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(71) Demandeur/Applicant:
TYCO HEALTHCARE GROUP LP, US

(72) Inventeurs/Inventors:
BRAGA, RICHARD M., US;
FINK, E. DAVID, US;
HEAGLE, DAVID, US;
VITARIS, RONALD F., US

(74) Agent: SMART & BIGGAR

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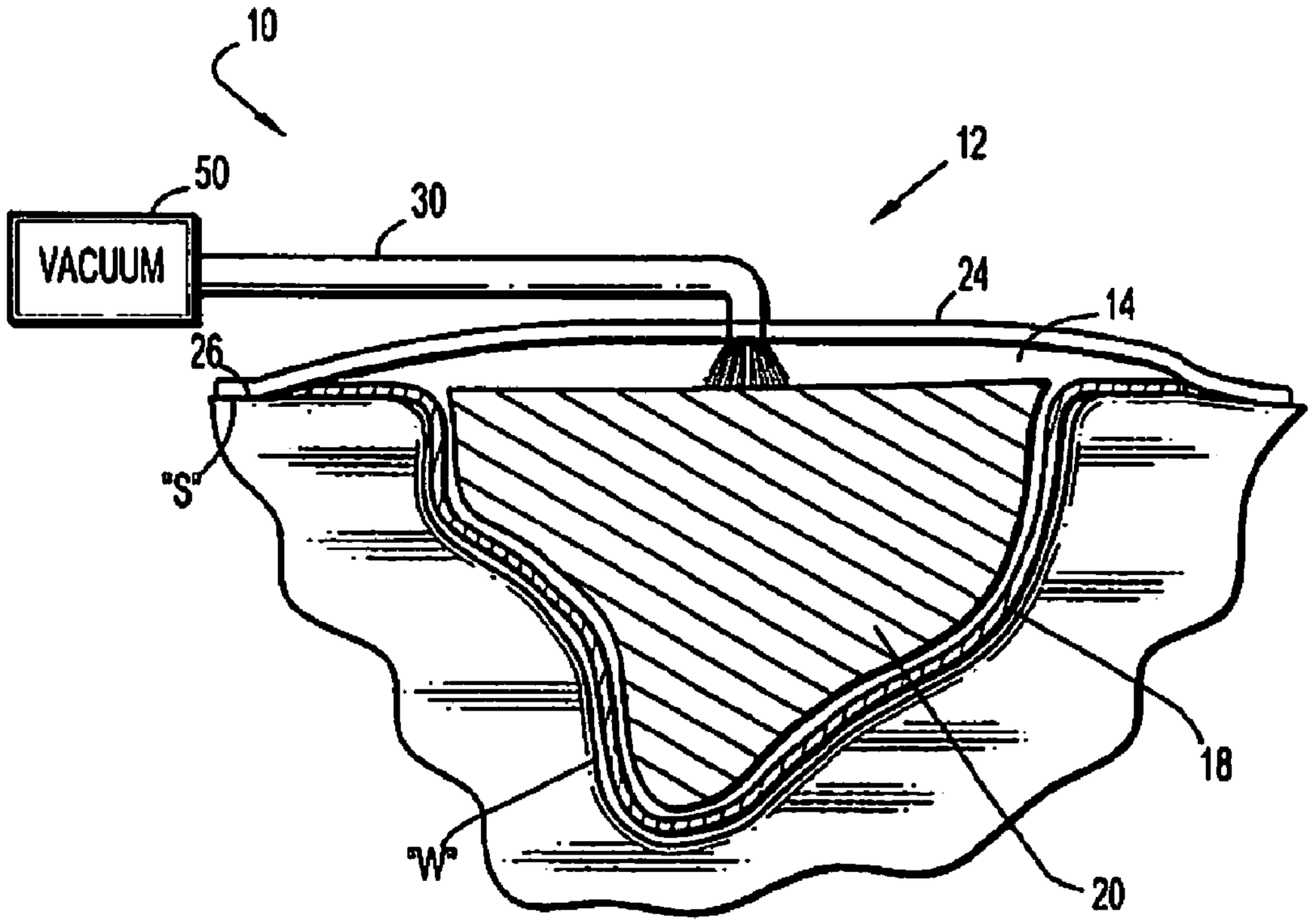

FIG. 1

(57) Abrégé/Abstract:
An apparatus for promoting the healing of an exuding wound includes a cover layer for positioning over a wound to define a reservoir over the wound. An exudate conduit having a fibrous core includes a plurality of fibers communicates with the reservoir for wicking fluids away from the wound.

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(71) Applicant *(for all designated States except US)*: **TYCO HEALTHCARE GROUP LP** [US/US]; 15 Hampshire Street, Mansfield, MA 02048 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **BRAGA, Richard, M.** [US/US]; 7 Parkview Circle, North Easton, MA 02356 (US). **FINK, David, E.** [US/US]; 10 Cranberry Drive, Franklin, MA 02038 (US). **HEAGLE, David** [US/US]; 55 Williams Street #302, Taunton, MA 02780 (US). **VITARIS, Ronald, F.** [US/US]; 9 Doyle St., Worcester, MA 01606 (US).

(74) Agents: **O'BRIEN, Elisabeth** et al.; Tyco Healthcare Group LP, 15 Hampshire Street, Mansfield, MA 02048 (US).

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[Continued on next page]

(54) Title: APPARATUS FOR VACUUM BRIDGING AND/OR EXUDATE COLLECTION

(57) Abstract: An apparatus for promoting the healing of an exuding wound includes a cover layer for positioning over a wound to define a reservoir over the wound. An exudate conduit having a fibrous core includes a plurality of fibers communicates with the reservoir for wicking fluids away from the wound.

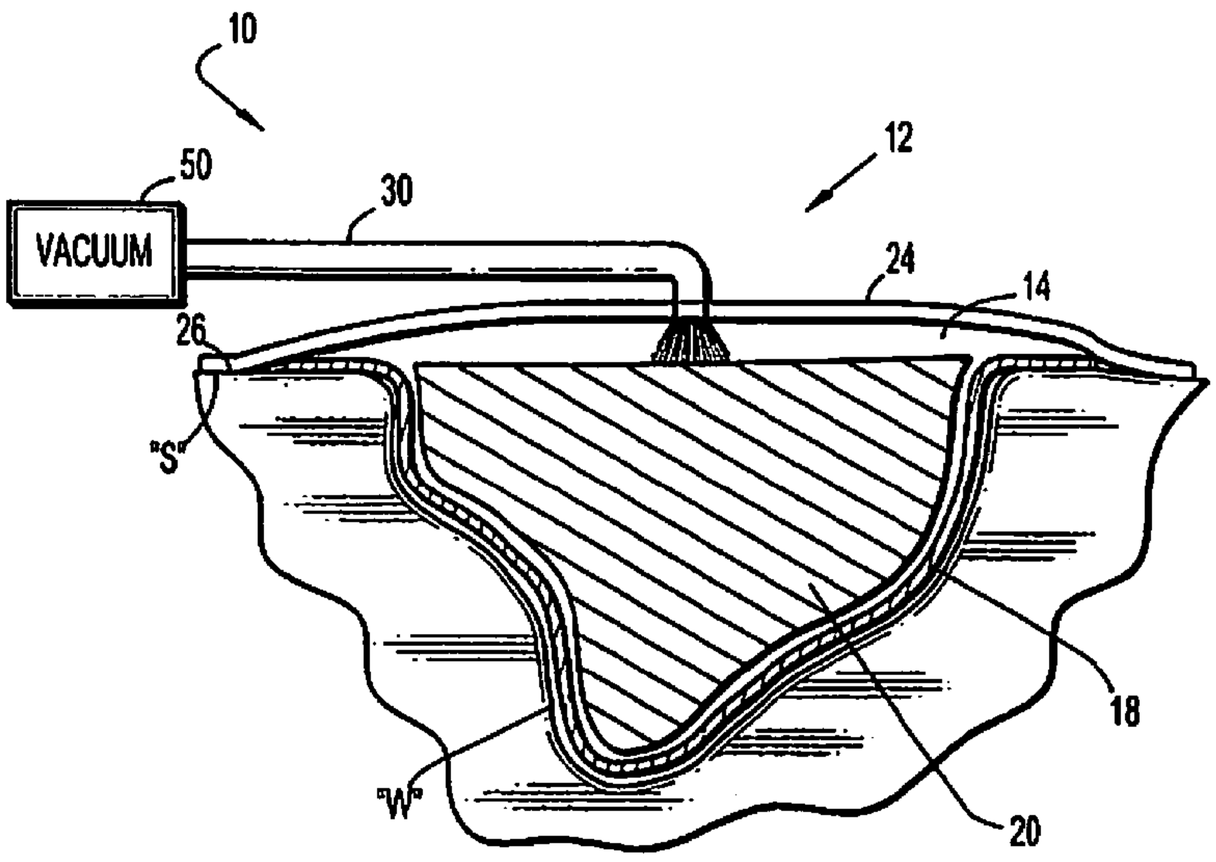

FIG. 1

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APPARATUS FOR VACUUM BRIDGING AND/OR EXUDATE COLLECTION

BACKGROUND

1. Technical Field

The present disclosure relates generally to wound therapy, and, in particular, relates to an apparatus for vacuum bridging and/or exudate collection for managing wound exudates during negative pressure wound therapy.

2. Background of Related Art

Various techniques to promote healing of a wound involve providing suction to the wound. For example, a vacuum source may serve to carry wound exudates away from a wound, which may otherwise harbor bacteria that inhibit the body's natural healing process. One technique for promoting the natural healing process may be described as negative pressure wound therapy (NPWT). This technique involves the application of a reduced pressure, e.g. sub-atmospheric, to a localized reservoir over a wound. Sub-atmospheric pressure has been found to assist in closing the wound by promoting blood flow to the area, which stimulates the formation of granulation tissue and the migration of healthy tissue over the wound. This technique has proven effective for chronic or non-healing wounds, but, has also been used for other purposes such as post-operative wound care.

SUMMARY

Accordingly, the present disclosure relates to further developments in wound therapy. In accordance with one embodiment, an apparatus for promoting the healing of an exuding wound includes a cover layer for positioning over a wound to define a reservoir over the wound. An exudate conduit having a fibrous core includes a plurality of fibers communicates with the reservoir for wicking fluids away from the wound. The exudate conduit may include a wound end adapted for positioning proximate to the cover layer and a vacuum end adapted for fluid connection with a vacuum source. A vacuum source may be in fluid communication with the vacuum end of the exudate conduit and operable to establish a reduced pressure within the reservoir. A collection canister may be adapted for fluid connection to the vacuum end of the exudate conduit whereby the vacuum source draws a vacuum through the collection canister.

In one embodiment, at least some of the fibers within the exudate conduit may be at least partially exposed adjacent the wound end of the exudate conduit. The exudate conduit may include an outer sleeve for at least partially accommodating the fibrous core with some of the fibers extending beyond the outer sleeve. At least one of the fibers may comprise a hydrophobic material.

The fibrous core may include an inner bundle of fibers and an outer bundle of fibers. The inner bundle may comprise hydrophobic fibers for discouraging fluid absorption and the outer bundle may comprise hydrophilic fibers for promoting fluid absorption. In the alternative, the outer bundle of fibers is knitted, woven, or braided around the inner bundle of fibers. The fibrous core may include at least one additive. The additive may be one of an antimicrobial, an anti-septic, and a surfactant. The fibrous core may include a concentration of

the additive adjacent the wound end which is greater than a concentration of the additive adjacent the vacuum end.

The outer sleeve may comprise a semi-permeable material. In one embodiment, the outer sleeve defines a first cross-sectional dimension greater than a second cross-sectional dimension to thereby reduce the profile of the outer sleeve.

A method for facilitating healing of a wound is also disclosed. The method includes the steps:

applying a wound dressing over a wound;

fluidly connecting an exudate conduit having a fibrous core to the wound dressing;

extending the exudate conduit into a second reservoir that incorporates a vacuum port; and

connecting the second reservoir to a vacuum source via the vacuum port thereby connecting the vacuum source with the first reservoir via the exudate conduit.

According to another aspect of the disclosure, a composite wound dressing apparatus includes a cover layer for defining a reservoir over a wound in which a negative pressure may be maintained by forming a substantially fluid-tight seal around the wound. The cover layer includes an aperture therein through which fluids may be extracted from the reservoir. An elongate wick has a first end and a second end, wherein the first end is in fluid communication with the reservoir through the aperture in the cover layer, and the second end is disposed remotely with respect to the aperture in the cover layer. The elongate wick is adapted for longitudinal transport of fluids therethrough. A flexible wick cover extends over the elongate

wick and has a first end and a second end. The first end of the wick cover is configured for forming a substantially fluid tight seal over the aperture in the cover layer, the second end including an aperture therein through which fluids may be extracted from the elongate wick. A fluid port is coupled to the wick cover and is in fluid communication with the second end of the elongate wick through the aperture in the wick cover. The fluid port is configured to receive a fluid conduit at the remote location with respect to the wound.

The apparatus may include a skin covering positioned beneath at least a portion of the elongated wick to substantially minimize contact of fluids with a skin surface adjacent the wound. The skin covering may be adapted to define an enclosure for accommodating the portion of the elongated wick.

The wick cover may include indicia thereon to indicate a distance from the fluid port. The indicia may include rule marks centrally located on the wick cover. The fluid port may include a flange coupled to an underside of the wick cover.

The elongate wick may be constructed of continuous synthetic fibers arranged as an elongate rope. The elongate wick may be treated with an antimicrobial agent such as polyhexamethylene biguanide.

According to another aspect of the disclosure, a composite bridge dressing and delivery apparatus includes a wick cover having a lower surface and an upper surface, wherein the lower surface is at least partially coated with a pressure sensitive adhesive such that the wick cover may form a fluid tight seal with the skin of a patient. An elongate wick is adhered to the lower surface of the wick cover, wherein the elongate wick is adapted for longitudinal transport of fluids therethrough. A backing layer is adhered to the lower surface of the wick cover in a

releasable manner such that the elongate wick is interposed between the wick cover and the backing layer.

