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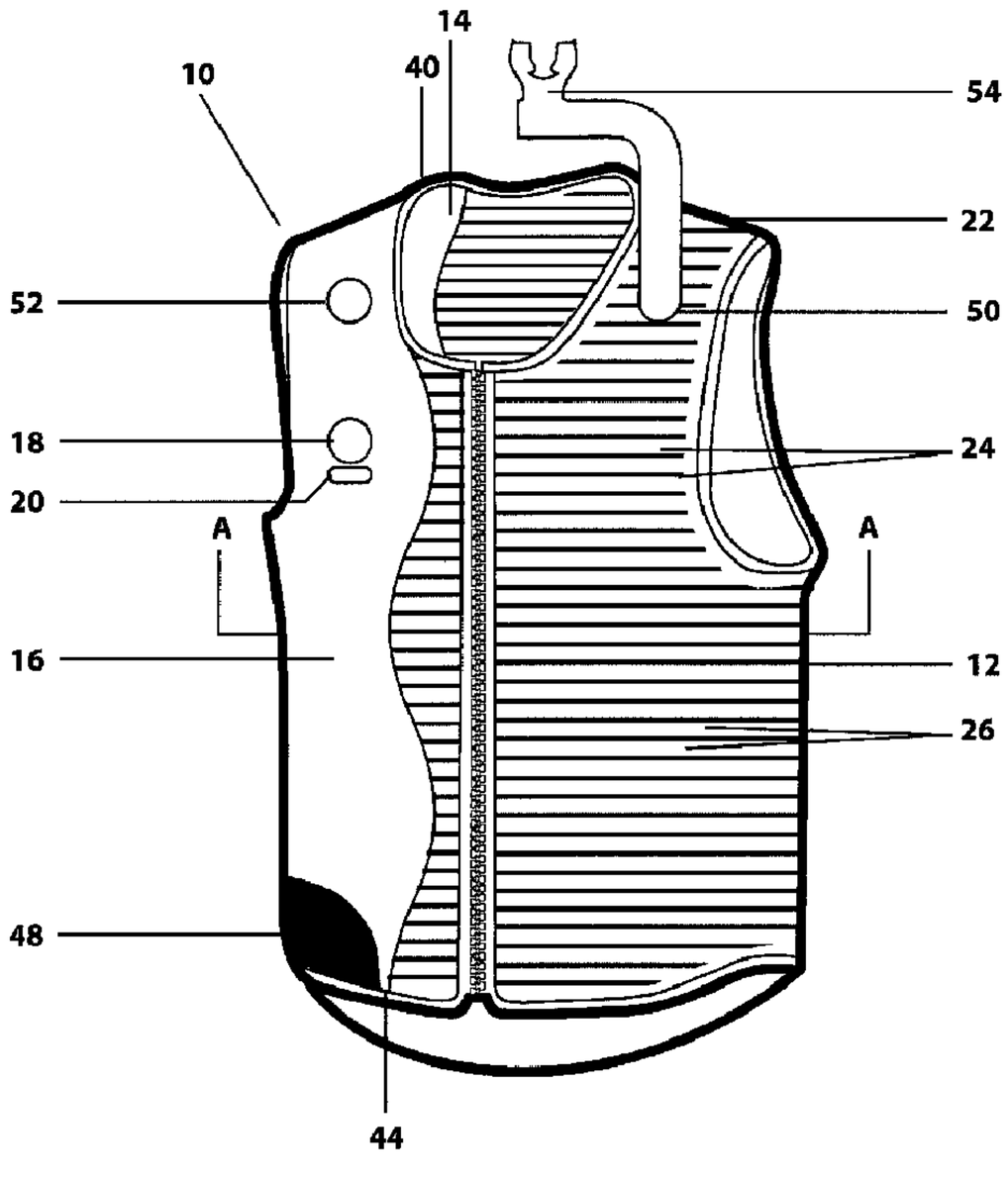
(71) Demandeur/Applicant:
WHITE, FRANK, CA

(72) Inventeur/Inventor:
WHITE, FRANK, CA...

(74) Agent: THOMPSON COOPER LLP

(54) Titre : VESTE DE SURVIE GONFLABLE
(54) Title: INFLATABLE SURVIVAL VEST



(57) Abrégé/Abstract:
An inflatable vest includes an inflatable bladder having an inflation inlet through which a gas is input to inflate the inflatable bladder. The bladder has a plurality of parallel seams that divide the bladder into tubular channels and cause the vest to have a wavy

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(57) Abrégé(suite)/Abstract(continued):
outwardly facing surface with crests and troughs and a wavy inwardly facing surface with crests and troughs. An inner layer overlies the crests of the wavy inwardly facing surface of the vest and forms a plurality of inner air channels in the troughs between the inner layer and the wavy inwardly facing surface. An outer layer overlies the crests of the wavy outwardly facing surface of the vest and forms a plurality of outer air channels in the troughs between the outer layer and the wavy outwardly facing surface.

ABSTRACT OF THE DISCLOSURE

An inflatable vest includes an inflatable bladder having an inflation inlet through which a gas is input to inflate the inflatable bladder. The bladder has a plurality of parallel seams that divide the bladder into tubular channels and cause the vest to have a wavy outwardly facing surface with crests and troughs and a wavy inwardly facing surface with crests and troughs. An inner layer overlies the crests of the wavy inwardly facing surface of the vest and forms a plurality of inner air channels in the troughs between the inner layer and the wavy inwardly facing surface. An outer layer overlies the crests of the wavy outwardly facing surface of the vest and forms a plurality of outer air channels in the troughs between the outer layer and the wavy outwardly facing surface.

TITLE

[0001] Inflatable Survival Vest

FIELD

[0002] There is described an inflatable survival vest.

BACKGROUND

[0003] U.S. Patent 4,060,867 (Miller) titled "Inflatable Life Vest; U.S. Patent 4,865,573 (Switlik Jr. et al) titled "Inflatable Life Vest Of The Single-Attachment, Single-Adjustment Type"; U.S. Patent 5,494,469 (Heath et al) titled "Inflatable Life Vest" and U.S. Patent 9,067,658 (Hughes) titled "Inflatable Swim Vest" are all examples of inflatable vests.

SUMMARY

[0004] There is provided an inflatable survival vest which includes an inflatable bladder having an inflation inlet through which a gas is input to inflate the inflatable bladder. The bladder is configured in the shape of a vest. The bladder has a plurality of parallel seams that divide the bladder into tubular channels which cause the vest to have a wavy outwardly facing surface with crests and troughs and a wavy inwardly facing surface with crests and troughs. An inner layer is provided having a peripheral edge. The inner layer is secured along the peripheral edge to the inflatable bladder, with the inner layer overlying the crests of the wavy inwardly facing surface of the vest and forming a plurality of inner air channels in the troughs between the inner layer and the wavy inwardly facing surface. An outer layer is provided having a peripheral edge. The outer layer is secured along the peripheral edge to the inflatable bladder, with the outer layer overlying the crests of the wavy outwardly facing surface of the vest and forming a plurality of outer air channels in the troughs between the outer layer and the wavy outwardly facing surface.

