to a delivery system for a medicament and is more particularly
5 directed to a needleless microprotrusion system for infusion of a medicament into a patient.

Still more particularly, the present invention relates to a novel method of administering chemodenervating agents
10 in a controlled and reproducible manner so as to confine effectiveness of the agent to a given region while minimizing the effects of the agent on adjacent tissue.

Chemodenervating agents such as, for example, botulinum
15 toxin, has been found effective for the treatment of hyperhidrosis and other dermatological indications, such as glabellar lines and brow furrow. Current therapies include topicals, that is, for example, antiperspirants, creams and systemic products. All too often these are short acting
20 and/or ineffective.

As noted, a significant advantage in ameliorating sweating and removing wrinkle lines has been achieved through the action of botulinum toxin injections. While
25 this specific treatment is revolutionary and efficacious, the patient is unfortunately placed under significant amount of duress and discomfort due to need to administer multiple injections.

30 In addition, since each injection represents a possibility for infection, the injections are typically spaced apart from one another, which results in peak and valley concentrations of the medicament.

The epithelia layer of the skin, also referred to as the epidermis, is part of the skin which provides a

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barrier against penetration and consists of four layers. These layers are an outermost layer called the stratum corneum and three underlying layers called the stratum granulosum, the stratum malpighii, and the stratum
5 germinativum.

The present invention provides for a system for intradermal administration of neurotoxins in the treatment of hyperhidrosis, skin wrinkles including facial lines.
10

US 2002/128599 A1 and US 2002/0082543 discuss transdermal drug delivery devices having coated microprotrusions.

15 A microneedle apparatus used for marking skin and for dispensing semi-permanent subcutaneous makeup is discussed in US 6,565,532. The apparatus comprises a microneedle patch consisting of microneedles, which are supported by a substrate, and which are of sufficient length to penetrate
20 into the epidermis. The microneedle patch is designed to have a desired pattern of the makeup or pattern to be applied. US 6,565,532 mentions that other type of skin structure modifiers may also be applied through the microneedle patch, including such ingredients as fat,
25 collagen, botulinum toxin, fibril, silicones, hydrogels, elastomers, and colloids.

SUMMARY OF THE INVENTION

30 It is the object of the present invention to provide a needleless microprotrusion system that enhances uniform penetration of the microprotrusions into the stratum corneum.

35 The present invention provides for a needleless microprotrusion system for infusion of a medicament into a

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patient which includes a plurality of microprotrusions having a length sufficient to penetrate a stratum corneum of the patient and a chemodenervating agent disposed on or in the microprotrusions.

5

A substrate is provided for supporting the microprotrusions with the substrate. The substrate features a shape for conforming to a selected patient body part in order to enable uniform penetration of the microprotrusions into the stratum corneum.

10 In one embodiment of the present invention, two pluralities of microprotrusions are provided with one plurality of microprotrusions disposed on one side of the substrate and another plurality of microprotrusions disposed on another side of the substrate.

15 A preferred shape for this embodiment includes a substrate sized for positioning within the palm of a patient and preferably the chemodenervating agent in accordance with the present invention comprises botulinum toxin, preferably type A.

20 A method for utilizing a system in accordance with this embodiment basically includes the steps providing a substrate having a shape for conforming to the palm of a patient with the substrate having microintrusions disposed on opposite sides of the substrates. The substrates have a length sufficient to penetrate the stratum corneum of the patients' palm.

30

A chemodenervating agent is provided for delivery by the microprotrusions and the patient may be instructed to dispose the substrate on one palm and press the other palm against the substrate in order to effect simultaneous delivery of the chemodenervating agent into both palms.

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In another embodiment of the present invention a substrate is size and shaped for conforming to a patients armpit for positioning against a palm and fingers of a user or for positioning against a sole of a users' foot or for
5 positioning against a sole and toes of a users' foot.

In one embodiment, various glove sizes and shoe sizes are used to produce the substrate.

10 In addition, an adhesive disposed on the substrate may be provided for temporarily adhering the substrate to a

3a

patients' skin at a selected location and is suitable for receiving the size and shape of the substrate.

To further enhance uniform penetration of the microprotrusions into the stratum corneum, the substrate is preferably flexible.

BRIEF DESCRIPTION OF THE DRAWINGS.....

10 The present invention may be more clearly understood with reference to the following detailed description in conjunction with the appended drawings, of which:

Figure 1 is a side view of one embodiment of the present invention generally showing two pluralities of microprotrusions disposed on opposite sides of a substrate;

Figures 2 and 3 illustrate the use of the system shown in Figure 1 which includes a substrate sized for positioning within the palm of a user;

Figures 4-5 show other embodiments of the system in accordance with the present invention utilizing a single plurality of microprotrusions and a substrate for supporting the microprotrusions and having a shape for conforming to a selected body part along with an adhesive for temporarily adhering a substrate to a patients' skin;

Figures 6 and 7 illustrate application of the embodiment shown in Figure 4 and 5;

Figure 8 shows an alternative embodiment of the present invention in which the substrate is sized and shaped for fitting the fossa axillaries (armpit) of a patient;

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Figure 9 shows an alternative embodiment of the present invention in which the substrate is sized and shaped for positioning against a users' palm and fingers;

5 Figure 10 shows an alternative embodiment of the present invention in which the substrate is sized and shaped for positioning against a users' sole and toes; and

Figure 11 is an enlarge view of the microprotrusions
10 shown in Figures 1 and 4.

DETAILED DESCRIPTION

With reference to Figure 1, there is shown a needleless
15 microprotrusion system 10 in accordance with the present invention for infusion of a medicament (not shown) into a patient, also not shown in Figure 1.

The system 10 generally includes two pluralities 12, 14
20 of microprotrusions 16, 18 disposed on opposite sides 20, 22 of a substrate 24.