The wick cover may include an aperture therein through which wound fluids may be drawn. A fluid port may be coupled to the wick cover, wherein the fluid port is configured to provide fluid communication between a vacuum source and the elongate wick through the wick cover. A releasable delivery layer may be adhered to the upper surface of the wick cover. At least one of the wick cover, the backing layer and the delivery layer may include indicia thereon to indicate a length along the apparatus. Identifiers may be included to provide visual queues to indicate the order in which layers of the apparatus should be separated. The apparatus may have a length in excess of 9 inches.

According to another aspect of the disclosure, a negative pressure wound therapy apparatus includes a cover layer for defining a reservoir over a wound in which a negative pressure may be maintained by forming a substantially fluid-tight seal around the wound. The cover layer includes an aperture therein through which fluids may be extracted from the reservoir. An elongate wick has a first end and a second end, wherein the first end is in fluid communication with the reservoir through the aperture in the cover layer, and the second end is disposed remotely with respect to the aperture in the cover layer. The elongate wick is adapted for longitudinal transport of fluids therethrough. A flexible wick cover extends over the elongate wick and has a first end and a second end. The first end of the wick cover is configured for forming a substantially fluid tight seal over the aperture in the cover layer, and the second end of the wick cover includes an aperture therein through which fluids may be extracted from the

elongate wick. A vacuum source is in fluid communication with the reservoir, wherein the vacuum source is suitable for generating the negative pressure in the reservoir.

According to another aspect of the invention there is provided use of a wound dressing for facilitating wound treatment, the wound dressing comprising: a cover layer for positioning over a wound and define a reservoir over the wound, and an exudate conduit including a fibrous core having a plurality of fibers communicating with the reservoir for wicking fluids away from the wound, the fibrous core including an inner bundle of fibers and an outer bundle of fibers, and the inner bundle comprising hydrophobic fibers for discouraging fluid absorption and the outer bundle comprises hydrophilic fibers for promoting fluid absorption.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the present disclosure and, together with the detailed description of the embodiments given below, serve to explain the principles of the disclosure.

FIG. 1 is a cross sectional view of an NPWT apparatus in accordance with the present disclosure;

FIG. 2 is a cross sectional view of an NPWT apparatus in accordance with another embodiment of the present disclosure;

FIG. 3 is perspective view of an exudate conduit containing a fibrous core which forms the connection between the wound and vacuum source of **FIG. 1**;

FIGS. 4A-**4**F are schematic views depicting various cross sections of individual fibers of the exudate conduit of the present disclosure;

FIGS. 5A-**5**G are schematic views depicting various co-extrusion arrangements for individual fibers of the exudate conduit of the present disclosure;

FIGS. 6A-**6**J are partial orthogonal views depicting various configurations of the fibrous core of the exudate conduit of the present disclosure;

FIG. 7 is a perspective view, with parts separated, of the exudate conduit and wound dressing in accordance with the present disclosure;

FIG. 8A is a cross sectional view of an NPWT treatment apparatus including a fluid port in the vicinity of a vacuum reservoir for treating a wound;

FIG. 8B is a partial cross sectional view of the fluid port of **FIG. 8**A affixed in an alternate configuration;

FIG. 8C is a partial cross sectional view of the fluid port of **FIG. 8**A affixed in another alternate configuration;

FIG. 9 is a sectional view of an NPWT apparatus in accordance with another embodiment of the present disclosure;

FIG. 10A is a cross sectional view of a composite wound dressing and bridging dressing with the fluid port in a remote location in accordance with the present disclosure as applied on the wound;

FIG. 10B is a partial cross-sectional view of an alternate configuration of a bridging dressing applied without a fluid port; and

FIG. 11 is an exploded perspective view of a composite bridging dressing and delivery system in accordance with the present disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

The NPWT system of the present disclosure incorporates a flexible, low profile exudate conduit having an appropriate fitting for connection to a vacuum source. The sleeve of the exudate conduit includes a collection of fibers disposed therein for wicking fluid away from a wound under vacuum. The sleeve may also hold wound fluid as it is drawn towards the vacuum source thereby acting as a fluid collection vessel.

One NPWT protocol involves covering the wound with a flexible cover layer such as a polymeric film, for example, to establish a vacuum reservoir over the wound where a reduced pressure may be applied by individual or cyclic evacuation procedures. Two methods of delivering the reduced pressure to a wound are either by placing a tube structure through the cover layer into the wound bed such that the tube is surrounded by a suitable fill material, such as gauze or foam, and covering the wound with an adhesive coated thin film to seal the wound area, or by packing and sealing the wound with a suitable fill material, covering the wound with an adhesive coated thin film to seal the wound, and attaching a vacuum connection to the outer film surface of the cover layer. The vacuum connections that are attached to the film dressing may be molded polymer materials that can be rigid or semi-rigid. Often times, however, the location of the wound makes it undesirable to use a tube or rigid vacuum connection because resultant pressure points from the connection may potentially cause further damage to the wound area or impede wound healing. In this situation, a technique known as bridging, in which the same or similar materials are used to fill and seal the wound to form a low-profile channel running away from the wound site to an area where connection to the vacuum source, may be less problematic for the patient and potentially less damaging to the wound. A conventional

technique requires a significant amount of the clinician's time custom building the structure. It also requires an increase in treatment costs through the consumption of more and sometimes different dressing materials.

Referring initially to **FIG. 1**, an NPWT apparatus according to the present disclosure is depicted generally as **10** for use on a wound "w" surrounded by healthy skin "s." The NPWT apparatus **10** includes a wound dressing **12** positioned relative to the wound "w" to define a reservoir **14** in which a negative pressure appropriate to stimulate healing may be maintained.

[0001] Wound dressing **12** may include a contact layer **18** positioned in direct contact with the bed of wound "w" and may be formed from perforated film material. An appropriate perforated material permits the negative pressure applied to the reservoir to penetrate into the wound "w," and also permits exudates to be drawn through the contact layer **18**. A non-adherent material may be selected such that contact layer **18** does not tend to cling to the wound "w" or surrounding tissue when it is removed. Exemplary materials that may be used as a contact layer 18 is sold under the trademark XEROFORM®, CURITY®, and VENTEX® by Tyco Healthcare Group LP (d/b/a Covidien).

Wound filler **20** is positioned in the wound "w," over the optional contact layer **18**, and is intended to allow wound dressing **12** to absorb and capture wound exudates. Wound filler **20** is conformable such that it may assume the shape of any wound "w" and may be packed up to the level of healthy skin "s." Exemplary materials that may be used as wound filler **20** are

sold under the trademarks KERLIX®, EXCILON®, and WEBRIL®, all by Tyco Healthcare Group LP (d/b/a Covidien).

Wound dressing **12** also includes a cover layer **24** in the form of a flexible membrane. Cover layer **24** may be positioned over the wound "w" such that a biocompatible adhesive at the periphery **26** of the cover layer **24** forms a substantially fluid-tight seal with the surrounding skin "s." Thus, cover layer **24** may act as both a microbial barrier to prevent contaminants from entering the wound "w," and also a fluid barrier maintaining the integrity of vacuum reservoir **14**. Cover layer **24** may be formed from a moisture vapor permeable membrane to promote the exchange of oxygen and moisture between the wound "w" and the atmosphere. A membrane that provides a sufficient moisture vapor transmission rate (MVTR) is a transparent membrane sold under the trade name POLYSKIN®II by Tyco Healthcare Group LP (d/b/a Covidien). A transparent membrane permits an assessment of wound conditions to be made without requiring removal of the cover layer **24**. Alternatively, cover layer **24** may comprise an impermeable membrane **24**. Cover layer **24** may be a substantially rigid member.

Exudate conduit **30** provides a fluid flow path leading through apparatus **10**. Exudate conduit **30** may be positioned within or proximate to reservoir **14** through cover layer **24** which is adapted to receive the exudate conduit **30** in a releasable and fluid-tight manner. Exudate conduit **30** extends from the reservoir **14** to provide fluid communication between the reservoir **14** and vacuum source **50**. Exudate conduit **30** may be low profile and flexible to allow for easy adaptation by the user to connect the wound dressing **12** to the vacuum source **50**. The low profile reduces pressure points on the patient's skin, thereby reducing the risk of pressure irritation of the skin surface or on the wound itself.

In embodiments, a collection canister **52** may extend between reservoir **14** and vacuum source **50** as illustrated in **FIG. 2**. Fluid conduit **54** extends from collection canister **52** providing fluid communication with vacuum source **50**. Any suitable conduit may be used for fluid conduit **54** including those fabricated from elastomeric or polymeric materials. Fluid conduit **54** may connect to vacuum source **50**, collection canister **52**, or other apparatus components by conventional air tight means such as friction fit, bayonet coupling, or barbed connectors. The conduit connections may be made permanent, or alternatively a quick-disconnect or other releasable means may be used to provide some adjustment flexibility to apparatus **10**.

The optional collection canister **52** may comprise any container suitable for containing wound fluids. For example, a rigid bottle may be used as shown or alternatively a flexible polymeric pouch may be appropriate. Collection canister **52** may contain an absorbent material to consolidate or contain the wound drainage or debris. For example, super absorbent polymers (SAP), silica gel, sodium polyacrylate, potassium polyacrylamide or related compounds may be provided within canister **52**. At least a portion of canister **52** may be transparent to assist in evaluating the color, quality or quantity of wound exudates. A transparent canister may thus assist in determining the remaining capacity of the canister or when the canister should be replaced.

Vacuum source **50** generates or otherwise provides a negative pressure to the NPWT apparatus **10**. Vacuum source **50** may comprise a peristaltic pump, a diaphragmatic pump or other mechanism that is biocompatible and draws fluids, e.g. atmospheric gases and wound exudates, from the reservoir **14** appropriate to stimulate healing of the wound "w." The

vacuum source **50** may be adapted to produce a sub-atmospheric pressure in the reservoir **14** ranging between about **20** mmHg and about **500** mmHg, in embodiments, from about **75** mmHg to about **125** mmHg, in other embodiments from about **50** mmHg to about **80**mmHg. Vacuum source **50** may be a peristaltic pump, a diaphragmatic pump or other mechanism that draws fluids, e.g. atmospheric gasses and wound exudates, from the reservoir **14** appropriate to stimulate healing of the wound "w." One suitable peristaltic pump is the Kangaroo PET Enteral Feeding Pump manufactured by Tyco Healthcare Group LP (d/b/a Covidien).

Referring now to **FIG. 3**, exudate conduit **30** includes outer member of sleeve **32** defining lumen **33**. Exudate conduit **30** has first or proximal end **34**, second or distal end **36**, and fibrous core **38** disposed within lumen **33** of outer sleeve **32**. Outer sleeve **32** may be fabricated from flexible polymer and/or elastomeric materials, for example, polyolefins such as polypropylene and polyethylene, polyesters such as polyethylene terephthalate, polyamides such as nylon, and polyurethanes. Outer sleeve **32** may be constructed from materials which are non-irritating and biocompatible. In embodiments, outer sleeve **32** may be fabricated from a breathable material, such as a material with a high moisture vapor transmission rate to allow for vapor transmission and evaporation thus increasing the fluid retention capacity of the exudate conduit **30**.

The wall **31** of outer sleeve **32** may range in thickness from about **0.002**" to about **0.020**". The diameter of outer sleeve **32** may be from about **0.1**" to about **3**" depending on the application. Additionally, outer sleeve **32** may be clear or translucent in color to permit visualization of wound fluid. Exudate conduit **30** may also be opaque and define a transparent window for visualizing the wound fluid. In embodiments, the window may be from about **15%**

to about **25%** of the periphery of outer sleeve **32**. Outer sleeve **32** may define a reduced profile with respect to the longitudinal axis "k" of the sleeve **32**. For example, outer sleeve **32** defines a first transverse dimension "b" which is substantially greater than a second transverse dimension "m" relative to the longitudinal axis "k." These dimensions provide a generally flattened, planar or elliptical profile to exudate conduit **32**. The reduced profile may assist in a bridging technique as will be discussed.

Exudate conduit **30** includes connection member or fitting **40** at the second or distal end **36** that connects to vacuum source **50**. Connection member or fitting **40** may be any conventional fitting for forming a fluid and air tight connection between exudate conduit **30** and vacuum source **50**. In embodiments, connection member **40** may include a check valve (schematically as reference numeral **40**v) and/or filter to prevent fluid contamination of vacuum source **50**. Check valves include duck bill style valves that are held in the open position during connection to vacuum source **50** and assume a closed position in the absence of the vacuum pressure thereby preventing wound fluid leakage. Connection member **40** may include electronic moisture sensing capability to signal that the fluid capacity of the conduit is full, thereby triggering an alarm and/or turning the vacuum source off until the conduit is replaced.

Exudate conduit **30** contains fibers **42** therein. A plurality of fibers **44** is disposed within exudate conduit **30** for maintaining the shape and/or preventing the flexible conduit **30** from collapsing. Fibers **42** also facilitates wound fluid movement. Fibers **42** may be any size from a micro denier of about **0.002** to a larger denier of about **0.1**. In embodiments, fibers **42** may extend from first or proximal end **34** of exudate conduit **30** into reservoir **14** or wound bed "w."

Referring now to **FIGS. 4**A-**4**F, the fibers may exhibit various cross-sections to enhance wicking capabilities or other fluid handling characteristics of the exudate conduit **30**. In embodiments, the fibers may be constructed to promote fluid movement without the aid of vacuum or gravity. A solid flat **42**a or round **42**b cross section as depicted in **FIGS. 4**A and 4B, respectively, may be a standard for most fibers due to a relatively low cost when compared to modified cross sections. Fiber **42**c is depicted in **FIG. 4**C having a void **41** in its cross section. Void **41** runs the entire length of fiber **42**c yielding a reduced density and rigidity of fiber **42**c and permitting air to be trapped within. Such a cross section may facilitate crimping, entangling and/or lofting processes which may further enhance fluid handling properties of the fiber. A multi-lobal cross section may also be used as depicted in **FIG. 4**D. Tri-lobal fiber **42**d exhibits three arms **43** projecting from a central region offering rigidity and resilience to the fiber **42**d.

Highly modified cross section fibers **42**e as depicted in **FIG. 4**E are sold under the trade name **4**DG™ by Fiber Innovation Technology, Inc. Deep channels **45** of various sizes and configurations are provided along a longitudinal axis of the fiber **42**e to help promote capillary wicking with its relatively large surface area. For example, fibers **42**e having a **4**DG™ cross section have demonstrated a capability to transport up to **2** liters of water per hour per gram of fiber. A fiber **42**f having a bowtie cross section as depicted in **FIG. 4**F may be well suited for use in self-crimping fibers.