[0005] When the inflatable survival vest described above is inflated, air located in the troughs of the wavy inwardly facing surface and air located in the outer air channels provides some insulation benefits which helps retain core body temperature.

[0006] When the inflatable survival vest described above is inflated, the inner liner is pressed into contact with the body of the wearer, this leaves fewer gaps for cold water entry

or cold air entry under the vest. Even more beneficial results may be obtained when a shell with limited stretch-ability overlies the outer layer to limit outward expansion of the inflatable bladder. With outward expansion of the inflatable bladder confined, the inflatable bladder will tend to expand inwardly to a greater extent and will be more effective at pressing the inner liner against the body of the wearer.

[0007] When cold water (or cold air) is in contact with the outer layer for a prolonged period of time, the temperature of the inflatable bladder avoidably drops, as does the temperature of insulating air located in the inner air channels and the outer air channels. Even more beneficial results may be obtained when a circulation inlet is provided into and an exhaust outlet is provided out of at least one of the inner air channels or the outer air channels. This enables a breath input device to be connected to the circulation inlet and breath from the person wearing the vest circulated through at least one of the inner air channels or the outer air channels from the circulation inlet to the exhaust outlet. The heat from the person's breath maintains relatively constant or at least slows the decrease in the temperature of the inflatable bladder.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] These and other features will become more apparent from the following description in which reference is made to the appended drawings, the drawings are for the purpose of illustration only and are not intended to be in any way limiting, wherein:

[0009] FIG. 1 is a front elevation view of a first embodiment of inflatable survival vest.

[0010] FIG. 2 is a front elevation view in partial section of the first embodiment of inflatable survival vest of FIG. 1.

[0011] FIG. 2A is a section view of the first embodiment of inflatable survival vest of FIG. 2, when inflated.

[0012] FIG. 2B is a section view of the first embodiment of inflatable survival vest of FIG. 2, when deflated.

[0013] FIG. 3 is a front elevation view in partial section of a second embodiment of inflatable survival vest.

[0014] FIG. 3A is a section view of the second embodiment of inflatable survival vest of

FIG. 3, when inflated.

[0015] FIG. 3B is a section view of the second embodiment of inflatable survival vest of FIG. 3, when deflated.

[0016] FIG. 4 is a side elevation view a snorkel breathing apparatus used with the first embodiment of FIG. 1.

[0017] FIG. 4A is a top plan view, in section, of the snorkel breathing apparatus FIG. 4.

[0018] FIG. 5 is a side elevation view of a third embodiment of inflatable survival vest.

[0019] FIG. 5A is a section view of the third embodiment of inflatable survival vest of FIG. 5.

DETAILED DESCRIPTION

[0020] A first embodiment of inflatable survival vest generally identified by reference numeral 10, will be described with reference to FIG. 1 through 2B. A second embodiment of inflatable survival vest generally identified by reference numeral 100, will be described with reference to FIG. 3 through 3B. A snorkel breathing apparatus that can be used with first embodiment 10 or second embodiment 100 will be described with reference to FIG. 4 and FIG. 4A. A third embodiment of inflatable survival vest generally identified by reference numeral 150, will be described with reference to FIG. 5 and FIG. 5A.

Structure and Relationship of Parts:

[0021] Referring to FIG. 2, inflatable survival vest 10 consists of an inflatable bladder 12, an inner layer 14 and an outer layer 16. Inflatable bladder 12 has an inflation inlet 18 through which a gas is input to inflate inflatable bladder 12. Inflation inlet 18 is shown having a gas cylinder 20 connected to it, which is used to rapidly inflate inflatable bladder 12 in the event of an emergency. Inflatable bladder 12 is configured in the shape of a vest, generally indicated by reference numeral 22. Inflatable bladder 12 has a plurality of parallel seams 24 extending vertically that divide inflatable bladder 12 into tubular channels 26. Referring to FIG. 2A and FIG. 2B, tubular channels 26 cause vest 22 to have a wavy outwardly facing surface 28 with crests 30 and troughs 32 and a wavy inwardly facing surface 34 with crests 36 and troughs 38.

[0022] Referring to FIG. 2, inner layer 14 has a peripheral edge 40. Inner layer 14 is secured along peripheral edge 40 to inflatable bladder 12. Referring to FIG. 2A, when inflatable bladder 12 is inflated, inner layer 14 overlies crests 36 of wavy inwardly facing surface 34 of vest 22 and forms a plurality of inner air channels 42 in troughs 38 between inner layer 14 and wavy inwardly facing surface 34.

[0023] Referring to FIG. 2, outer layer 16 has a peripheral edge 44. Outer layer 16 is secured along peripheral edge 44 to inflatable bladder 12. Referring to FIG. 2A, when inflatable bladder 12 is inflated, outer layer 16 overlies crests 30 of wavy outwardly facing surface 28 of vest 22 and forms a plurality of outer air channels 46 in troughs 32 between outer layer 16 and wavy outwardly facing surface 28.

[0024] Referring to FIG. 2, a shell 48 a shell with limited stretch-ability overlies outer layer 16. Referring to FIG. 2A, shell 48 has limited stretch-ability and limits outward expansion of inflatable bladder 12. This serves to direct expansion of inflatable bladder 12 inwardly, forcing inner layer 14 against body 200.

[0025] Referring to FIG. 2, a circulation inlet 50 is provided into and an exhaust outlet 52 is provided out of inner air channels 42 (as shown in FIG. 2A), outer air channels 46 (as shown in FIG. 2A) or both. A breath input device, such as mouthpiece 54, is connected to circulation inlet 50. An exhaust valve forms part of exhaust outlet 52. The exhaust valve discharges excess air externally of inner air channels 42, outer air channels 46 or both. The exhaust valve is a one way valve that is pressure activated to open when the pressure exceeds pre-set limits. When the exhaust valve is closed, it prevents the entry of water. When the exhaust valve is open, the release of air prevents entry of water. The exhaust valve will not be further described, as suitable exhaust valves are known in the art and are commercially available. One example of a commercially available exhaust valve are the exhaust valves manufactured in various sizes for various applications under the Trademark brand SI-TECH.