The microprotrusions 16, 18 may be of any suitable size and configuration and formed from a metal, preferably
25 stainless steel, or other inert material that are directly embedded into the substrate 24 which is preferably an inert platform such as silicone, or polypropylene. With the proper selection of materials, the microprotrusions and substrate may be formed unitarily.

30

A chemodenervating agent, preferably botulinum toxin, is disposed on the microprotrusions 16, 18 and covered with a removable liner 32 in a conventional manner, said liner being removable for exposing the microprotrusions 16, 18 for
35 use.

As more clearly shown in Figures 2 and 3, the substrate 24 is sized and shaped for conforming to a patients' palm 36 which enables a method in accordance with the present invention as illustrated in Figure 3 in which a patient, following instructions, disposes the system 10 in one palm 36 and press another palm 38 against the system 10 in order to effect simultaneous delivery of the chemodenerivating agent into both palms 36, 38.

10 This method for delivering the medicament is suitable for treatment of hyperhidrosis. Preferably, the substrate is flexible for enabling uniform penetration of the microprotrusions 16, 18 into the patients' palms 36, 38 respectively. Microprotrusions suitable for use in the present invention are described in U.S. 6,322,808
15 microprotrusions 16, 18 and substrates 24.

20 With reference to Figures 4 and 5, there are shown alternative embodiments 44, 46 in accordance with the present invention which further include exposed portions 48, 50 respectively which include an adhesive for temporarily

25

30

35

adhering the substrate portions 48, 50 to a patient, see Figures 6 and 7 respectively which illustrate application of the embodiment 44 for removing wrinkles adjacent a patients' eye and in a glabellar region of the patient.

5

In another embodiment 56 of the present invention as illustrated in Figure 8 in which a substrate 58 is sized and shaped for fitting and conforming to a patients armpit 60.

10 Figures 9-10 are alternative embodiments 64, 66 illustrating substrates 68, 70 respectively, which are sized and shaped for positioning against a palm 74 and fingers 76 of a user and for positioning against a sole 80 and toes 80 of a user. Various glove sizes and shoe sizes may be used
15 to produce embodiments 64, 66 for use.

Figure 11 is an enlarged view of the microprotrusions 16, which as hereinabove noted, may be coated with botulinum toxin or alternatively, filled with a solution including
20 botulinum toxin.

In this instance, a reservoir 90 may be provided behind the microprotrusions 16 and covered by a backing 92 for enabling pressure to be exerted on the reservoir for
25 effecting delivery of the botulinum toxin from the microprotrusion.

It should be appreciated that the length of the microprotrusions are varied depending upon the anatomy of
30 the particular tissue being targeted by the therapeutic neurotoxin.

Although there has been hereinabove described a specific needleless microprotrusion blastoplast system in accordance with the present invention for the purpose of illustrating the manner in which the invention may be used to advantage, it should be appreciated that the invention is not limited thereto. That is, the present invention may suitably comprise, consist of, or consist essentially of the recited elements. Further, the invention illustratively disclosed herein suitably may be practiced in the absence of any element which is not specifically disclosed herein. Accordingly, any and all modifications, variations or equivalent arrangements which may occur to those skilled in the art, should be considered to be within the scope of the present invention as defined in the appended claims.

15

AMENDED CLAIMS

5 1. A needleless microprotrusion system for infusion of a medicament into a patient, the system comprising:

 a plurality (12, 14) of microprotrusions (16, 18) having a length sufficient to penetrate a stratum corneum of the patient;

10 a chemodenerivating agent disposed on the microprotrusion (16, 18);

 a substrate (24) for supporting the microprotrusions (16, 18), said substrate (24) having a shape for conforming to a selected patient body part in
15...order...to...enable uniform penetration of the microprotrusions (16, 18) into said stratum corneum, wherein the system is

 further comprising two pluralities (12, 14) of microprotrusions, one plurality (12) of microprotrusions
20 disposed on one side (20) of said substrate (24) and another plurality (14) of microprotrusions (18) disposed on another side (22) of said substrate (24).

 2. The system according to claim 1 wherein said
25 substrate (24) is sized for positioning within a palm (36) of said patient.

 3. A system according to claim 2 wherein said
substrate (24) is disposable in one palm (36) of said
30 patient and another palm (38) may be pressed against the substrate (24) in order to effect simultaneous delivery of said chemodenerivating agent into both palms (36, 38).

4. A needleless microprotrusion system for infusion of a medicament into a patient, the system comprising:

5 a plurality of microprotrusions (16) having a length sufficient to penetrate a stratum corneum of the patient;

a chemodenervating agent disposed on the microprotrusion (16);

10 a substrate (58, 68, 70) for supporting the microprotrusions (16), said substrate (58, 68, 70) having a shape for conforming to a selected patient body part in order to enable uniform penetration of the microprotrusions (16) into said stratum corneum,

wherein

15 said substrate (58, 68, 70) is sized and shaped for positioning against a palm (74) and fingers (76) of a user or for conforming to a patients' armpit (60) or for positioning against a sole (80) of a users' foot or for positioning against a sole (80) and toes of a users' foot.

20

~~5. The system according to claim 4 wherein various glove sizes and shoe sizes are used to produce the substrate (68, 70).~~

25

6. The system according to claim 1 or 4 further comprising an adhesive disposed on said substrate for temporary adhering said substrate to a patients' skin.

30

7. The system according to one of claim 6 wherein said adhesive surrounds said microprotrusion.

8. The system according to one of claims 1 to 7 wherein said substrate is flexible.

5 9. The system according to one of claims 1 to 8 wherein said chemodenervating agent is coated on said microprotrusion (16).

10 10. The system according to one of claims 1 to 8 wherein said chemodenervating agent is disposed within said microprotrusion (16).

11. The system according to claim 9 or 11 wherein said
15 chemodenervating agent comprises botulinum toxin.

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FIG. 1.