Referring now to **FIGS. 5**A through **5**G, two or more distinct polymers may be co-extruded to generate fibers with complex profiles and specialized characteristics. The co-extruded fibers may have any of the cross-sections as described above, among others. A fiber **42**g exhibiting a concentric sheath-core arrangement is depicted in **FIG. 5**A. A core polymer

47g is surrounded by a sheath polymer 49g. A sheath polymer may exhibit a lower melting temperature than a core polymer such that the sheath polymer may be melted to provide a binder for individual fibers. Other applications for a sheath-core arrangement may include providing a high strength structural core polymer 47g and a sheath polymer 49g with surface characteristics appropriate to help promote wicking of wound fluid or to accept any of the beneficial polymer additives discussed below. A fiber 42h exhibiting an eccentric sheath-core arrangement is depicted in **FIG. 5**B including an off-center core polymer 47h and corresponding sheath polymer 49h. This arrangement may be used to provide a self-crimping fiber when the core polymer and sheath polymer are provided with differing shrinkage characteristics when subject to a temperature change. When heated, the fibers may curl into a helix that is retained when the filament is cooled, thus developing a crimp or bulk in an otherwise flat fiber. Such a self-crimping procedure may be further facilitated by using a side-by-side arrangement as depicted in **FIG. 5**C. Fiber 42i is similar to fiber 42h, but differs in that core polymer 47i and sheath polymer 49i each occupy a portion of the outer surface of the fiber 42i. With a proper polymer selection, the side-by-side arrangement of fiber 42i may yield higher levels of latent crimp than the eccentric sheath-core arrangement of fiber 42h. As shown in **FIG. 5**D, a fiber 42j having a pie-wedge arrangement may include alternating wedges comprising polymers 47j and 49j. A fiber 42k exhibiting a hollow pie wedge arrangement including a hollow center core is depicted in **FIG. 5**E.

With reference to **FIG. 5**F, fiber 42m exhibits an islands-in-the-sea arrangement where one or more "island" polymers 47m are surrounded by a soluble "sea" polymer 49m. This arrangement may provide for very fine strands of island polymers 47m to be effectively handled by manufacturing equipment. Once the island polymers 47m are in place, the soluble sea

polymer is dissolved away. For example, as many as about **37** or more island polymers **47**m having a denier of about **0.04** (roughly **2** microns in diameter) may thus be handled effectively as a single fiber **42**m. A fiber **42**n exhibits a "three island" arrangement, as depicted in **FIG. 5**G. This arrangement includes three island polymers **47**n surrounded by a sea polymer **49**n. Fiber **42**n may be used in a manner similar to fiber **42**m exhibiting an islands-in-the-sea arrangement, but may be more commonly used in a manner similar to fibers **42**g, **42**h, and **42**i described above exhibiting a sheath-core arrangement. Fiber **42**n may be described as including three core polymers **47**n collectively having an increased surface area to discourage de-lamination from a potentially incompatible sheath polymer **49**n.

Various suppliers may produce fibers as described above, as any commercial fiber or suture material may advantageously be employed in exudate conduit **30**. A non-exhaustive list of materials includes, but are not limited to, polymers and polymer blends selected from the group consisting of polyolefins (such as polyethylene and polypropylene including atactic, isotactic, syndiotactic, and blends thereof as well as, polyisobutylene and ethylene-alphaolefins copolymers, and fluorinated polyolefin such as polytetrafluoroethylene); polyesters (such as polyethylene terephthalate and polybutylene terephthalate); acrylic polymers and copolymers; modacrylics; vinyl halide polymers and copolymers (such as polyvinyl chloride); polyvinyl ethers (such as polyvinyl methyl ether); polyvinylidene halides (such as polyvinylidene fluoride and polyvinylidene chloride); polyacrylonitrile; polyvinyl ketones; polyvinyl aromatics (such as polystyrene); polyvinyl esters (such as polyvinyl acetate); copolymers of vinyl monomers with each other and olefins (such as etheylene-methyl methacrylate copolymers, acrylonitrile-styrene copolymers, ABS resins and ethylene-vinyl acetate copolymers); polyamides (such as nylon **4**, nylon **6**, nylon **6.6**, nylon **610**, nylon **11**, nylon **12** and polycaprolactam); alkyd resins;

polycarbonates; polyoxymethylenes; polyimides; polyethers; epoxy resins; aramids, polyurethanes; rayon; rayon-triacetate; and spandex.

Fibers **30** may be bundled into a plurality of fibers **44** to form fibrous core **38**. An outer bundle of fibers **46** may be selectively arranged around an inner core or bundle **48** of various fiber combinations and sizes to optimize fluid handling and to reduce the propensity for clogging of wound fluid. It is envisioned that the fibers that comprise the bundles may be varied to facilitate optimal fluid handling. For example, the inner bundle fibers **48** may be a hydrophobic polymer to discourage fluid absorption while the outer bundle fibers **46** may be hydrophilic to promote some absorption.

Typical fiber bundle **44** arrangements are illustrated in **FIGS. 6**A-**6**E. Referring now to **FIG. 6**A, fibers **42** may be arranged so as to be generally non-intersecting along their length. Although not necessarily parallel, fibers **42** may be generally free from entanglement or interlacing over a substantial portion of their length. Outer bundle of fibers **46**a may be included to help prevent separation of fibers **42** which form inner bundle **48**. A single outer bundle **46**a may be formed from a separate continuous fiber wrapped or tied around inner bundle **48** to compress bundle **48** in a localized region. Alternatively, outer bundle **46**b may be placed intermittently along inner bundle **48**, as shown in **FIG. 6**B, to help secure fibers **42** at multiple locations, or separate continuous fibers may be wrapped helically around inner bundle **48** as in **FIG. 6**C to form outer bundle **46**c.

Fibers **42** may also be enclosed in a knitted, woven, or braided outer bundle **46**d as illustrated in **FIG. 6**D. The knitted, woven, or braided outer bundle **46**d may be adjusted to provide a greater or lesser diameter and conduit patency under vacuum or kinking of the exudate

conduit. Fibers may also be twisted, as in a rope, to provide an outer bundle **46**e as illustrated in **FIG. 6**E.

Alternatively, fibers **42** may be arranged or constructed as shown in **FIGS. 6**F-**6**J to help the inner bundle **48** resist separation of individual fibers **42**. Fibers **42** may be enclosed with a self-sealing, non-woven mesh or other porous sheet to form bonding feature **51**a as shown in **FIG. 6**F. A self-sealing bonding feature **51**a may be an elastic or slightly undersized band such that individual fibers **42** may be inserted through an open end of the band to be constrained under compression. Alternatively, bonding features may include an adhesive component such that a flat strip may be wrapped around the fibers and the flat strip may be affixed by adhering either to itself or to the individual fibers **42** with the adhesive component. As depicted in **FIG. 6**G, a bonding feature **51**b may be formed with a substantial length of a non-woven mesh or a porous sheet to enclose a substantial length of the fibers. Bonding features **51**a and **51**b may be porous to promote absorption of wound fluids and exudates.

Fibers **42** which form inner bundle **48** may be entangled by various processes to form a bonding feature **51**c (**FIG. 6**H). Jets of steam, air, or water may be directed at localized regions in the bundle **48** to entangle fibers **42** and provide bonding feature **51**c. The entangling process may involve application of heat in a localized area to entangle or bond fibers **42**. Another example of an entangling process involves needles used in a manner similar to needle punching to entangle fibers **42**. A bonding feature **51**d (**FIG. 6**I) may be provided simply by bonding fibers **42** with an adhesive, or by incorporating a binding material having a lower melting temperature than fibers **42**. By heating the bundle, the binding material may melt and bind fibers **42** together upon cooling. A binding material may be provided along with one or

more of the individual fibers in a co-extrusion such as a core-sheath arrangement, as described above. As depicted in **FIG. 6**J, a bonding feature **51**e may also be provided by crimping individual fibers to provide some degree of entanglement thereby providing additional surface area, as described in greater detail above. It is also envisioned that the arrangement of individual fibers may include two or more of the features shown in **FIGS. 6**A through **6**J.

Various polymer additives may be applied to individual fibers **42**, the inner bundle **48**, the outer bundle **46**, or the entire plurality of fibers **44** or a selective subset of fibers therein. Further, the additive may be imparted to a section of each fiber such as the sheath construction of a sheath-core fiber construct. The additive may be any substance or mixture of substances that have clinical use. Consequently, the additives may or may not have pharmacological activity per se, e.g., a dye. Alternatively an additive could be any agent that provides a therapeutic or prophylactic effect, a compound that affects or participates in tissue growth, cell growth, cell differentiation, a compound that may be able to invoke a biological action such as an immune response, or could play any other role in one or more biological processes. It is envisioned that the additive may be applied to the fibers **42** in any suitable form of matter, e.g., films, powders, liquids, gels and the like. The additive could also be formed to activate only on contact with moisture such as wound fluids and exudates.

Examples of classes of additives which may be utilized in accordance with the present disclosure include anti-adhesives, antimicrobials, antibacterials, antiobiotics, anti-virals, anti-fungals, anti-septics, anti-inflammatories, and anesthetics. Additionally, odor control technology may also be incorporated into fibers **42** as an additive. It is also intended that combinations of additives may be used. For example, an anti-adhesive, to prevent adhesions

from forming between the fibers and the surrounding tissue, may be utilized with an antimicrobial, such as polyhexamethylene biguanide, to reduce the bio burden in the wound bed.

Other additives, such as surfactants like silicone or floropolymers such as PTFE may be added to provide fiber **42** with a slicker surface. A slicker or surfactant treated surface may facilitate optimal fluid handling properties. For example, a surfactant or combination of surfactants may create a highly hydrophobic surface on the fiber and/or bundle to encourage directional wicking and fluid movement away from the wound dressing. Surfactant treatment may be selective along the length of fiber **42** such that the portions located within or adjacent the proximal end **34** of exudate conduit **30** could be processed in a combination of materials or concentration of materials to promote more rapid fluid movement away from the wound where the portions of fibers **42** located in or towards the distal end **36** of exudate conduit **30** would allow slower movement thus increasing its capacity of holding and containing wound fluid.

In embodiments, exudate conduit **30** may be treated with a moisture sensitive material on the inside of sleeve **32** and/or fiber bundle **44** that could change color in the presence of moisture, thus indicating a filled conduit. The color sensitive material could be continuous providing a visual indication of the remaining fluid capacity of the conduit. The distal end **36** of sleeve **32** may be treated to provide an early indication of the conduit's capacity. As such, exudate conduit **30** may act as a fluid reservoir thus eliminating the need for collection canister **52** at or near vacuum source **50**. The exudate conduit **30** may vary in length to accommodate larger quantities of wound fluid.

Referring now to **FIG. 7**, the fibers **42** of exudate conduit **30** are at least partially inserted through an aperture or access hole **25** in cover layer **24** thereby positioning the fibers

proximate to the wound "w." Access hole **25** may be provided as a prefabricated feature of cover layer **24**, or alternatively, access hole **25** may be cut as appropriate by a clinician at the time cover layer **24** is installed. Proximal end **34** of sleeve **32** may then be inserted into or adjacent to access hole **25**. Sleeve **32** may be provided with an adhesive for securing the exudate conduit **30** to cover layer **24** in order to form an air and fluid tight connection with cover layer **24**. Alternatively, an adhesive coated thin film, thin film dressing, or other provisions may be made for sealing the connection between exudate conduit **30** and access hole **25** of cover layer **24**. Distal end of sleeve **32** may then be routed to the vacuum source or collection canister as discussed above.

The size, shape, and/or location of the wound "w" may influence the manner in which exudate conduit **30** is routed relative to wound dressing **12** and the vacuum source **50**. For example, some wounds "w" may accommodate a fluid port or a vacuum port in the vicinity of a vacuum reservoir as depicted in **FIG. 8**A.

FIG. 8A generally depicts an NPWT apparatus **60** for use on a wound "w" surrounded by healthy skin "s." The NPWT apparatus **60** includes a wound dressing **62** positioned relative to the wound "w" to define a reservoir 14 in which a negative pressure appropriate to stimulate healing may be maintained.

Wound dressing **62** includes a contact layer 18 positioned in direct contact with the bed of wound "w." Contact layer **18** may be formed from perforated film material as described above with reference to **FIG. 1**. Also, passage of wound fluid through the contact layer **18** is preferably unidirectional such that exudates do not flow back into the wound bed. Unidirectional flow may be encouraged by conical or directional apertures formed in the contact

layer **18**, or a lamination of materials having absorption properties differing from those of contact layer **18**. Wound dressing **62** also includes a wound filler **20** and a cover layer **24** as described above with reference to **FIG. 1**. Cover layer **24** includes access hole **25** therein, through which wound fluids and atmospheric gasses may be removed from the dressing **62**.

A fluid port **66** having a flange **68** may also be included in wound dressing **62** to facilitate connection of the wound dressing **62** to fluid conduit **54**. The fluid port **66** may be configured as a rigid or flexible, low-profile component, and may be adapted to receive a fluid conduit **54** in a releasable and fluid-tight manner. An adhesive on the underside of flange **68** may provide a mechanism for affixing the fluid port **66** to the dressing **62**, or alternatively the flange **68** may be positioned within reservoir **14** (**FIG. 8**B) such that an adhesive on an upper side of the flange **68** affixes the fluid port **66**. As depicted in **FIG. 8**C, an additional alternative for affixing the fluid port to the cover layer **24** involves securing the flange **68** to the cover layer **24** with a skirt **24a**. The skirt **24a** may be constructed of an adhesively coated polymeric film similar to the cover layer **24**. However it is affixed to the dressing **62**, a hollow interior of the fluid port **66** provides fluid communication between the fluid conduit **54** and the reservoir **14**.

Fluid conduit **54** extends from the fluid port **66** to provide fluid communication between the reservoir **14** and collection canister **52**. Any suitable conduit may be used including exudate conduit **30** described above with reference to **FIG. 3**. Leading from collection canister **54** is another section of fluid conduit **54** providing fluid communication with vacuum source **50**.