Operation:

[0026] Referring to FIG. 2, vest 22 is intended to be worn in a normally deflated condition. Referring to FIG. 2, when vest 22 is immersed in water gas cylinder 20 is used to rapidly inflate inflatable bladder 12 within vest 22. Gas cylinder 20 can be manually activated or a liquid sensor can be provided with a valve that automatically causes gas cylinder to open the valve to inflate inflatable bladder 12 when liquid is sensed by the liquid sensor. Automated systems using liquid sensors are well known and, for that reason, will not be further described. A manual system has been chosen for illustration. It will be appreciated, that a simple blow tube can be used to inflate inflatable bladder 12. The manner of inflating inflatable bladder 12 is not essential to the present invention. Referring to FIG. 2A, once inflatable bladder 12 is inflated, some immediate benefits are achieved. Firstly, expansion of inflatable bladder 12 forces inner layer 14 against a body 200 of a wearer. This eliminates or at least reduces gaps 202 through which cold water 204 (or in land applications cold air) can circulate. A preferred material for inner layer 14 is neoprene. The use of shell 48 that has limited stretch-ability and limits outward expansion of inflatable bladder 12, serves to assist in directing expansion of inflatable bladder 12 inwardly forcing inner layer 14 against body 200, thereby making the seal more effective. Secondly, air is positioned in inner air channels 42 and outer air channels 46. This air has some insulation value.

[0027] Referring to FIG. 2A, when a person is immersed in cold water for a prolonged period of time, the cold water 204 will cool the air positioned in outer air channels 46. This cold temperature will be transmitted to body 200 and the core temperature will decrease, resulting eventually in death. Referring to FIG. 2, a person wearing vest 22 is able to exhale into mouthpiece 54. Breath exhaled through mouthpiece 54 enters circulation inlet 50 and passes to exhaust outlet 52. Referring to FIG. 2A, breath input into circulation inlet 50 (as shown in FIG. 2) is circulated through inner air channels 42 and outer air channels 46 before exiting exhaust outlet 52 (see FIG. 2). Warm breath passing along inner air channels 42 serves to warm body 200. Warm breath passing along outer air channels 46 provides a buffer which keeps the cold from the cold water away from body 200 and eliminates or at least slows the decrease in core temperature.

Variations:

[0028] Referring to FIG. 2, seams 24 of inflatable survival vest 10 were vertical seams. Referring to FIG. 3, a variation has been illustrated with an inflatable survival vest 100 having seams 124 that extend horizontally. There follows a description which referring to FIG. 3 through 3B. As the vests are identical, except for the orientation of the seams, identical reference numerals have been used to identify identical elements.

Structure and Relationship of Parts:

[0029] Referring to FIG. 3, inflatable survival vest 100 consists of an inflatable bladder 12, an inner layer 14 and an outer layer 16. Inflatable bladder 12 has a circulation inlet 18 through which a gas is input to inflate inflatable bladder 12. Circulation inlet 18 is shown having a gas cylinder 20 connected to it, which is used to rapidly inflate inflatable bladder 12 in the event of an emergency. Inflatable bladder 12 is configured in the shape of a vest, generally indicated by reference numeral 22. Inflatable bladder 12 has a plurality of parallel seams 124 extending horizontally that divide inflatable bladder 12 into tubular channels 26. Referring to FIG. 3A and FIG. 3B, tubular channels 26 cause vest 22 to have a wavy outwardly facing surface 28 with crests 30 and troughs 32 and a wavy inwardly facing surface 34 with crests 36 and troughs 38.

[0030] Referring to FIG. 3, inner layer 14 has a peripheral edge 40. Inner layer 14 is secured along peripheral edge 40 to inflatable bladder 12. Referring to FIG. 3A, when inflatable bladder 12 is inflated, inner layer 14 overlies crests 36 of wavy inwardly facing surface 34 of vest 22 (see FIG. 3) and forms a plurality of inner air channels 42 in troughs 38 between inner layer 14 and wavy inwardly facing surface 34.

[0031] Referring to FIG. 3, outer layer 16 having a peripheral edge 44. Outer layer 16 is secured along peripheral edge 44 to inflatable bladder 12. Referring to FIG. 3A, when inflatable bladder 12 is inflated, outer layer 16 overlies crests 30 of wavy outwardly facing surface 28 of vest 22 (see FIG. 3) and forms a plurality of outer air channels 46 in troughs 32 between outer layer 16 and wavy outwardly facing surface 28.

[0032] Referring to FIG. 3, a shell 48 with limited stretch-ability overlies outer layer 16. Referring to FIG. 3A, shell 48 has limited stretch-ability and limits outward expansion of inflatable bladder 12 and serves to direct expansion of inflatable bladder 12 inwardly, forcing inner layer 14 against body 200.

[0033] Referring to FIG. 3, a circulation inlet 50 is provided into and an exhaust outlet 52 is provided out of inner air channels 42, outer air channels 46 or both. A breath input device, such as mouthpiece 54, is connected to circulation inlet 50. An exhaust valve forms part of exhaust outlet 52. The exhaust valve discharges excess air externally of inner air channels 42, outer air channels 46 or both. The exhaust valve is a one way valve that is pressure activated to open when the pressure exceeds pre-set limits. When the exhaust valve is closed, it prevents the entry of water. When the exhaust valve is open, the release of air prevents entry of water. The exhaust valve will not be further described, as suitable exhaust valves are known in the art and are commercially available. One example of a commercially available exhaust valve are the exhaust valves manufactured in various sizes for various applications under the Trademark brand SI-TECH.

Operation:

[0034] Referring to FIG. 3, vest 22 is intended to be worn in a normally deflated condition (as illustrated in FIG. 3B). Referring to FIG. 3, when vest 22 is immersed in water gas cylinder 20 is used to rapidly inflate inflatable bladder 12 within vest 22. Gas cylinder 20 can be manually activated or a liquid sensor can be provided with a valve that automatically causes gas cylinder to open the valve to inflate inflatable bladder 12 when liquid is sensed by the liquid sensor. Automated systems using liquid sensors is well known and, for that reason, will not be further described. A manual system has been chosen for illustration. It will be appreciated, that a simple blow tube can be used to inflate inflatable bladder 12. The manner of inflating inflatable bladder 12 is not essential to the present invention. Referring to FIG. 3A, once inflatable bladder 12 is inflated, some immediate benefits are achieved. Firstly, expansion of inflatable bladder 12 forces inner layer 14 against a body 200 of a wearer. This eliminates or at very least reduces gaps 202 through which cold water 204 (or cold air for land applications) can circulate. A preferred material

for inner layer 14 is neoprene. The use of shell 48, with limited stretch-ability, limits outward expansion of inflatable bladder 12 and serves to assist in directing expansion of inflatable bladder 12 inwardly forcing inner layer 14 against body 200, thereby making the seal more effective. Secondly, air is positioned in inner air channels 42 and outer air channels 46. This air has some insulation value.