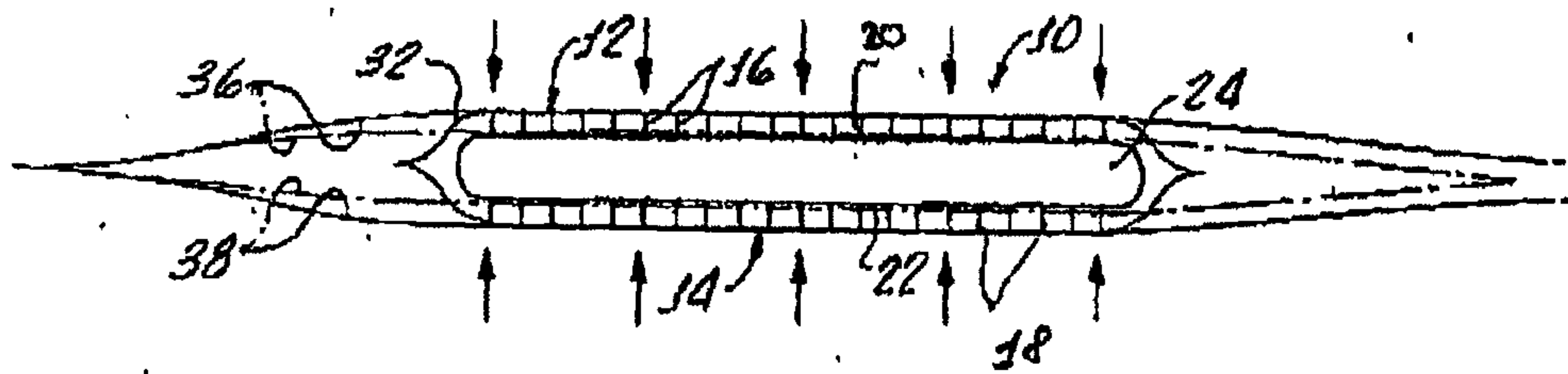


FIG. 2.