In some applications, providing a fluid port or exudate conduit at a remote location with respect to the wound "w" may be beneficial. For example, wounds formed on contoured body parts, such as the foot or elbow, or other parts of the body in which the fluid port

or exudate conduit would inhibit the patient's movement or comfort may require a different and sometimes indirect method of routing exudate conduit **30**. The exudate conduit **30**, then, may be routed from the wound site to a second site where connection to the vacuum source is less problematic for the patient and less damaging to the wound.

As illustrated in **FIG. 9**, a wound dressing **12** is positioned relative to a wound "w" to define a reservoir **14** in which a negative pressure appropriate to stimulate healing may be maintained as described above with reference to **FIGS. 1** and **2**. Exudate conduit **30** may be positioned through cover layer **24** in any manner and position which will not interfere with the patient or wound healing. As illustrated, the proximal end **34** of sleeve **32** is positioned within reservoir **14** by sealing the conduit **30** between skin "s" and cover layer **24** in a fluid and air tight manner. Exudate conduit **30** may then be routed to run along the healthy skin "s" of the patient to prevent or minimize any unnecessary winding or flexure that could tend to kink the exudate conduit **30**. In embodiments, an exudate conduit **30** having an outer sleeve **32** with a reduced profile as discussed above may be positioned with the "flattened" side having the first transverse dimension "b" substantially flush with skin "s" to maximize the exudate conduit's contour along skin "s" of the body. Thus, exudate conduit **30** may be placed along the patient's skin "s", such as up a leg, down an arm, or across a chest, towards a second site which does not interfere with the patient's movement or comfort, such as an such as a portion of healthy skin "h" that is relatively flat, for connection to vacuum source **50**.

The second site may be any area where a vacuum port **70** may be placed for connection to a vacuum source **50**. As illustrated, a second cover layer **24'** may be placed over skin "h" to form a second reservoir **14'**. The distal end **36** of the exudate conduit **30** may be sealed within the reservoir **14'** by cover layer **24'** in a similar or different manner than that of

proximal end **34** with cover layer **24**. A vacuum port **70** having a flange **73** may be provided to facilitate connection of the reservoir **14'** to vacuum source **50** via fluid conduit **54**. The vacuum port **70** is affixed to cover layer **24'** and a hollow interior of the vacuum port **70** provides fluid communication between the fluid conduit **54** and the reservoir **14'**. The fluid conduit **54** may then be routed to a canister or vacuum source as described in detail above.

Referring now to **FIG. 10**A, an alternate embodiment includes a composite wound dressing 100. Compound dressing **100** permits a fluid port **66** to be placed remotely with respect to the wound "w." Composite wound dressing 100 includes a contact layer **18**, a wound filler **20** and a cover layer **24** applied to the wound "w" in a manner similar to wound dressing **12** discussed. The fluid port **66**, however, is affixed to the composite wound dressing **100** at a location "r" that is remote from the wound "w," rather than being affixed to the cover layer **24** at the access hole **25**.

To provide fluid communication, or a "bridge," between access hole **25** and the remote location "r," a bridging dressing 102 is positioned partially over the cover layer **24** and partially over the healthy skin "s." The remote location "r" may be an area of the healthy skin "s" where the fluid port **66** will tend not to irritate the wound "w" or to cause discomfort for the patient. If the wound "w" is located on the back of a patient, the remote location "r" may be, for example, at the chest or shoulder of the patient. This permits the patient to lie comfortably without placing undue pressure on the fluid port **66**. To provide this functionality, a bridging dressing **102** may exhibit a length in the range from about 2 inches to about 12 inches, or more.

The bridging dressing **102** includes a, skin lining or film **103**, an elongate wick **104**, a wick cover **106**, and the fluid port **66**. The film or lining **103** will be placed in contact

with skin, typically, the healthy skin along a portion of the "bridge". The lining or film **103** may be any suitable film adapted for patient contact, and may or may not have an adhesive backing for securement to the skin. The film or lining **103** may overlap a peripheral portion of the cover **24**. The film or lining **103** may or may not be adhesively coated, and, in some embodiments is a thin, transparent, polymeric membrane such as polyurethane, elastomeric polyester or polyethylene. The elongate wick **104** defines a longitudinal direction therealong between a first end **110** positioned near the access hole **25** in the cover layer **24**, and a second end **112** near the remote location "r." The elongate wick **104** is adapted for longitudinal transport of fluids therethrough. The elongate wick **104** may promote capillary action in a longitudinal direction to provide for the longitudinal transport of fluids. A cross section of individual fibers, or an arrangement of fibers may serve to transport fluids longitudinally. The elongate wick **104** may be constructed from materials suitable for use as wound filler **20** and/or exudate conduit **30**. The elongate wick **104** may, for example, be constructed of hydrophobic fibers, such as continuous synthetic fibers, arranged as an elongate rope or cord. The fibers may be crimped, bulked or lofted to influence the absorptive, wicking or comfort characteristics of the elongate wick **104**. U.S. Provisional Application No. 61/188,370, filed August 8, 2008, the entire content of which is hereby incorporated by reference, describes various such processes and arrangements for fibers, which may be employed to construct the elongate wick **104** or the filler **20**.

Alternatively, elongate wick **104** may be constructed from staple fibers, and may be arranged as woven or kitted fabrics. The fibers may be treated with antibacterial agents such as polyhexamethylene biguanide (PHMB) to decrease the incidence of infection, or other medicaments to promote healing of the wound "w." The fibers may also include combinations

of materials or chemicals to tailor the wick for specific fluid transport, comfort or other specific requirements.

The wick cover **106** has a first end **114** positioned near the access hole **25** in the cover layer **24** and beyond the first end **110** of the elongate wick **104**. A second end **116** of the wick cover **106** is positioned near the remote location "r." The first end **114** of wick cover **106** forms a substantially fluid-tight seal with the cover layer **24**, and the second end **116** of the wick cover **106** forms a substantially fluid tight seal with the lining **103** or the skin in the absence of the lining **103**. The second end **114** of wick cover **106** may contact or be secured to lining **103** thereby assisting in securement of the lining relative to the subject and optionally forming an enclosure **105** between the wick cover **106** and the lining **103** substantially enclosing the a portion of the elongated wick **103** preventing exudate from contacting the skin.

Wick cover 106 may be constructed from any of the materials used to fabricate cover layer **24**. For example, wick cover **106** may be constructed of an adhesively coated, thin, transparent, polymeric membrane such as polyurethane, elastomeric polyester or polyethylene. The thickness of the wick cover **106** may, for example, be in the range of about 0.8 mils to about 1.2 mils. Thicknesses in this range may permit wick cover **106** to conform comfortably to the contours of a patient's skin surrounding the elongate wick **104**, and accommodate evacuation cycles associated with an NPWT procedure. The adhesive coating should provide firm, continuous adhesion to the skin "s" and/or the cover layer **24** such that leak paths are not readily formed as reservoir **14** is subjected to the evacuation cycles of an NPWT treatment. The adhesive should also not unduly interfere with the MVTR of the wick cover, and should peel away from the skin "s" easily when the wick cover **106** is no longer required.

An aperture **118** in the wick cover **106** facilitates fluid communication between fluid port **66** and the elongate wick **104**. The fluid port **66** forms a substantially fluid tight seal with the wick cover **106** near the aperture **118** and receives fluid conduit **54**. Fluid conduit **54** may be coupled to a vacuum source **50** as described above with reference to **FIG. 2**.

In this manner, fluids such as wound exudates and atmospheric gasses may be drawn from the reservoir **14**, through the access hole **25** in the cover layer **24**, and into the first end **110** of the elongate wick **104**. The fluids are transported longitudinally through the wick **104** under the influence of the reduced pressure and the fluid transport properties of the wick **104** to the second end **112** of the wick **104** near the remote location "r." The fluids may then be removed from the bridging dressing **102** through the fluid port **66**. Since the wick **104** and the wick cover **106** are generally more flexible and conformable to the contours of the patient's body, and also to the movements of the patient than fluid port **66**, these components of bridging dressing **102** are typically more comfortable positioned adjacent to the wound "w."

Referring now to **FIG. 10B**, an alternate embodiment of the disclosure permits fluid communication between the fluid conduit **54** and the second end **112** of the wick **104** near the remote location "r" to be established without the use of a fluid port. A wick cover **106a** includes a second end **116a** devoid of an aperture for the attachment of a fluid port. Rather, the wick cover **106a** forms a substantially fluid tight seal with the fluid conduit **54** and the lining **103** surrounding the remote location "r." This configuration allows fluid conduit **54** to be placed comfortably at the remote location "r" rather than near the wound "w." Since the fluid conduit **54** may be generally less conformable or more rigid than the wick **104** and the wick cover **106a**,

placement of the fluid conduit **54** remote from the wound "w" may be more comfortable than adjacent the wound "w."

Referring now to **FIG. 11**, bridging dressing **102** is depicted as provided with a delivery system attached. While the composite dressing and delivery system **120** may be manufactured in any desired size or shape, the particular location of the wound "w" to be treated may prompt customization of each individual bridging dressing **102**. As provided, composite dressing and delivery system **120** may be generally rectangular having a length of about 6 inches and a width of about 4 inches as shown. The composite dressing and delivery system **120** may be provided with a greater length than is anticipated to be necessary to permit the bridging dressing **102** to be cut to length at the time of application.

A backing layer **124** has a firm but releasable affinity for the adhesively coated lower surface **126** of the wick cover **106**. Backing layer **124** covers the adhesive coating on the wick cover **106** and maintains the wick **104** in position against the lower surface **126** wick cover **106**. The backing layer **124** includes a peripheral region **128** that extends substantially beyond at least one edge of the wick cover **106**. Peripheral region **128** thus provides a gripping surface to facilitate the separation of the backing layer **124** from the wick cover **106**. Peripheral region **128** includes an indicator, such as first numerical indicator **132**, printed or otherwise applied thereto. First numerical indicator **132** provides a prominent visual queue to indicate the order in which the layers of the composite dressing and delivery system **120** should be separated.

A delivery layer **136** is adhered to an upper surface **138** of the wick cover **106** in a releasable manner. Delivery layer **136** is substantially rigid in relation to wick cover **106** to maintain the wick cover **106** in a relatively smooth and unwrinkled configuration while the wick

layer **106** is applied over the lining **103** positioned to cover the skin "s" and/or the cover layer **24** (**FIG. 10**A). Delivery layer **136** is, however, sufficiently flexible to conform to irregular contours of the skin "s" such that the wick cover **106** may be pressed onto the skin "s" and/or the cover layer **24** to form a substantially fluid tight seal therewith. Thereafter, the delivery layer **136** may be separated from the wick cover **106**.

Preferably, both delivery layer **136** and upper surface **138** are non-adhesive, and may be adhered by heat lamination contact or similar means. Alternately, the delivery layer may include an adhesive to provide appropriate adhesion to the cover layer during application. A peripheral region **140** of delivery layer **136** overlies wick cover **106**, but is not adhered to wick cover **106**. Peripheral region **140** thus provides a gripping surface to facilitate separation of the delivery layer **106** from the dressing layer **102**. An indicator such as second numerical indicator **142** is positioned on the peripheral region **140** to indicate the order in which the layers of the composite dressing and delivery system **120** should be separated. Delivery layer **136** also includes a central opening **146** to accommodate fluid port **66**. Fluid port **66** may be adhered to the upper surface **138**, the lower surface **126**, or removed all together.

In use, a bridging dressing **102** may be applied subsequent to the application of a cover layer **24** to a wound "w" (**FIG. 10**A). Once the desired length of the bridging dressing **102** is determined, the composite dressing and delivery system **120** may be cut to length. Indicia such as rule marks **148** may be printed or otherwise applied to the wick cover **106** to facilitate customizing the length of the bridging dressing **102**. Alternatively, indicia may be applied to the backing layer **124** or the delivery layer **136**, particularly when these layers are substantially transparent.

While the disclosure has been illustrated and described, it is not intended to be limited to the details shown, since various modifications and substitutions can be made without departing in any way from the spirit of the present disclosure. For example, in the embodiment of **FIG. 1**, the vacuum source **50** may be optional whereby wound exudate is conveyed through exudate tube via gravity, wicking or the like. In the embodiment of **FIG. 2**, the canister **52** may be optional whereby the exudate is contained within the exudate tube. In this embodiment, a filter or check valve may be utilized to prevent fluid communication into the vacuum source. It is further envisioned that a check valve could be positioned adjacent the wound end of exudate conduit to prevent fluid regress into the wound area. As such, further modifications and equivalents of the disclosure can occur to persons skilled in the art, and all such modifications and equivalents are intended to be within the spirit and scope of the disclosure as defined by the following claims.

WHAT IS CLAIMED IS:

1. An apparatus to promote the healing of a wound comprising:

a cover layer for positioning over a wound to define a reservoir over the wound; and

an exudate conduit including a fibrous core having a plurality of fibers communicating with the reservoir for wicking fluids away from the wound,

wherein the fibrous core includes an inner bundle of fibers and an outer bundle of fibers, and

wherein the inner bundle comprises hydrophobic fibers for discouraging fluid absorption and the outer bundle comprises hydrophilic fibers for promoting fluid absorption.

2. The apparatus according to claim 1, wherein at least a portion of the plurality of fibers are at least partially exposed adjacent a wound end of the exudate conduit.

3. The apparatus according to claim 2, wherein the exudate conduit includes an outer sleeve for at least partially accommodating the fibrous core, the at least some of the fibers extending beyond the outer sleeve.

4. The apparatus according to claim 1, wherein at least one of the plurality of fibers comprises a hydrophobic material.

5. The apparatus according to claim 1, wherein the outer bundle of fibers is knitted, woven, or braided around the inner bundle of fibers.

6. The apparatus according to claim 1, wherein the fibrous core includes at least one additive selected from the group consisting of an antimicrobial, an anti-septic, and a surfactant.

7. The apparatus according to claim 6, wherein the exudates conduit has a wound end adapted to be positioned proximate the cover layer, and a vacuum end adapted to be fluidly connected to a vacuum source, and wherein a concentration of the at least one additive in a region of the fibrous core adjacent the wound end is greater than a concentration of the at least one additive in the fibrous core adjacent the vacuum end.