[0035] When a person is immersed in cold water 204 for a prolonged period of time, the cold water 204 will cool the air positioned in outer air channels 46. This cold temperature will be transmitted to body 200 and the core temperature will decrease, resulting eventually in death. Referring to FIG. 3, a person wearing vest 22 is able to exhale into mouthpiece 54. Breath exhaled through mouthpiece 54 enters circulation inlet 50 and passes to exhaust outlet 52. Referring to FIG. 3A, breath input into circulation inlet 50 (shown in FIG. 3) is circulated through inner air channels 42 and outer air channels 46 before exiting exhaust outlet 52. Warm breath passing along inner air channels 42 serves to warm body 200. Warm breath passing along outer air channels 46 provides a buffer which keeps the cold from the cold water away from body 200 and eliminates or at least slows the decrease in core temperature.

[0036] It will be apparent to persons skilled in the art that an inflatable survival vest can provide buoyancy and, if sufficient buoyancy is provided, may be certified as a personal floatation device (PFD). However, the same principle can be used to maintain core body temperature under cold weather conditions where buoyancy is not required. It will also be apparent to one skilled in the art that one could include arms that attach to the vest in order to provide some additional warmth in cold weather.

[0037] Referring to FIG. 4, in rough seas the onslaught of waves makes it difficult to breath without swallowing water. In such applications, a snorkel tube 58 extends above the head of the wearer and connects to mouthpiece 54. Referring to FIG. 4A, in order to make breathing as effortless as possible, it is preferred that mouthpiece 54 be part of a breathing assembly 56. This breathing assembly has a first one way valve 60 that allows exhaled breath 66 to pass from mouthpiece 54 along an exhale hose 68 which leads to the circulation

inlet 50 into bladder 12 and prevents a reverse flow from bladder 12. A second valve 62 that permits fresh air 70 to flow through snorkel tube 58 when the wearer inhales and blocks air flow through snorkel tube 58 when the wearer exhales. In operation, when the wearer inhales through mouthpiece 54, second one way valve 62 opens to receive fresh air 70 from snorkel tube 58 and first one way valve 60 closes to that air is not drawn from bladder 12. When the wearer exhales through mouthpiece 54, first one way valve 60 opens to allow exhaled breath to pass along exhale hose 68 into circulation inlet 50 of bladder 12 and second one way valve 62 closes so that air is not sent up snorkel tube 58.

[0038] The inflatable survival vest is referred to as a "survival vest" rather than a floatation device, as it can be used on both land and water. When used on land, it is contemplated it would be used in extremely cold environments, such as the Arctic or Antarctic, the air is so cold that it can harm the lungs if not preheated. It is, therefore, desirable to preheat the air. Referring to FIG. 5, an air supply tube 74 is connected to a heat exchanger 76 built into survival vest 10. Referring to FIG. 5A, heat exchanger 76 consists of a passage 78 through which fresh air 70 is drawn. Passage 78 is positioned adjacent to bladder 12. As fresh air 70 passes along passage 78 it is preheated by a heat exchange with warmer exhaled air 66 that is passing through bladder 12.

Cautionary Warning

[0039] Referring to FIG. 2 and FIG. 3, it has been determined that the positioning of exhaust outlet 52 has an impact on how easy or how difficult it is to breathe. The farther that exhaust outlet 52 is positioned below circulation inlet 50, the more difficult it becomes to breathe. It is, therefore, preferred that circulation inlet 50 and exhaust outlet 52 be positioned on approximately the same horizontal plane.

[0040] In this patent document, the word "comprising" is used in its non-limiting sense to mean that items following the word are included, but items not specifically mentioned are not excluded. A reference to an element by the indefinite article "a" does not exclude the possibility that more than one of the element is present, unless the context clearly requires that there be one and only one of the elements.

[0041] The scope of the claims should not be limited by the illustrated embodiments set forth as examples, but should be given the broadest interpretation consistent with a purposive construction of the claims in view of the description as a whole.

What is Claimed is:

1. An inflatable survival vest, comprising:

an inflatable bladder having an inflation inlet through which a gas is input to inflate the inflatable bladder, the bladder being configured in the shape of a vest, the bladder having a plurality of parallel seams that divide the bladder into tubular channels, the tubular channels causing the vest to have a wavy outwardly facing surface with crests and troughs and a wavy inwardly facing surface with crests and troughs;

an inner layer having a peripheral edge, the inner layer being secured along the peripheral edge to the inflatable bladder with the inner layer overlying the crests of the wavy inwardly facing surface of the vest and forming a plurality of inner air channels in the troughs between the inner layer and the wavy inwardly facing surface; and

an outer layer having a peripheral edge, the outer layer being secured along the peripheral edge to the inflatable bladder with the outer layer overlying the crests of the wavy outwardly facing surface of the vest and forming a plurality of outer air channels in the troughs between the outer layer and the wavy outwardly facing surface.

2. The inflatable survival vest of Claim 1, wherein a shell with limited stretch-ability overlies the outer layer, thereby limiting outward expansion of the inflatable bladder.

3. The inflatable survival vest of Claim 1, wherein a circulation inlet is provided into and an exhaust outlet is provided out of at least one of the inner air channels or the outer air channels, with a breath input device connected to the circulation inlet, whereby breath of a person wearing the vest is circulated through at least one of the inner air channels or the outer air channels from the circulation inlet to the exhaust outlet.

4. The inflatable survival vest of Claim 3, wherein the circulation inlet and the exhaust outlet are positioned on approximately the same horizontal plane.

5. The inflatable survival vest of Claim 3, wherein the breath input device is connected to a

snorkel tube.

6. The inflatable survival vest of Claim 5, wherein the breath input device has a first one way valve on an exhale tube and a second one way valve on the snorkel tube, the first one way valve closing and the second one way valve opening as a wearer inhales, the second one way valve opening and the second one way valve closing as the wearer exhales.

7. The inflatable survival vest of Claim 3, wherein the breath input device is connected to a heat exchanger what preheats fresh air with a heat exchange with the bladder.

8. An inflatable survival vest, comprising:

an inflatable bladder having an inflation inlet through which a gas is input to inflate the inflatable bladder, the bladder being configured in the shape of a vest, the bladder having a plurality of parallel seams that define tubular channels which causes the vest to have a wavy outwardly facing surface with crests and troughs and a wavy inwardly facing surface with crests and troughs;

an inner layer having a peripheral edge, the inner layer being secured along the peripheral edge to the inflatable bladder with the inner layer overlying the crests of the wavy inwardly facing surface of the vest and forming a plurality of inner air channels in the troughs between the inner layer and the wavy inwardly facing surface;

an outer layer having a peripheral edge, the outer layer being secured along the peripheral edge to the inflatable bladder with the outer layer overlying the crests of the wavy outwardly facing surface of the vest and forming a plurality of outer air channels in the troughs between the outer layer and the wavy outwardly facing surface;

a shell with limited stretch-ability overlying the outer layer, thereby limiting outward expansion of the inflatable bladder and directing expansion of the inflatable bladder inward toward the inner layer;

a circulation inlet is provided into and an exhaust outlet is provided out of at least one of the inner air channels or the outer air channels, with a breath input device connected to the circulation inlet, whereby breath of a person wearing the vest is circulated through at least one of the inner air channels or the outer air channels from the circulation inlet to the exhaust

outlet, the circulation inlet and the exhaust outlet being positioned on approximately the same horizontal plane.