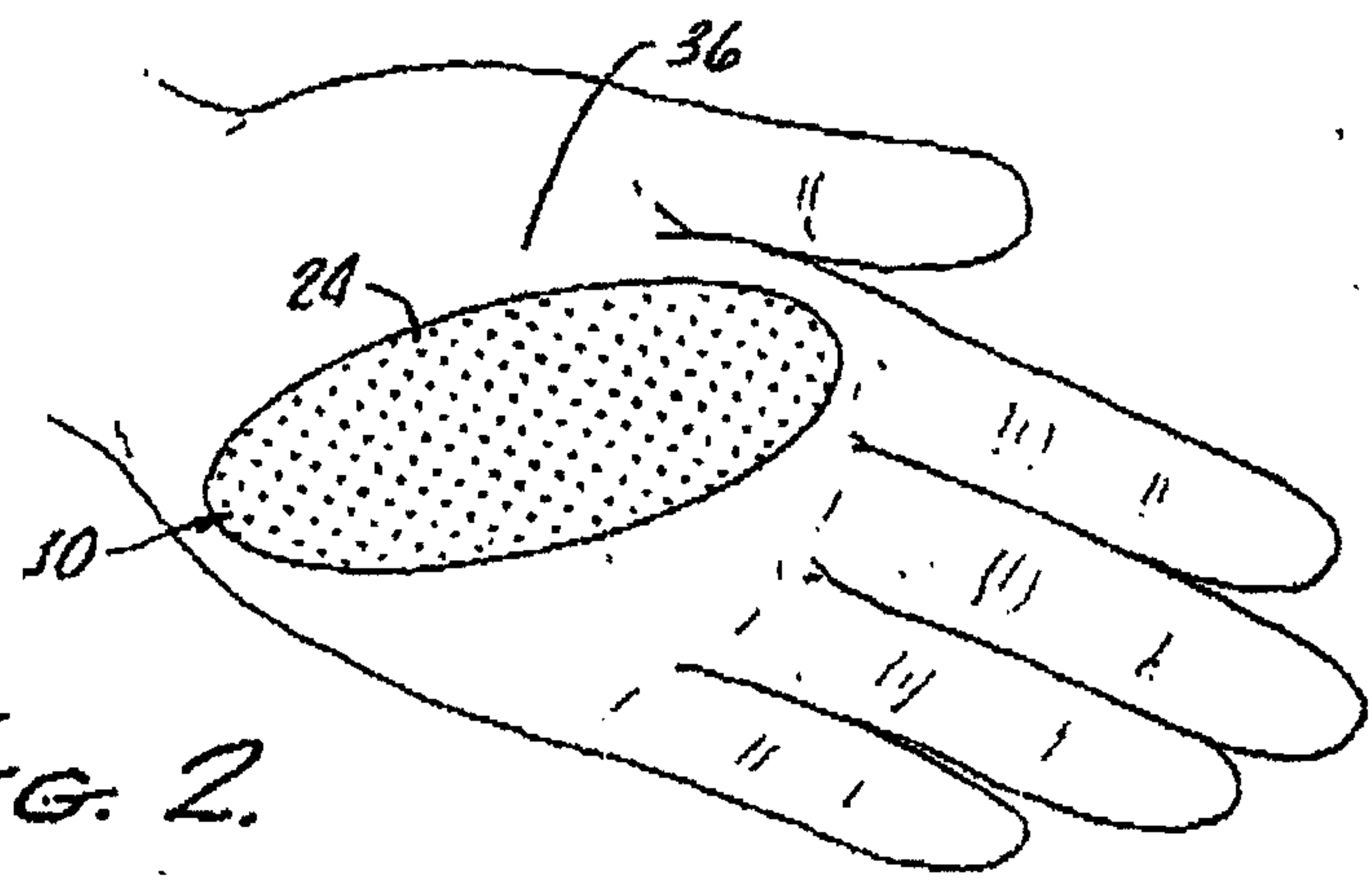
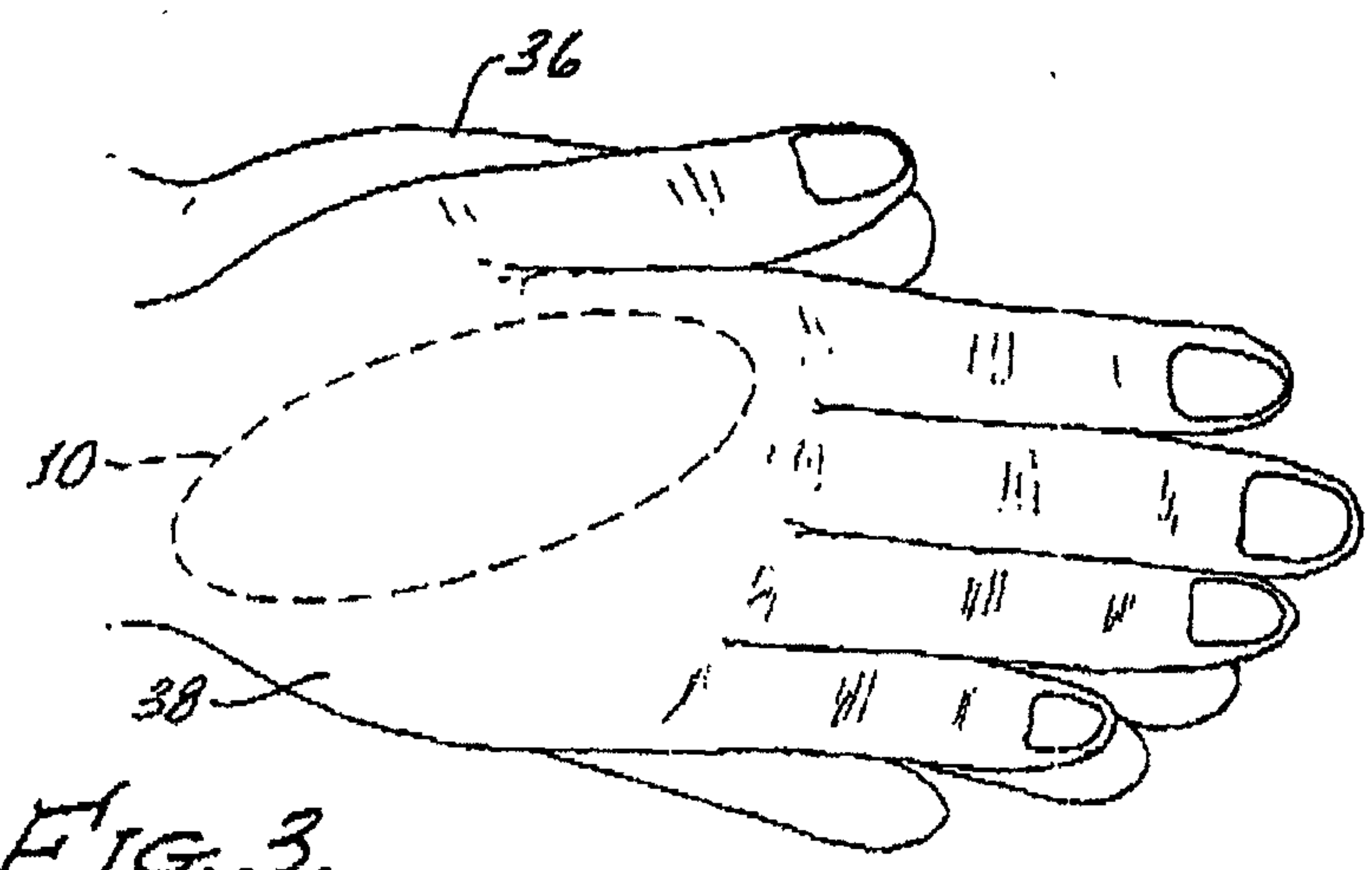


FIG. 3.