8. The apparatus of claim 1, wherein the fibrous core defines an elongate wick having a first end and a second end, the first end in fluid communication with the reservoir through an aperture in the cover layer, the second end disposed remotely with respect to the aperture, the elongate wick adapted for longitudinal transport of fluids therethrough; and wherein the apparatus further comprises a flexible wick cover extending over the elongate wick and having a first end and a second end, the first end configured for forming a substantially fluid tight seal over the aperture in the cover layer, the second end including an wick cover aperture therein through which fluids may be extracted from the elongate wick; and a fluid port coupled to the wick cover and in fluid communication with the second end of the elongate wick through the wick cover aperture, the fluid port configured to receive a fluid conduit.

9. The apparatus according to claim 8, wherein the wick cover includes indicia thereon that is indicative of a distance from the fluid port.

10. The apparatus according to claim 9, wherein the indicia include rule marks on the wick cover.

11. The apparatus according to claim 8, wherein the fluid port includes a flange coupled to an underside of the wick cover.

12. The apparatus according to claim 8, wherein the elongate wick is treated with an antimicrobial agent comprising polyhexamethylene biguanide.

13. The apparatus according to claim 8 further comprising a backing layer adhered to the lower surface of the wick cover in a releasable manner such that the elongate wick is interposed between the wick cover and the backing layer.

14. The apparatus according to claim 13 wherein the wick cover comprises an aperture therein through which wound fluids may be drawn.

15. Use of a wound dressing for facilitating wound treatment, said wound dressing comprising:

a cover layer for positioning over a wound and define a reservoir over the wound, and an exudate conduit including a fibrous core having a plurality of fibers communicating with the reservoir for wicking fluids away from the wound, the fibrous core including an inner bundle of fibers and an outer bundle of fibers, and the inner bundle comprising hydrophobic fibers for discouraging fluid absorption and the outer bundle comprises hydrophilic fibers for promoting fluid absorption.

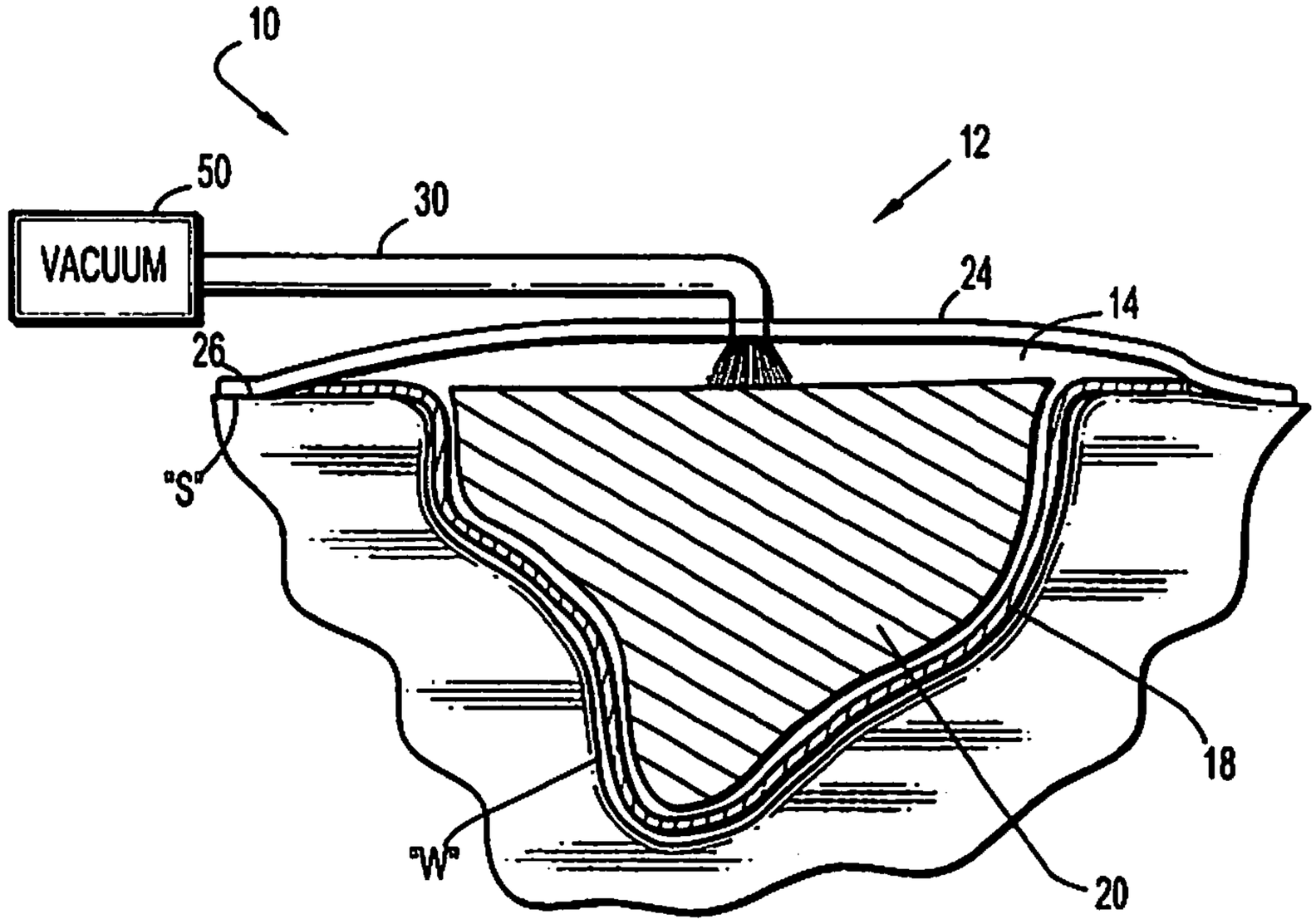
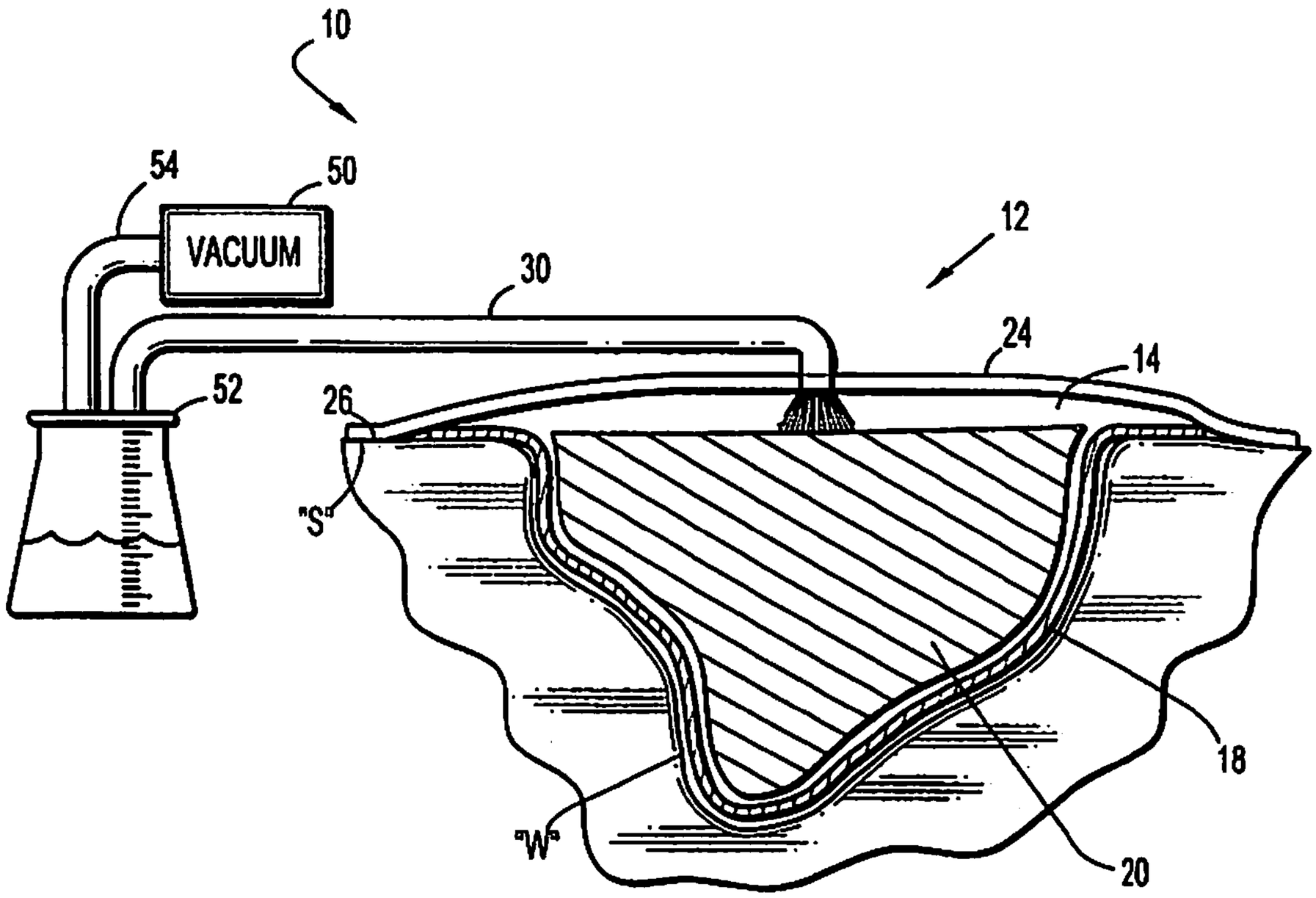

10
12
50
30
VACUUM
24
14
26
"S"
18
"W"
20

FIG. 1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54
50
VACUUM
12
30
24
14
52
26
"S"
18
"W"
20