FIG. 1

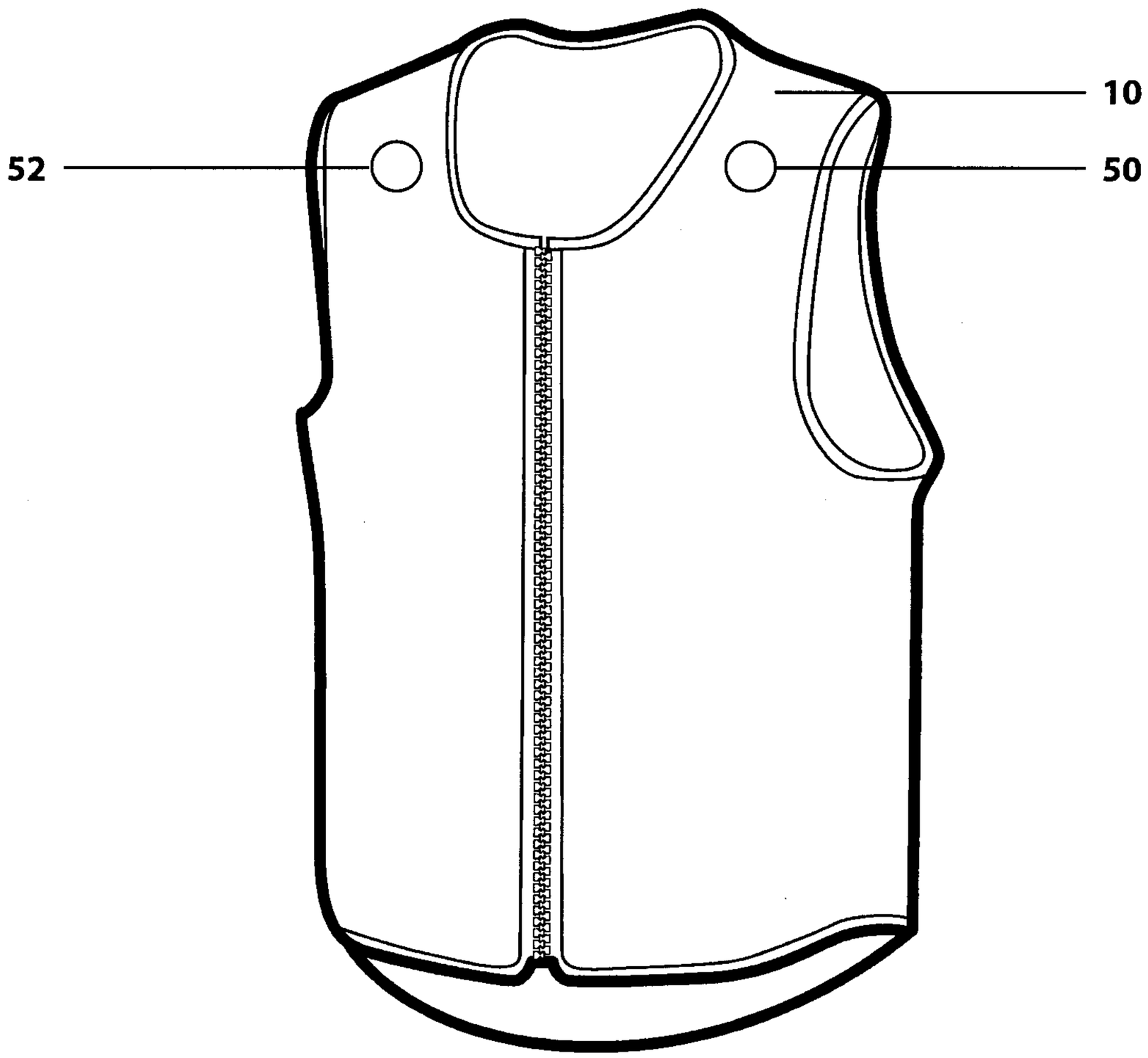

FIG. 2

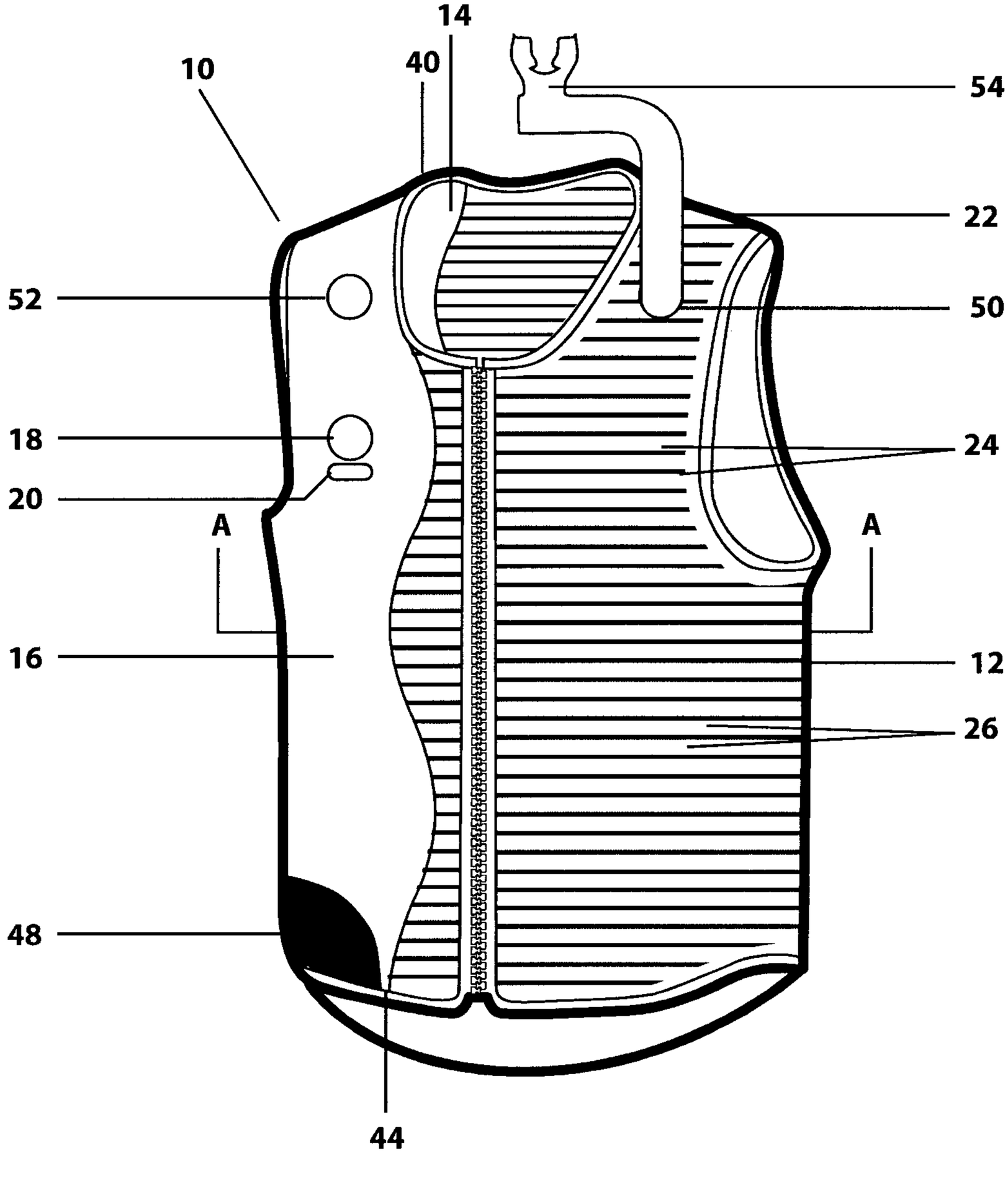

FIG. 2A
INFLATED