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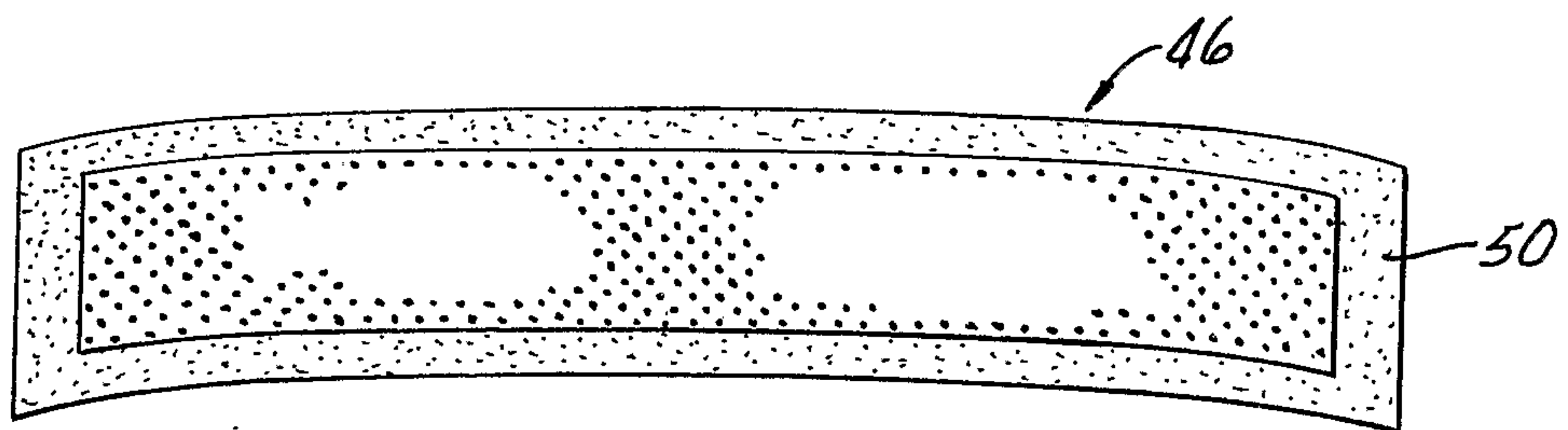
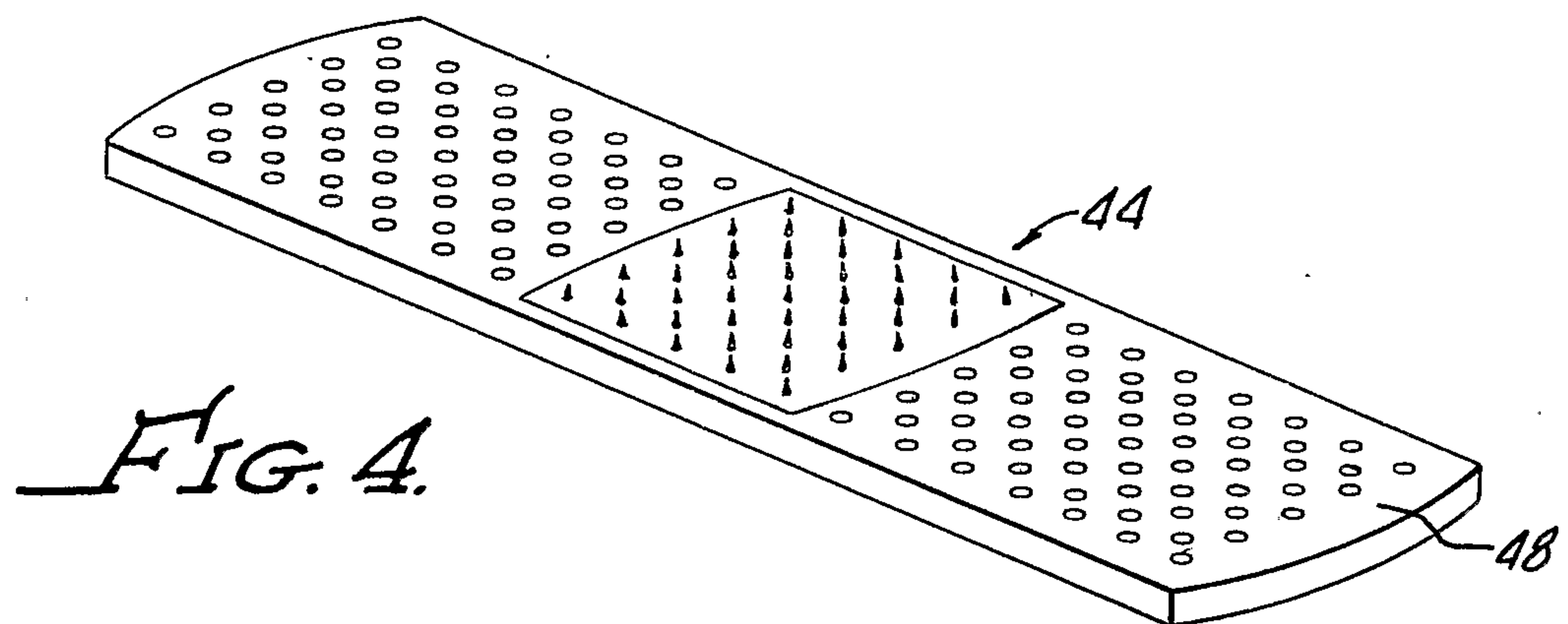
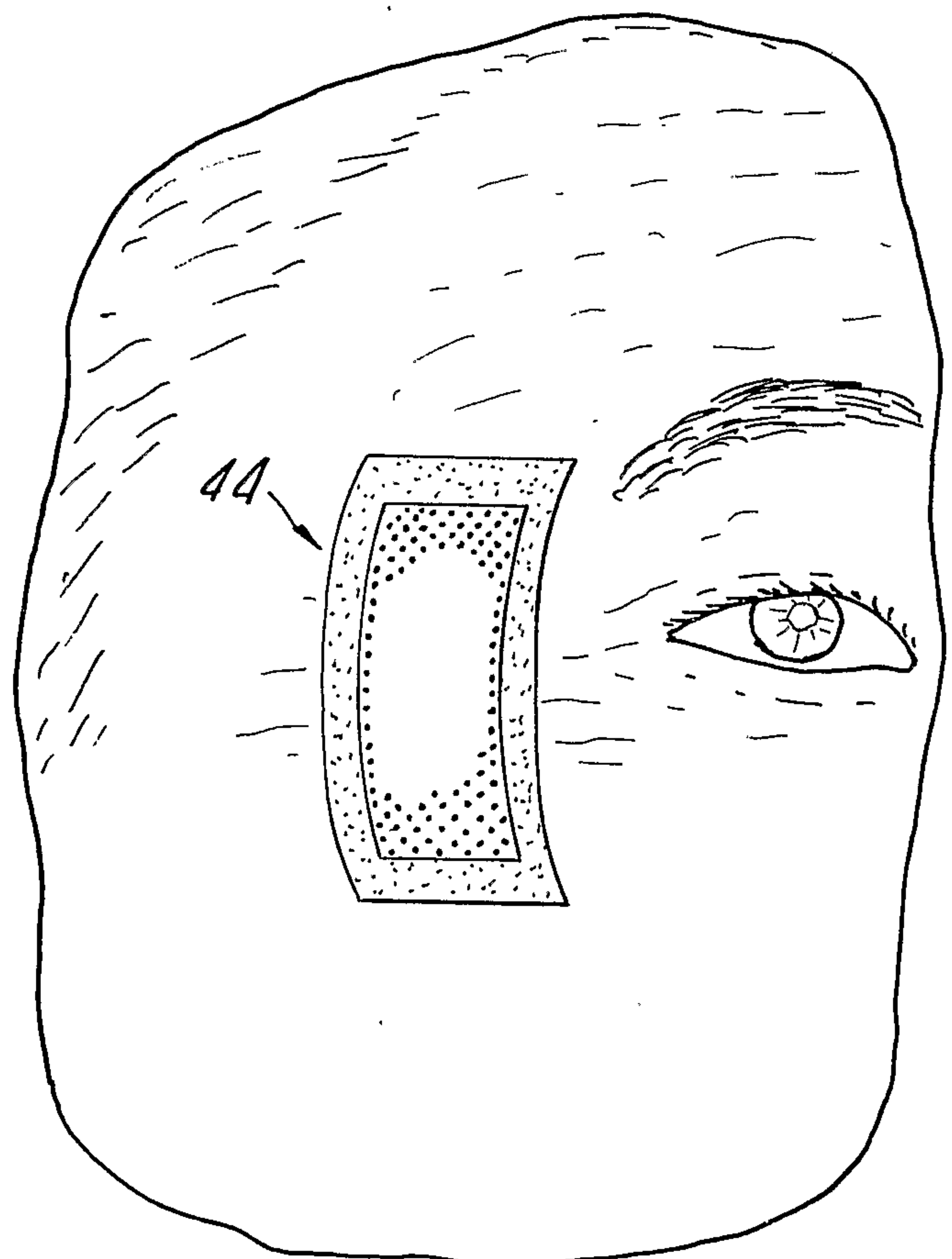