FIG. 2

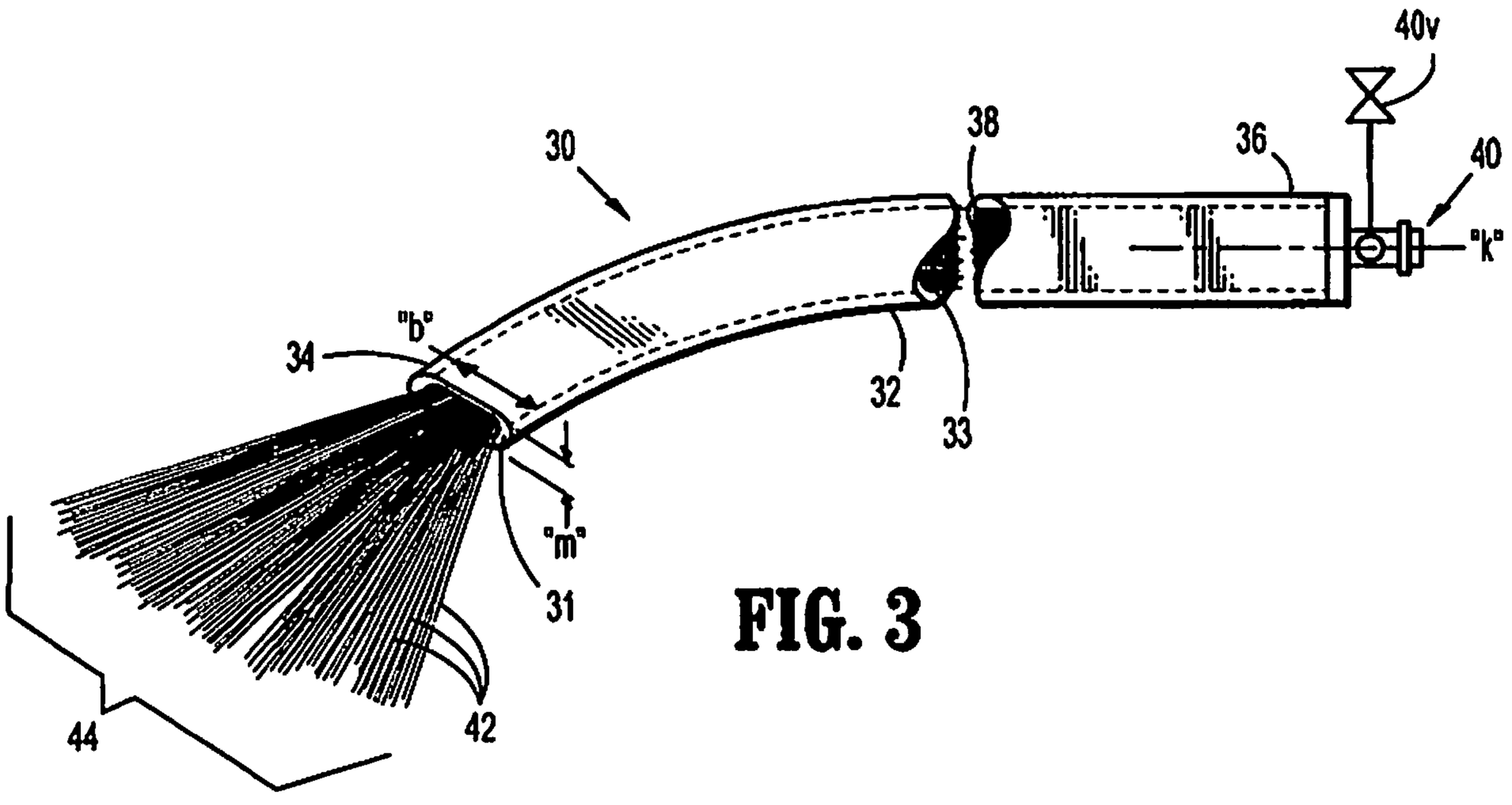


FIG. 3

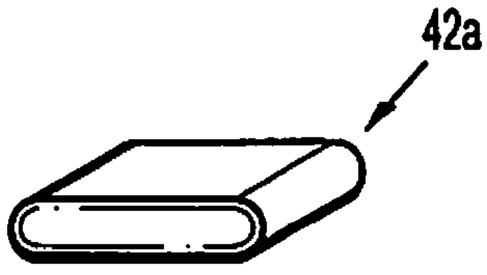


FIG. 4A

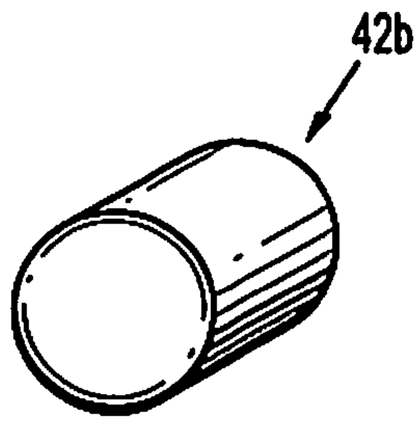


FIG. 4B

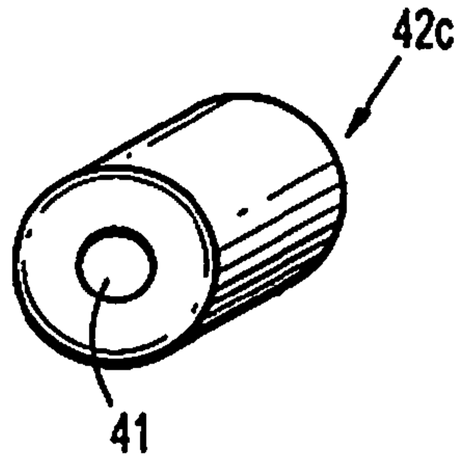


FIG. 4C

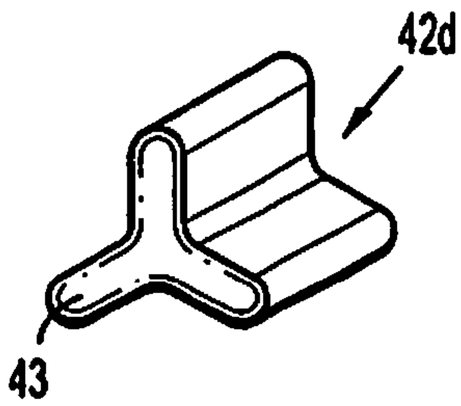


FIG. 4D

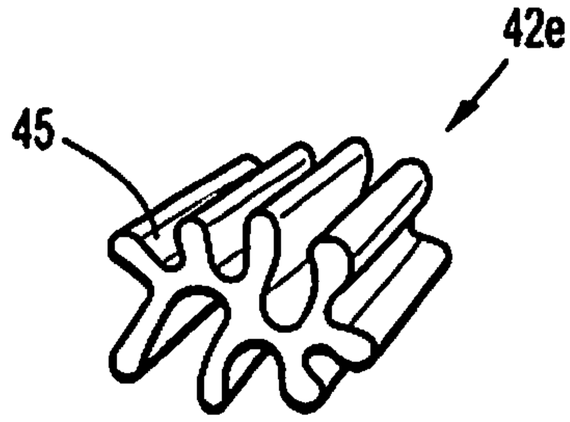


FIG. 4E

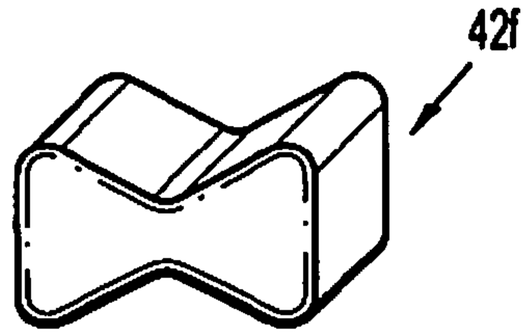


FIG. 4F

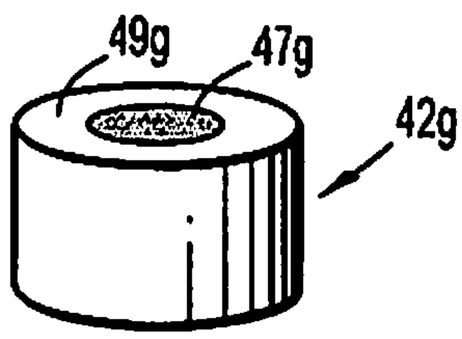


FIG. 5A

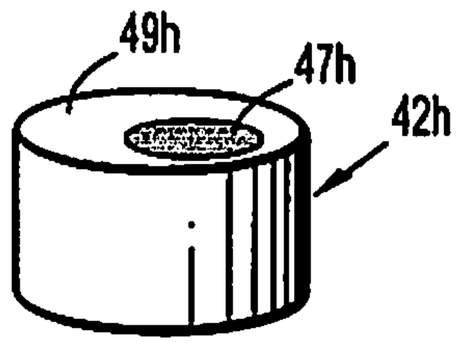


FIG. 5B

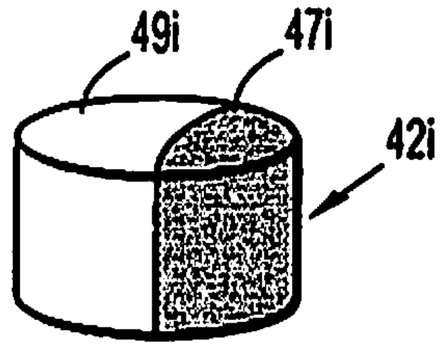


FIG. 5C

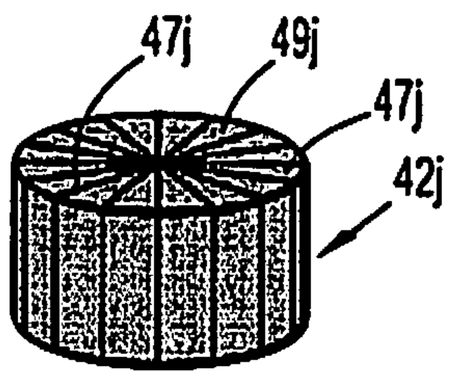


FIG. 5D

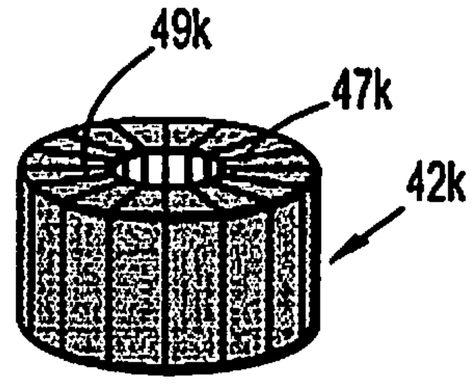


FIG. 5E

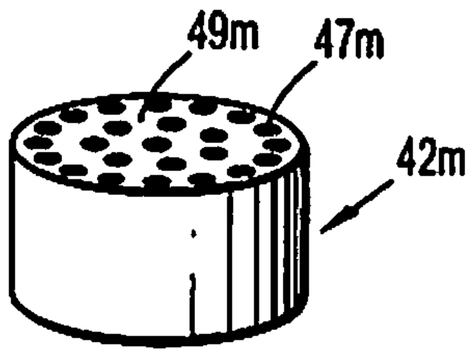


FIG. 5F

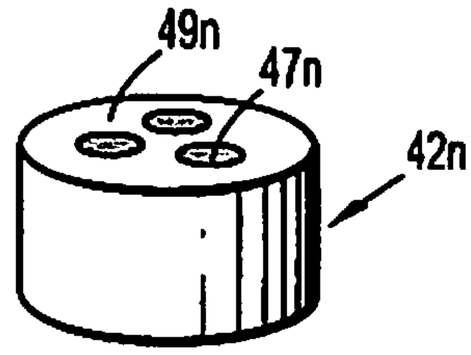


FIG. 5G

FIG. 6A

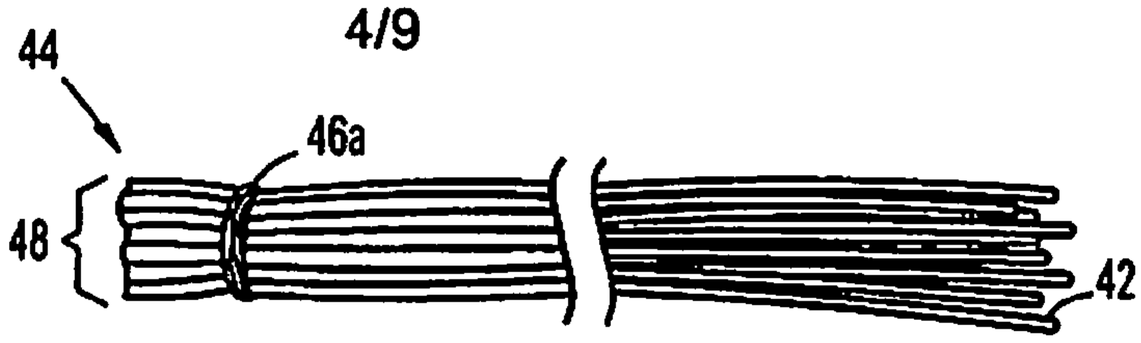


FIG. 6B

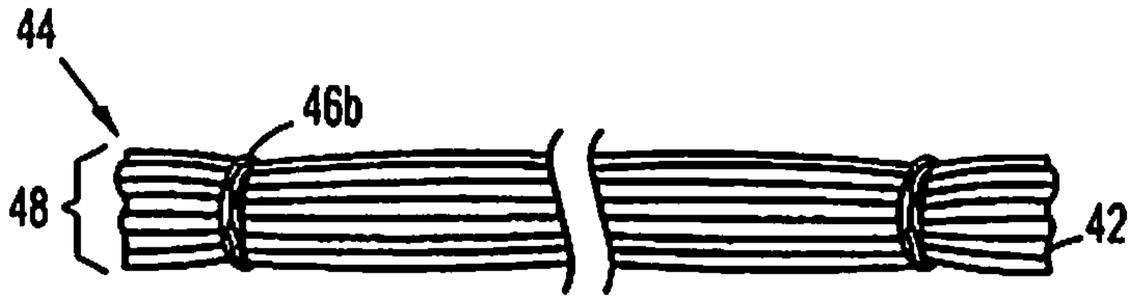


FIG. 6C

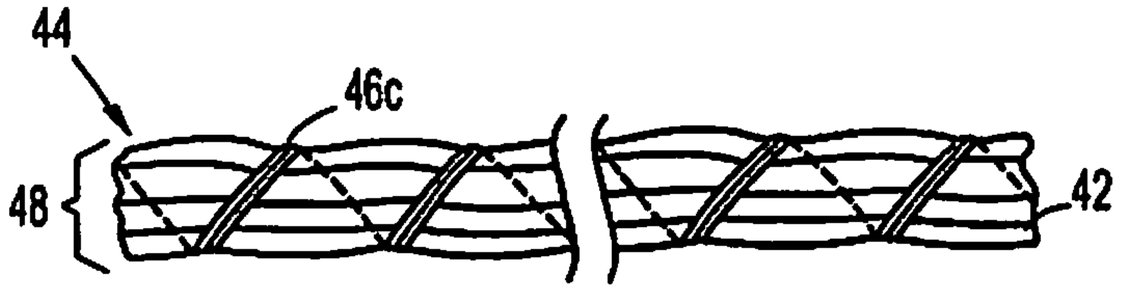


FIG. 6D

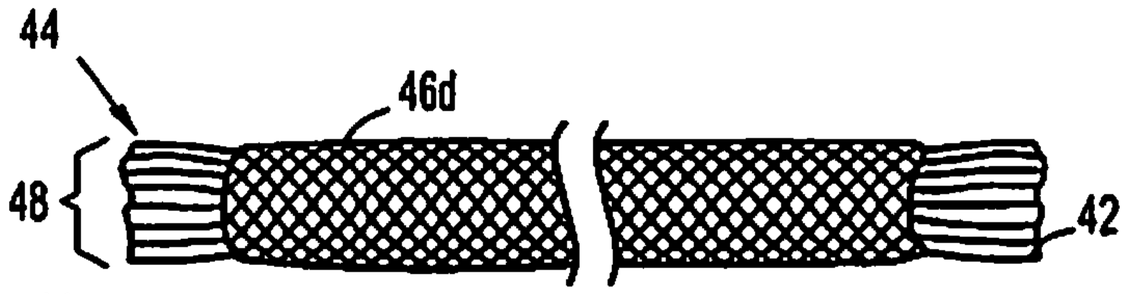


FIG. 6E

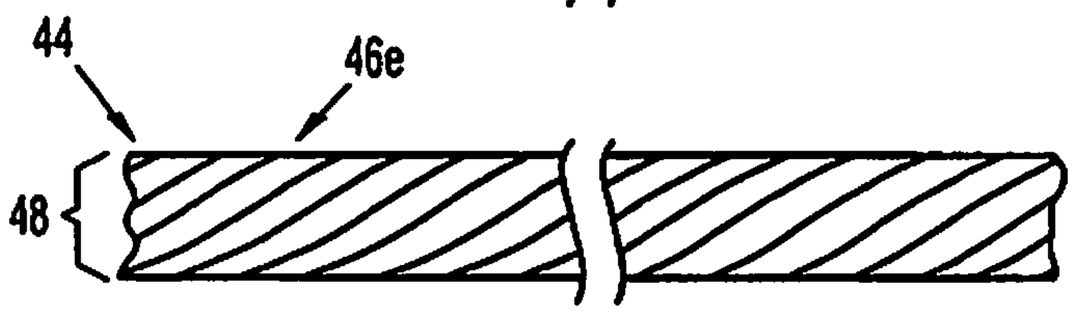


FIG. 6F

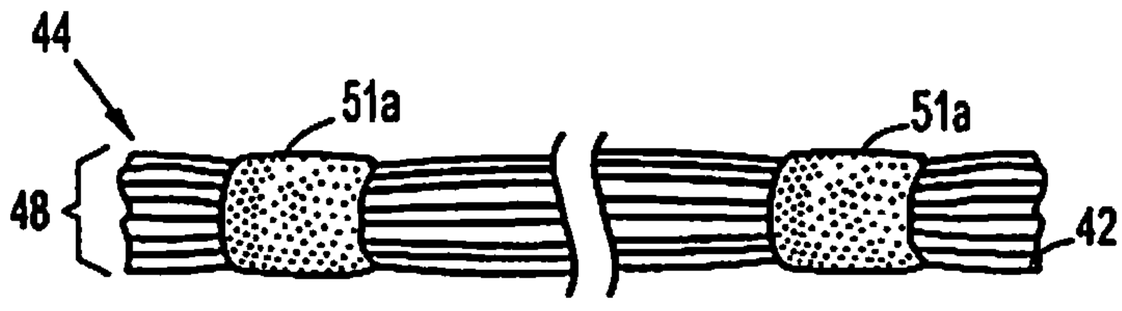


FIG. 6G

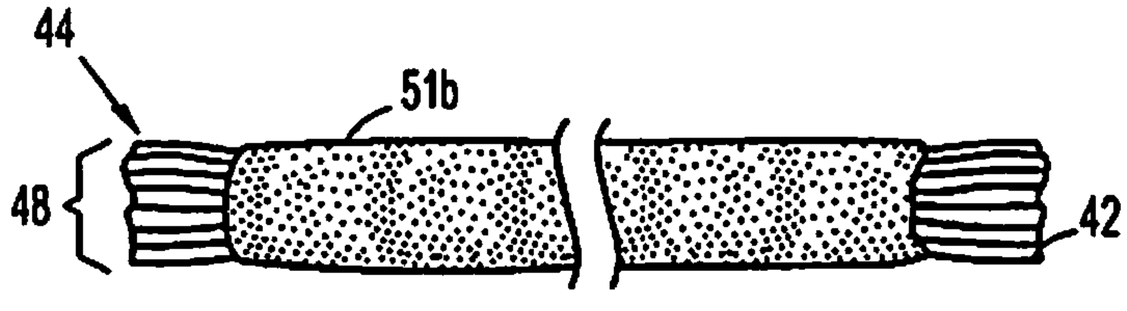


FIG. 6H

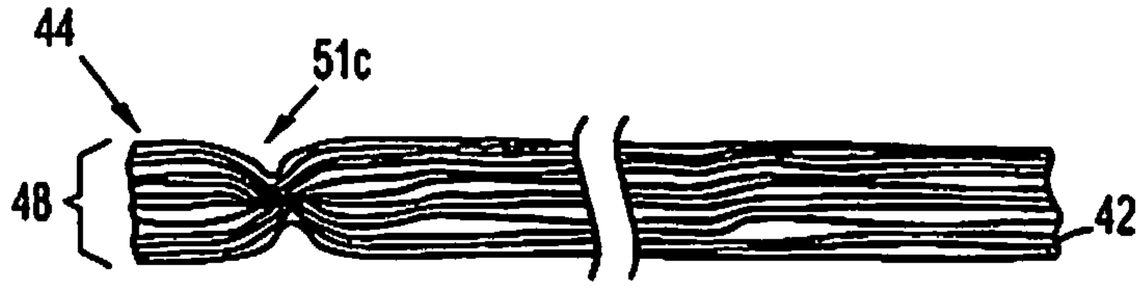


FIG. 6I

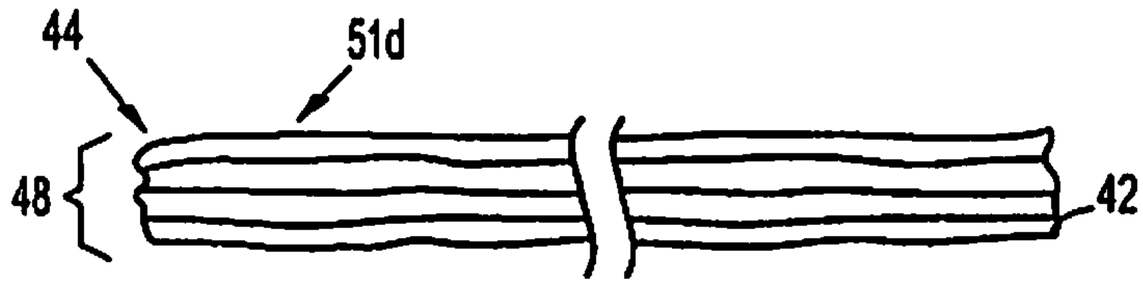
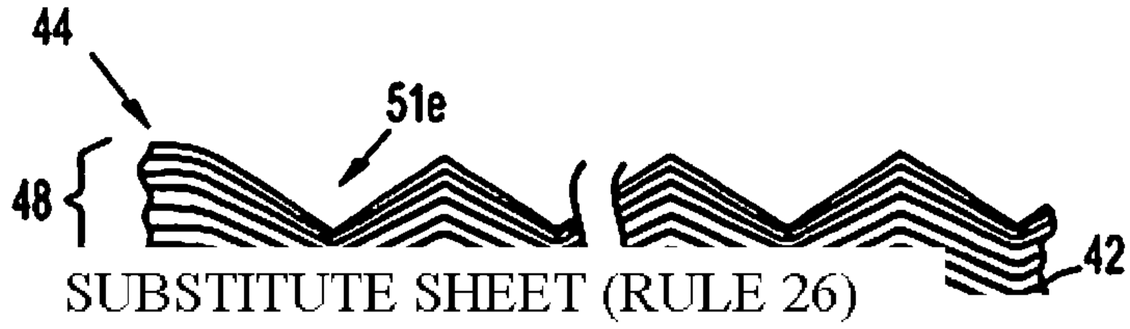