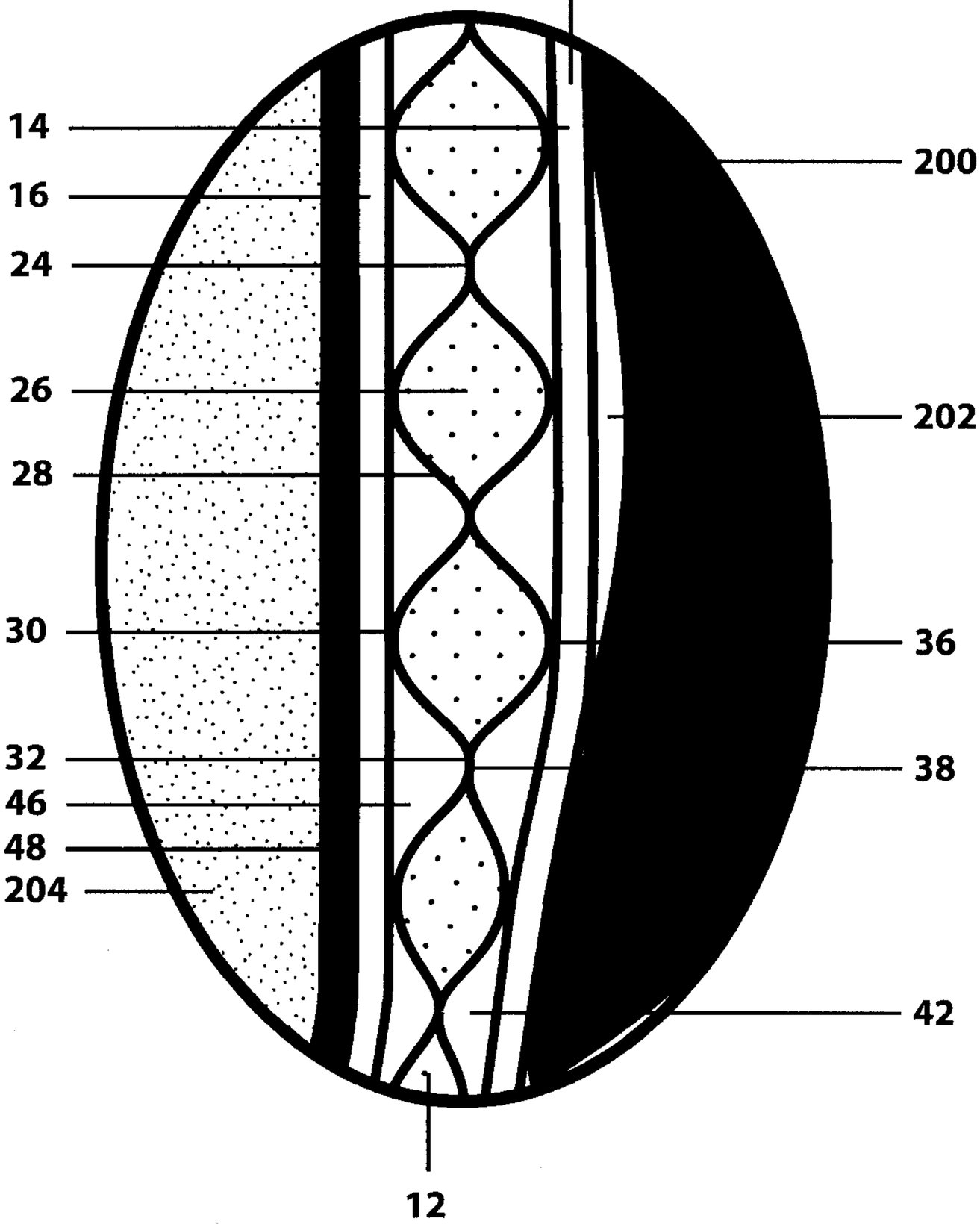

FIG. 2B

DEFLATED

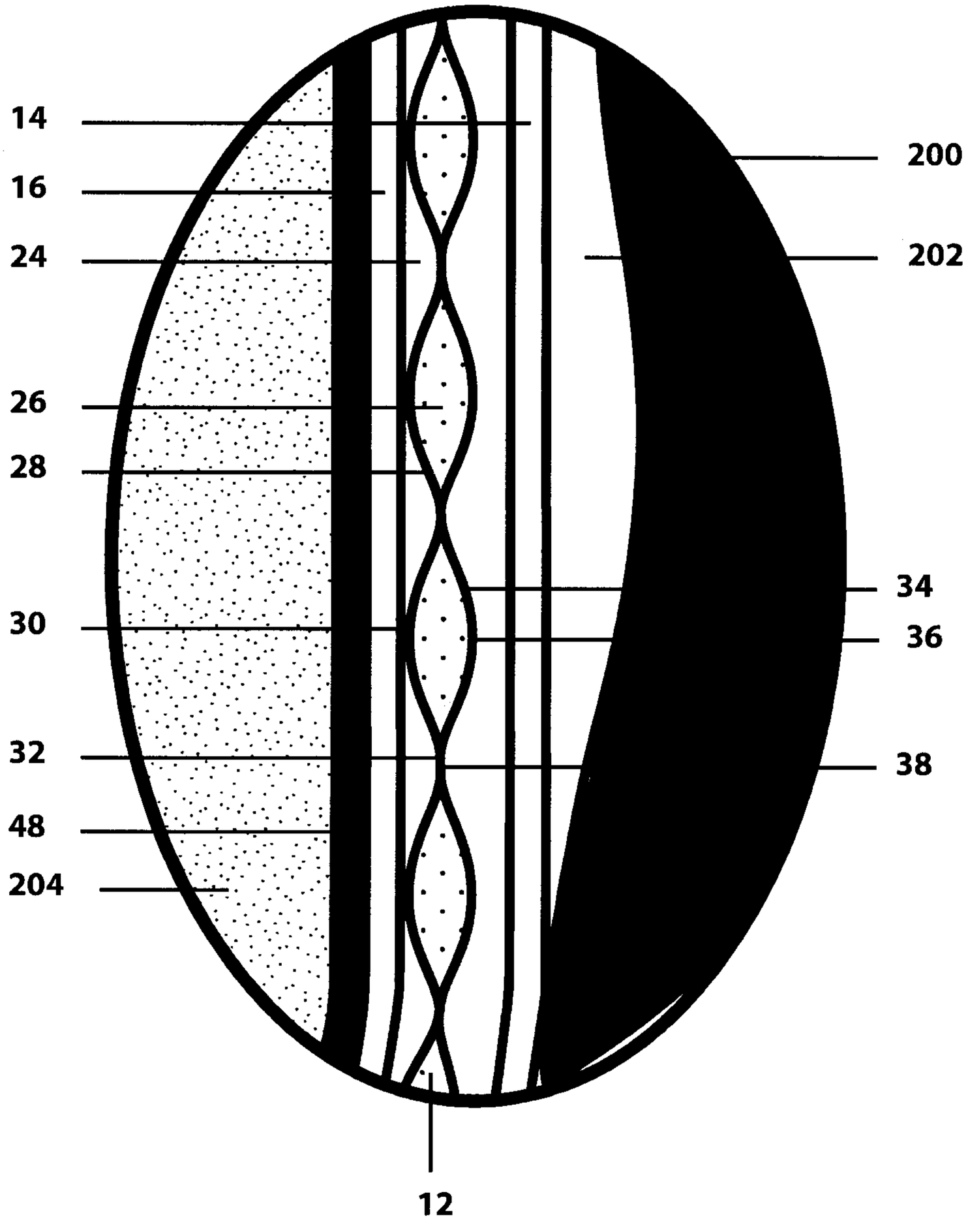