FIG. 6.



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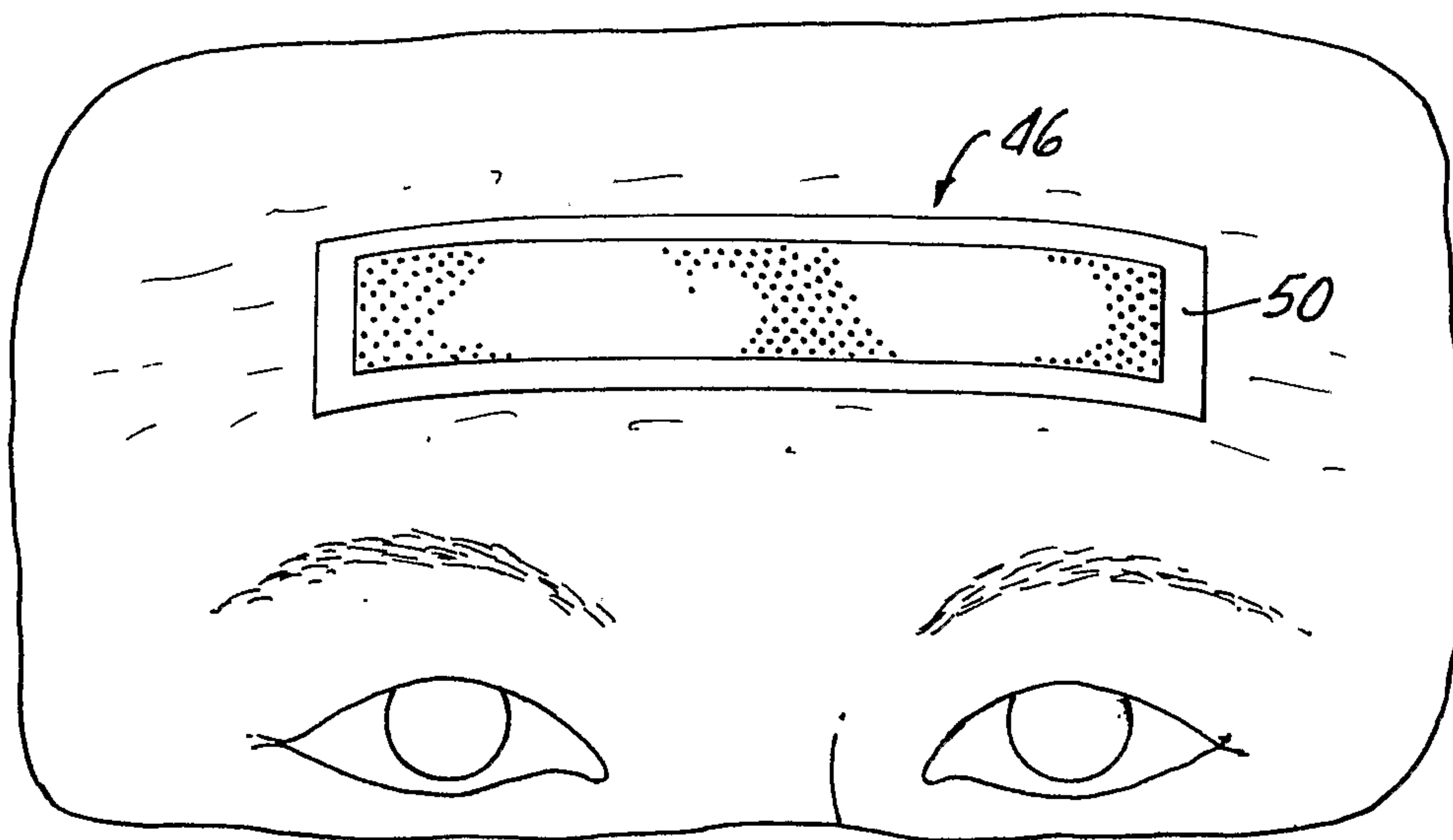


FIG. 7.