FIG. 6J



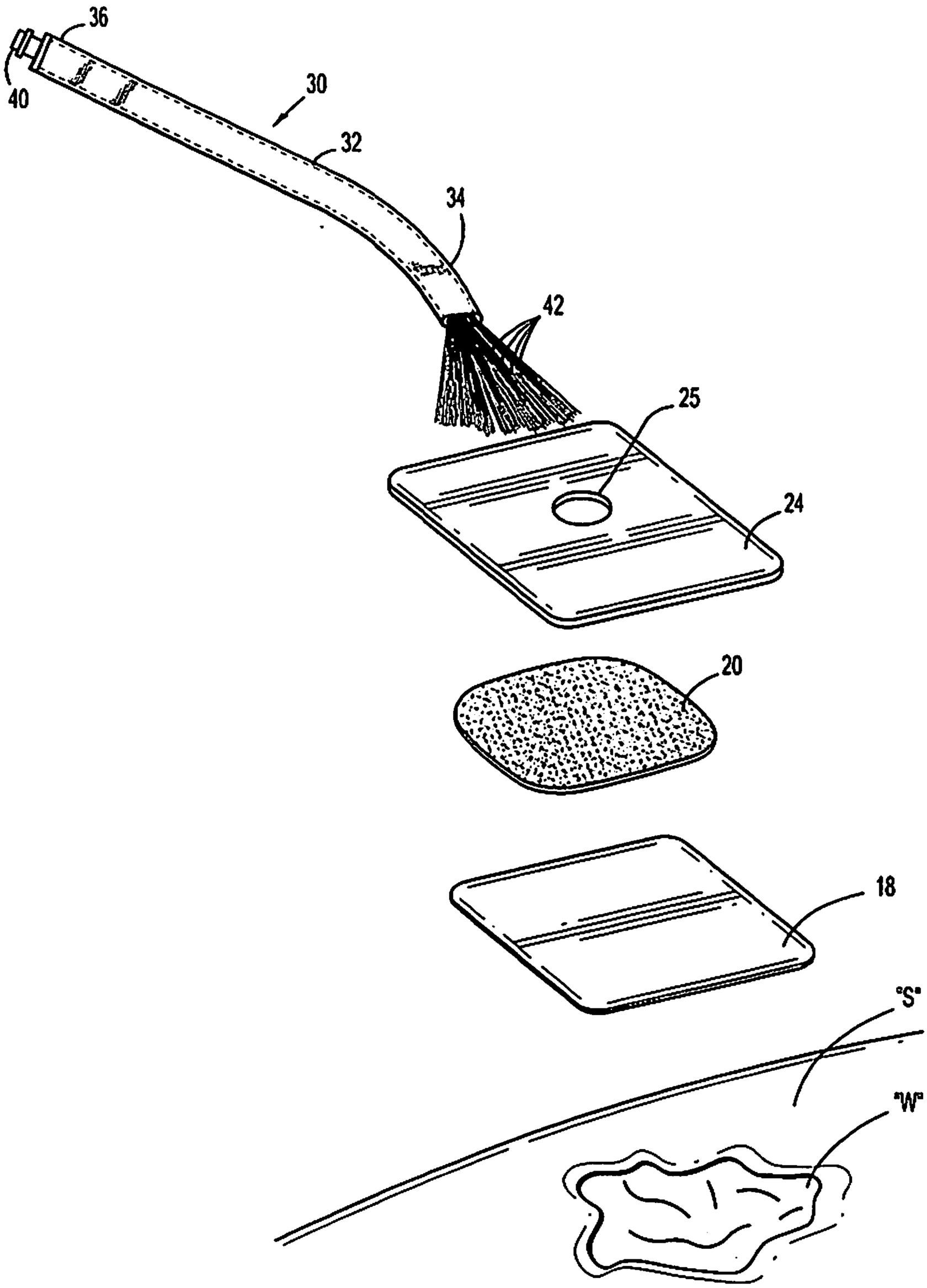


FIG. 7

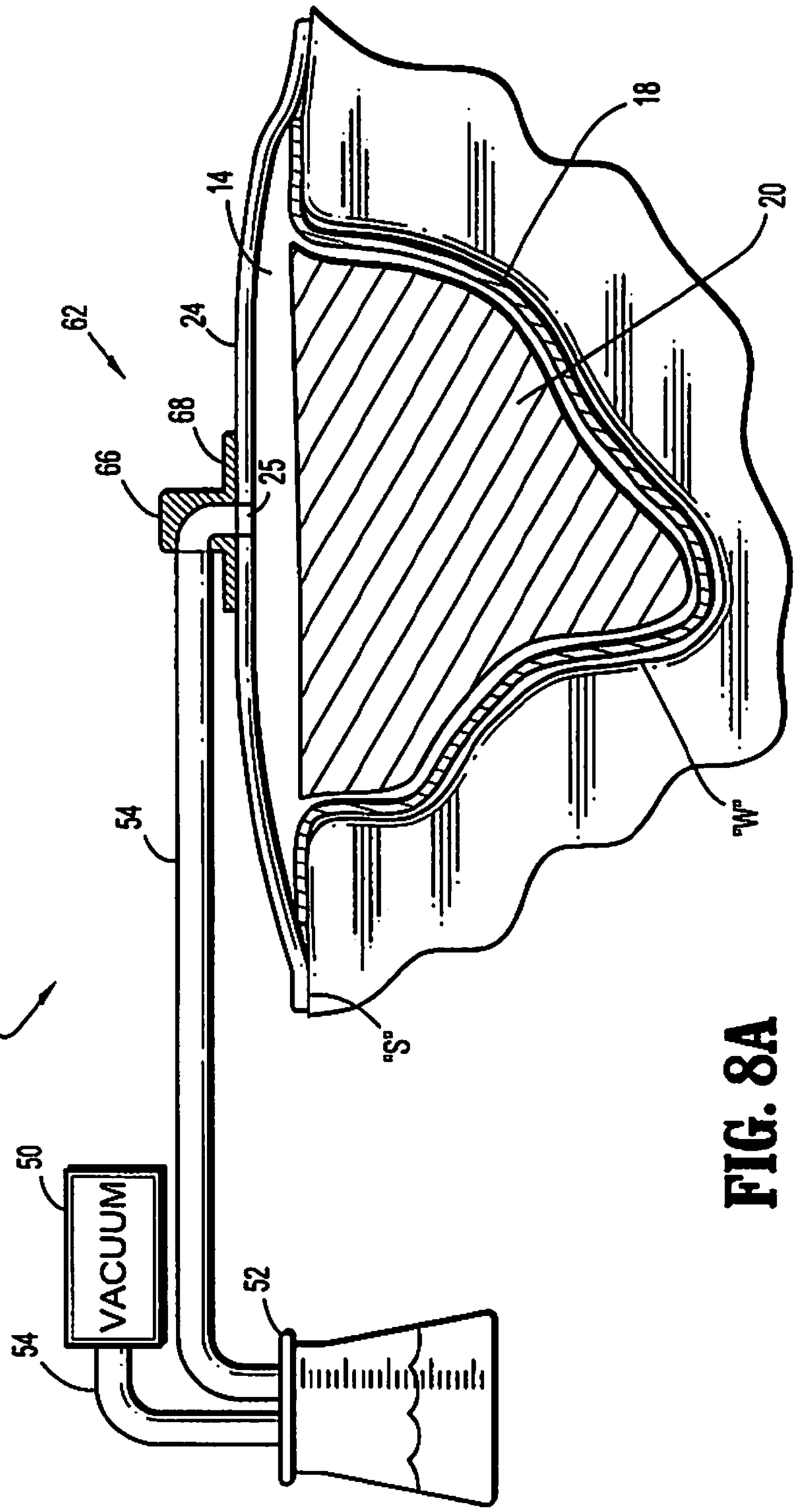


FIG. 8A

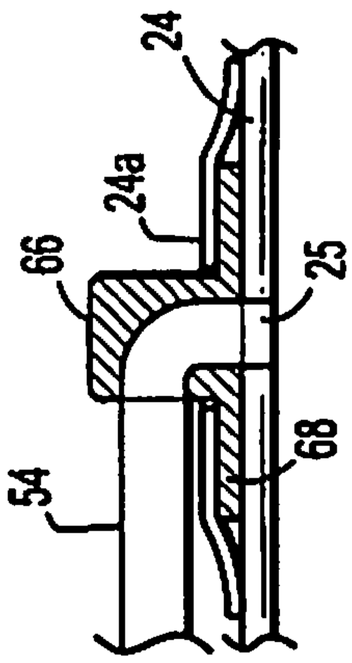


FIG. 8C

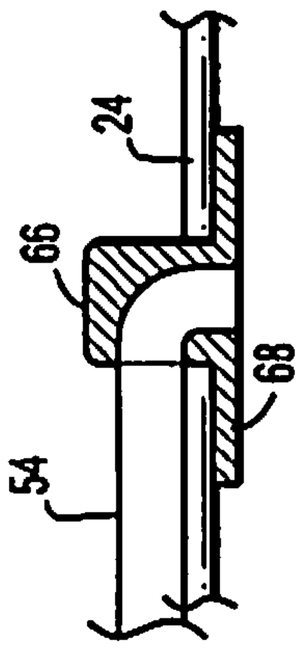


FIG. 8B