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FIG. 3

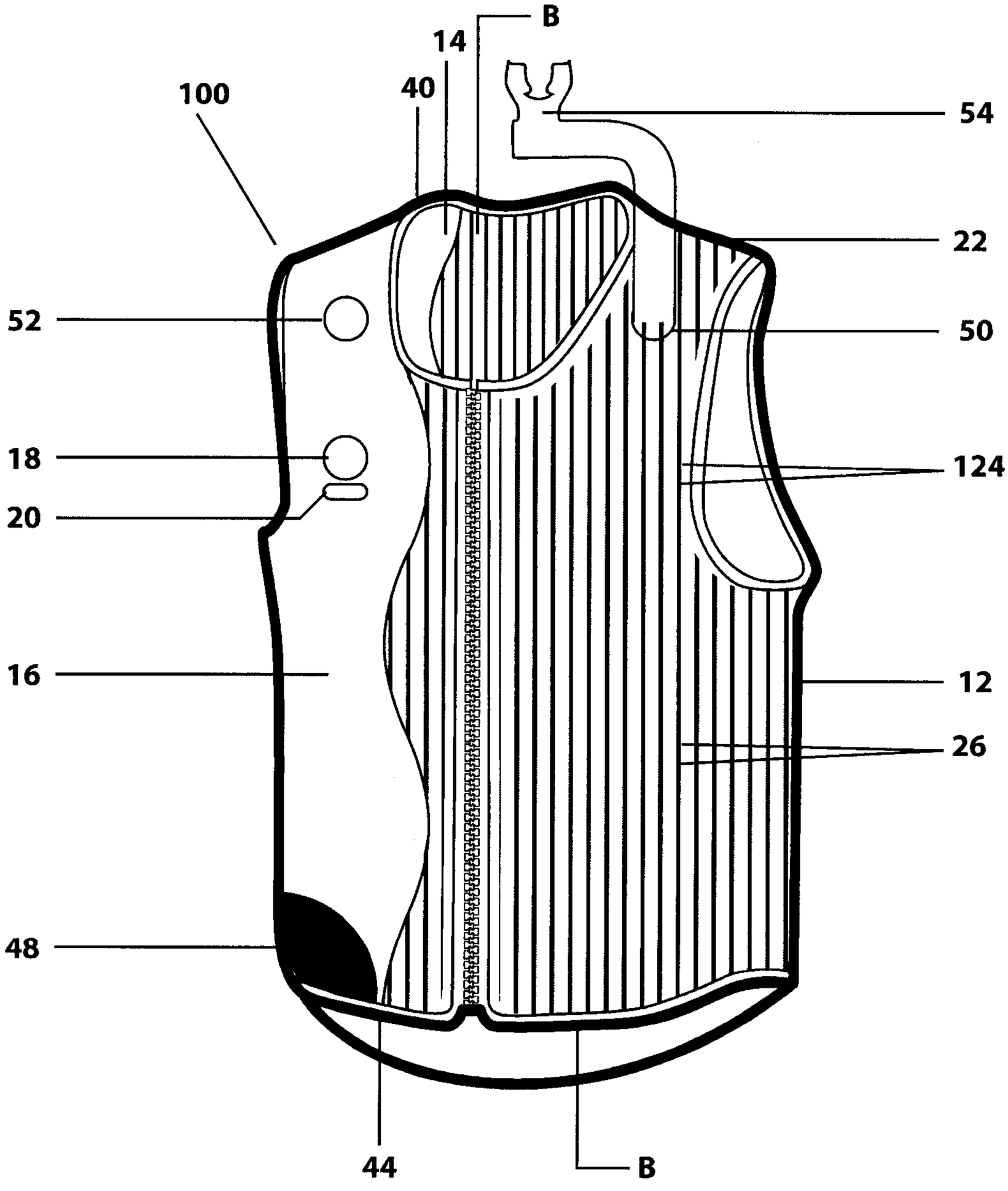


FIG. 3A
INFLATED