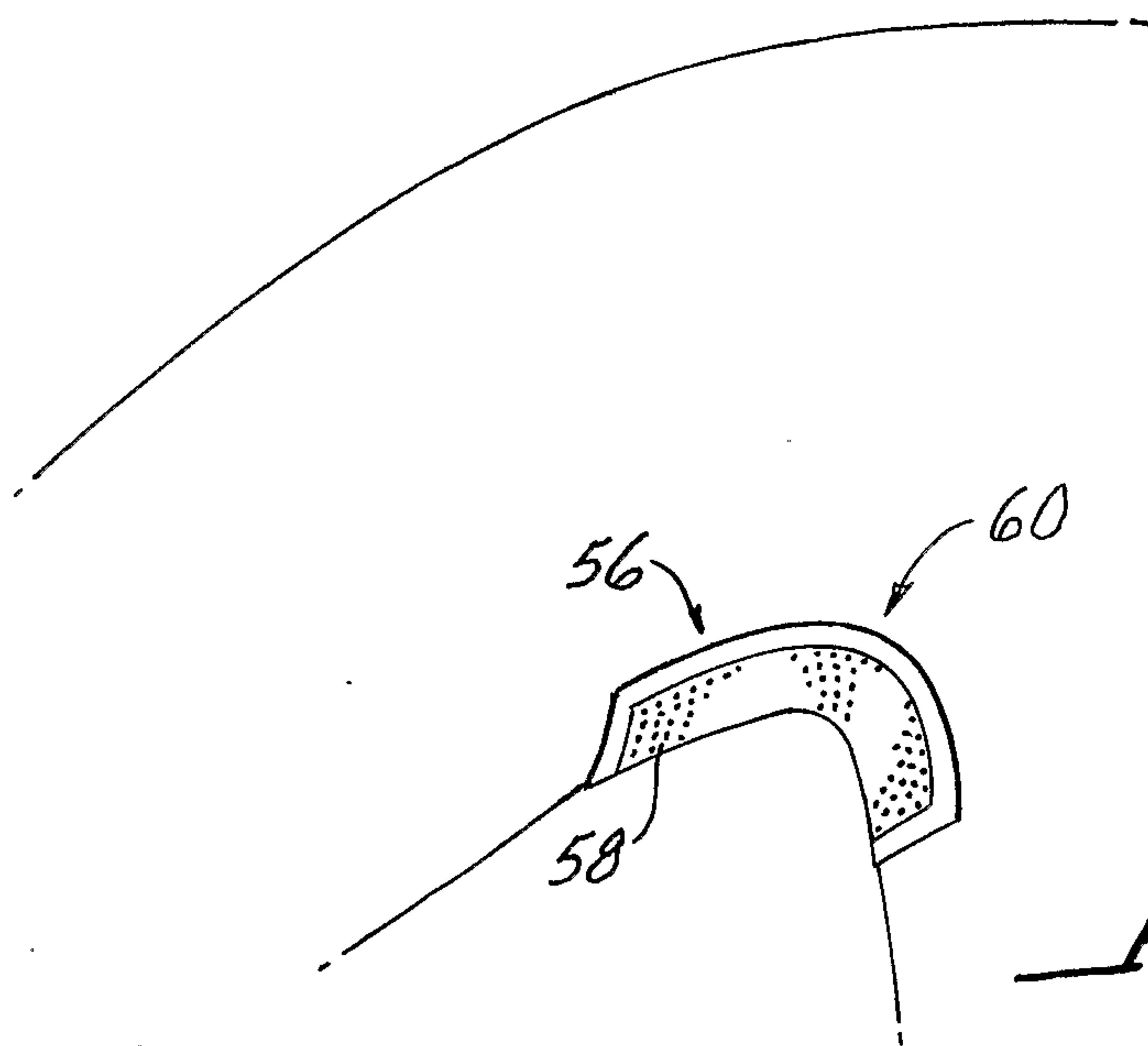


FIG. 8.

FIG. 11.