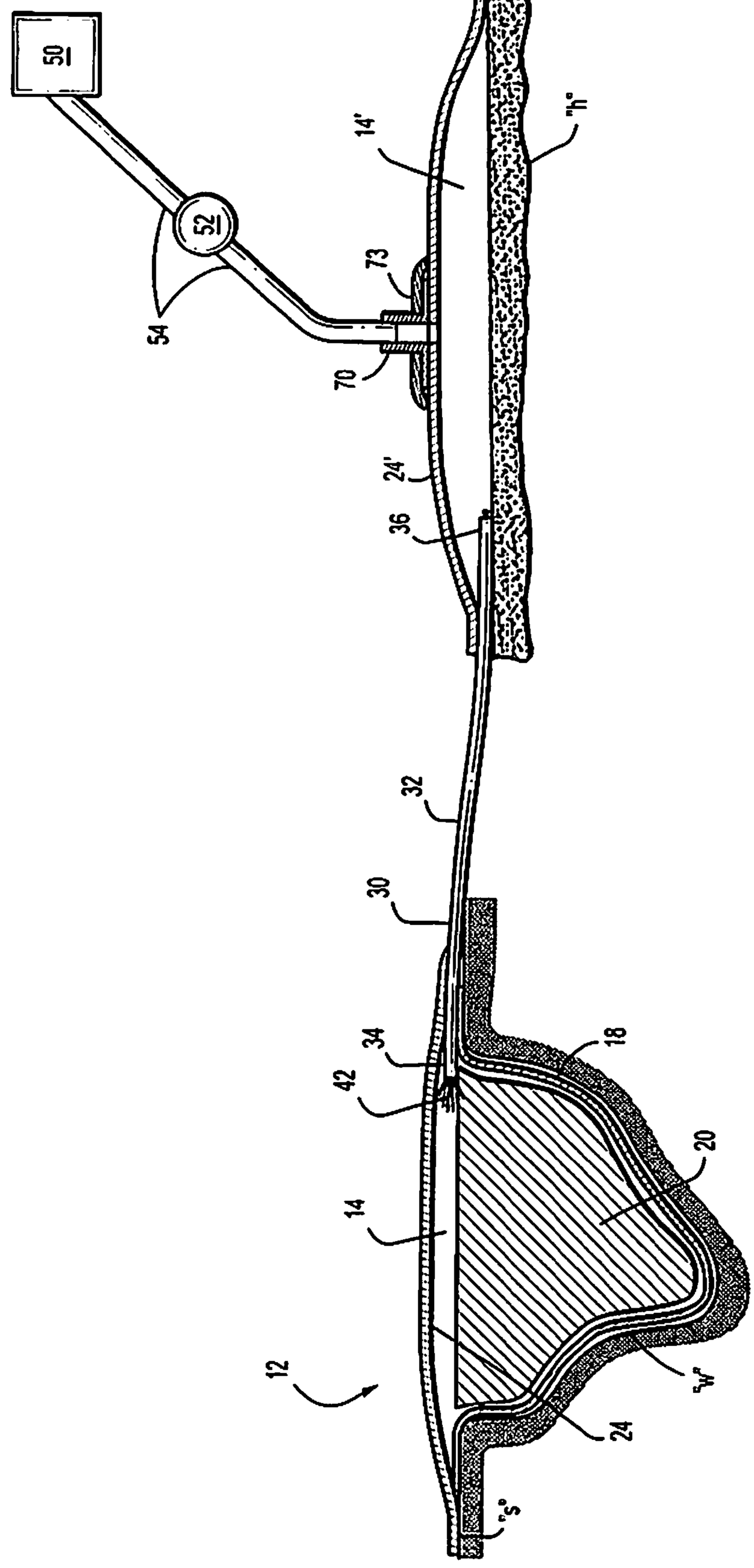


FIG. 9

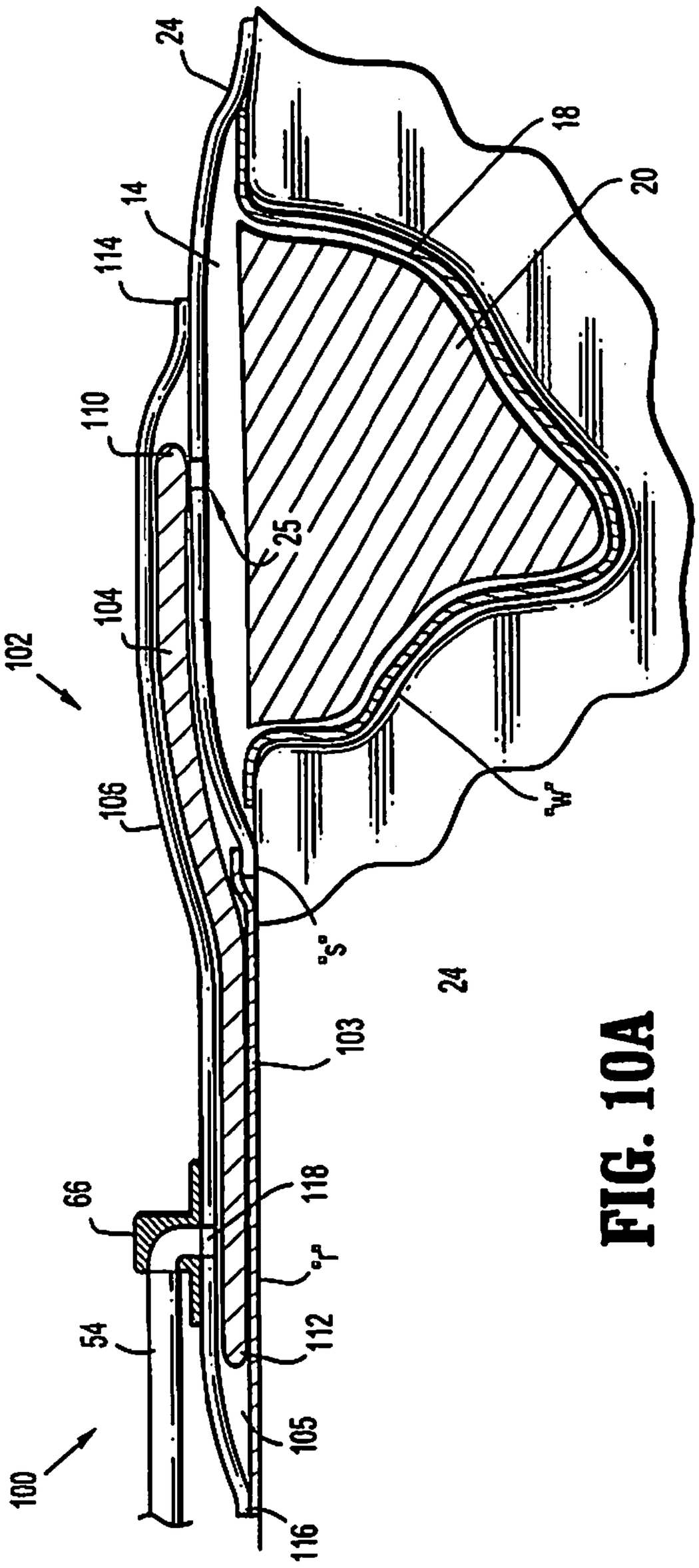


FIG. 10A

FIG. 10B

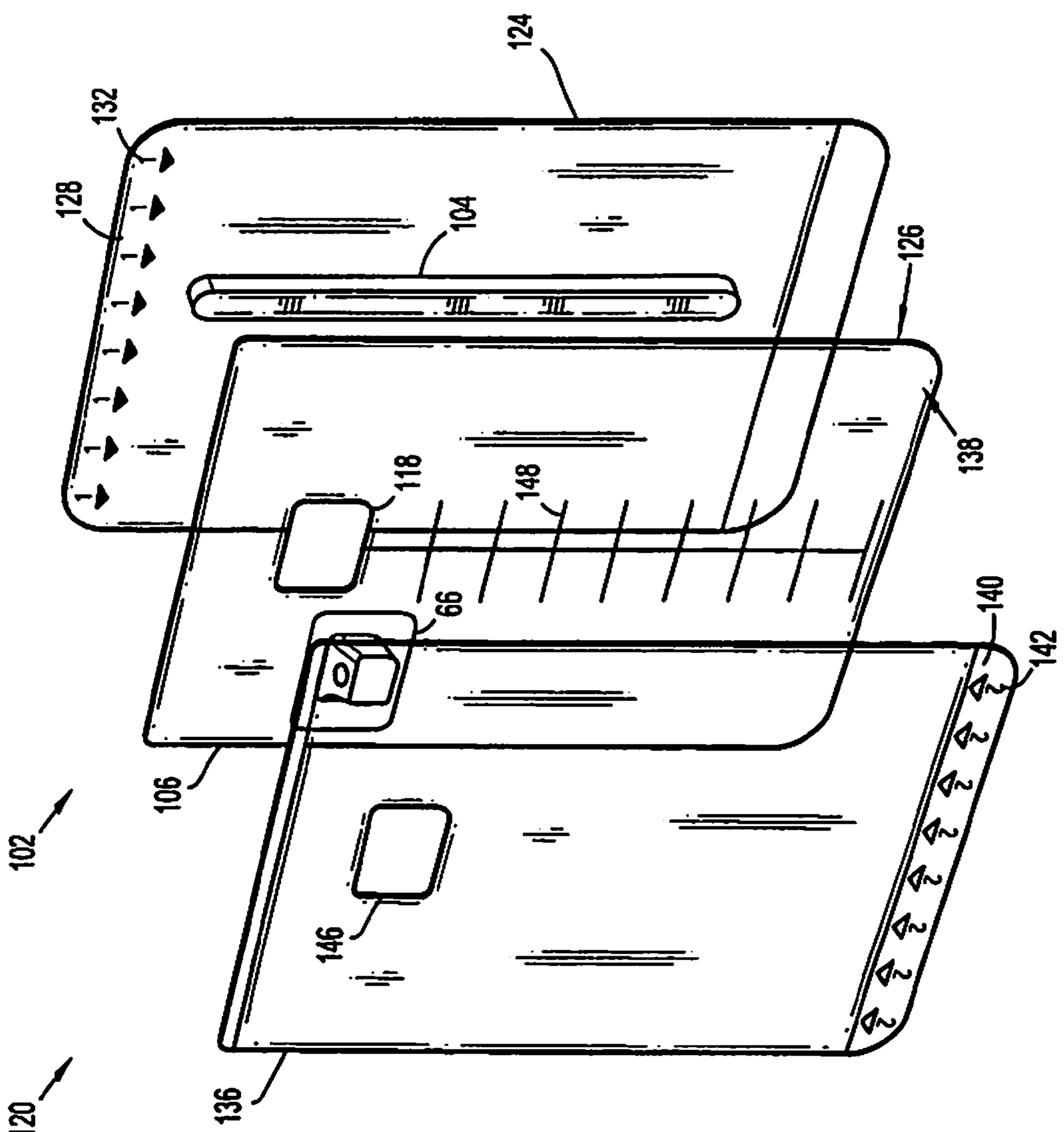


FIG. 11

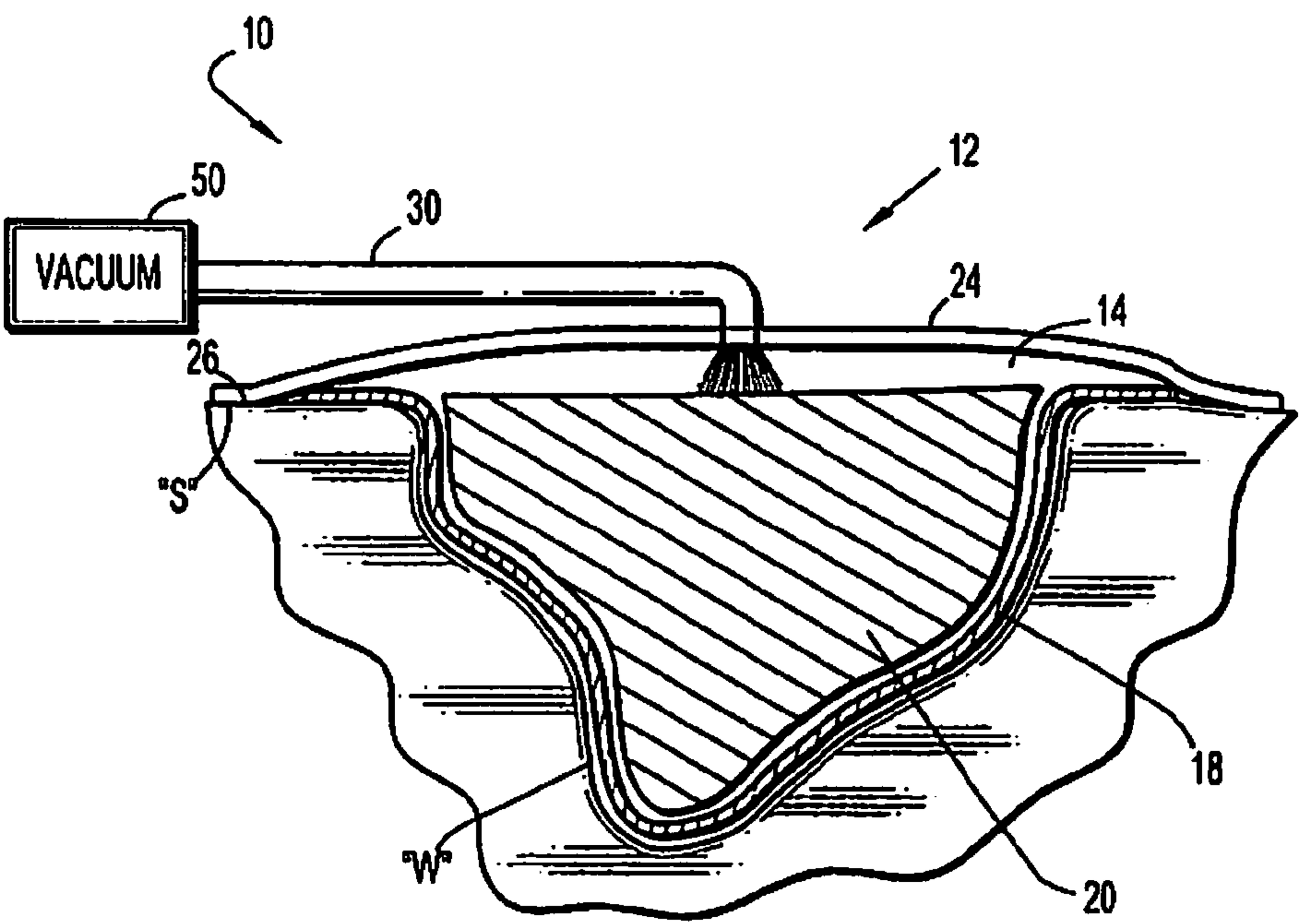


FIG. 1