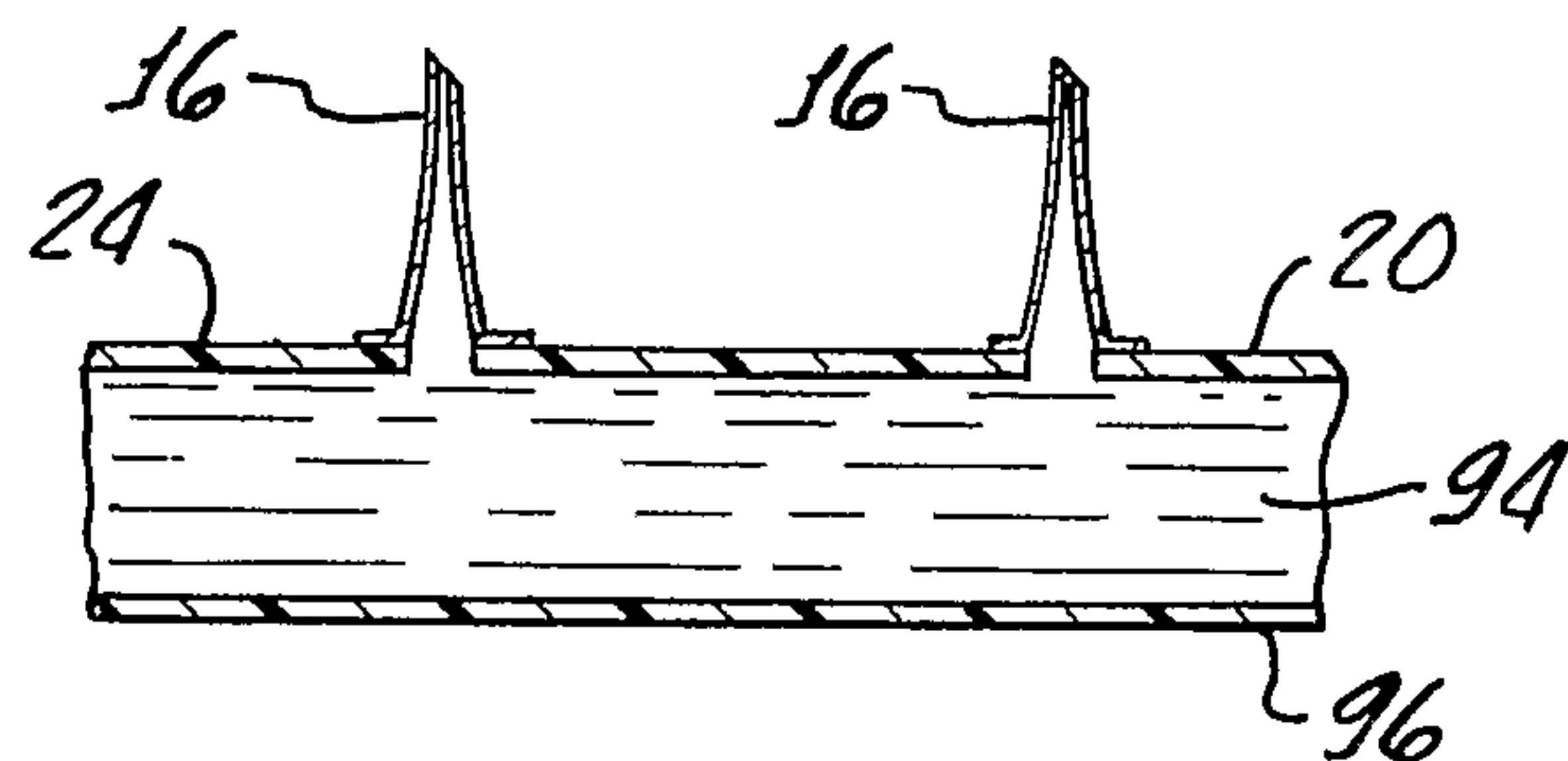
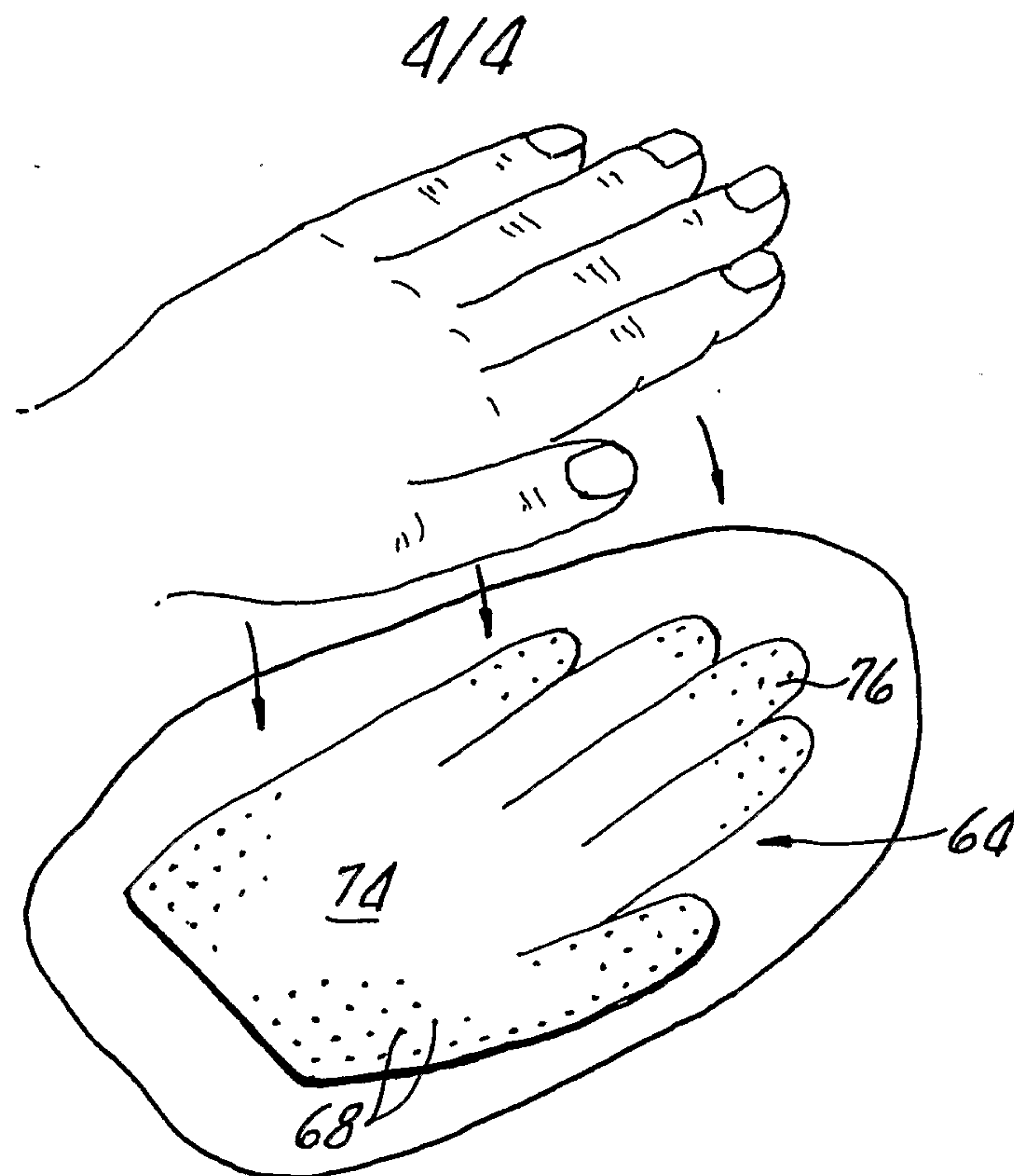


FIG. 9.*FIG. 10.*