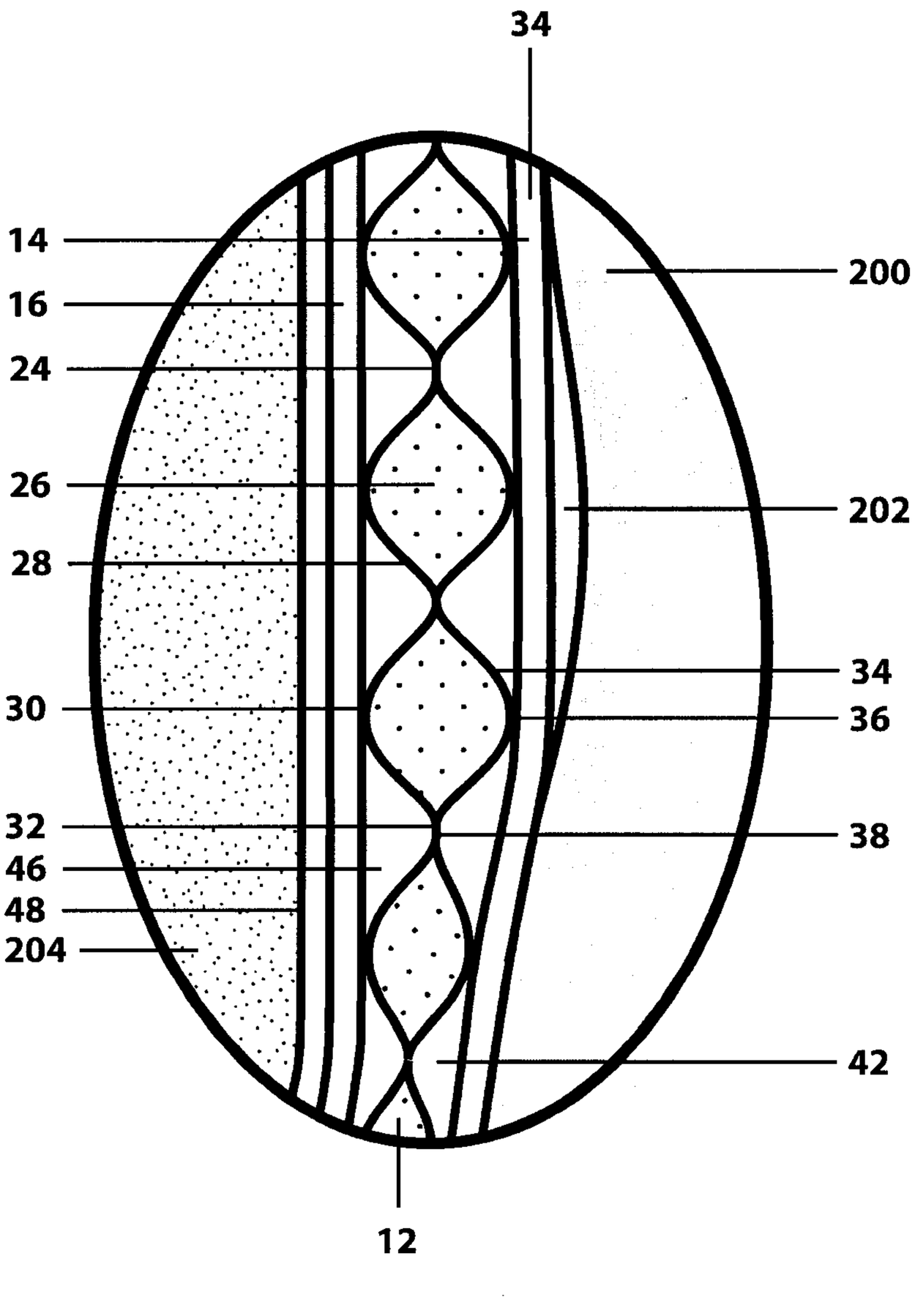


FIG. 3B

DEFLATED

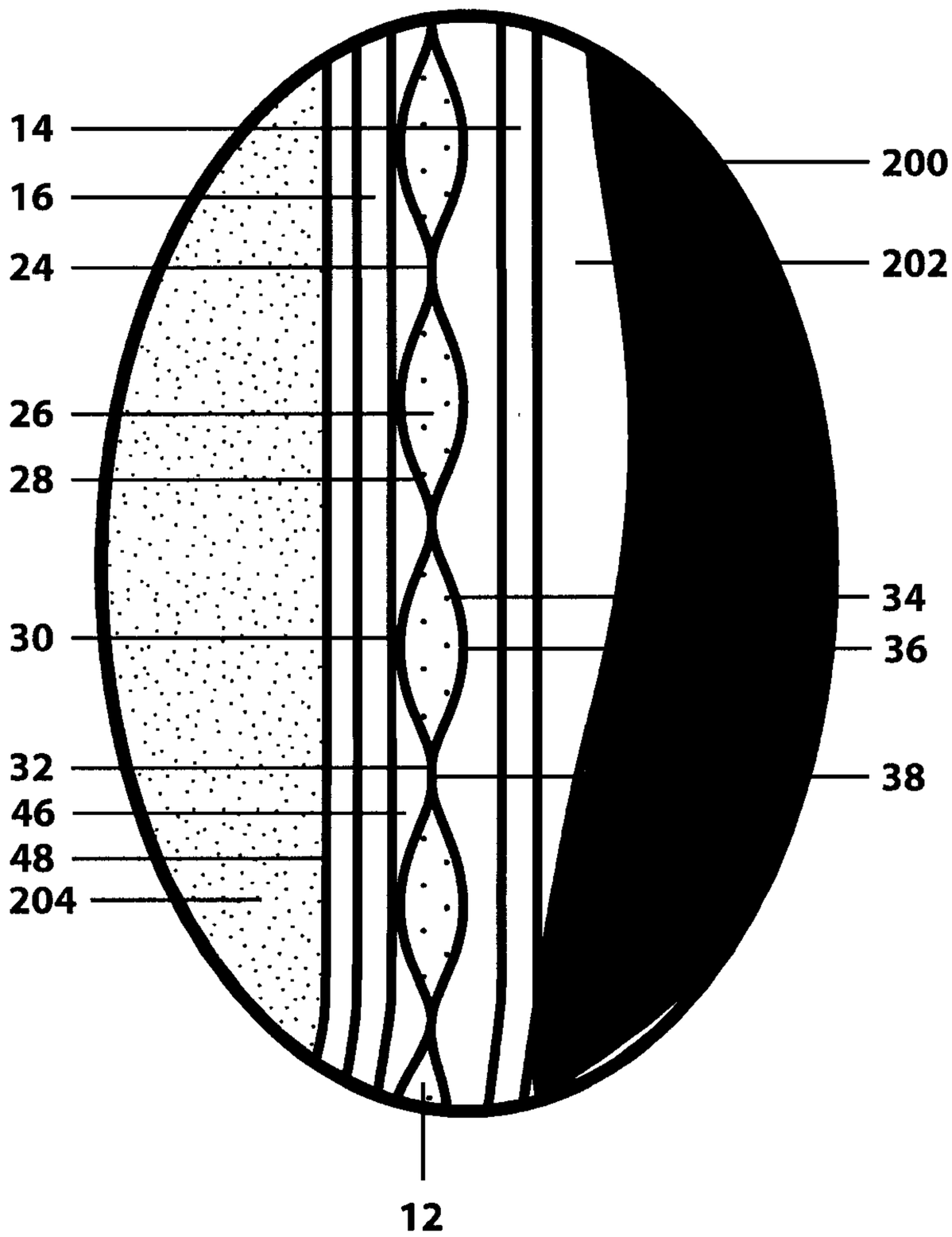


FIG. 4

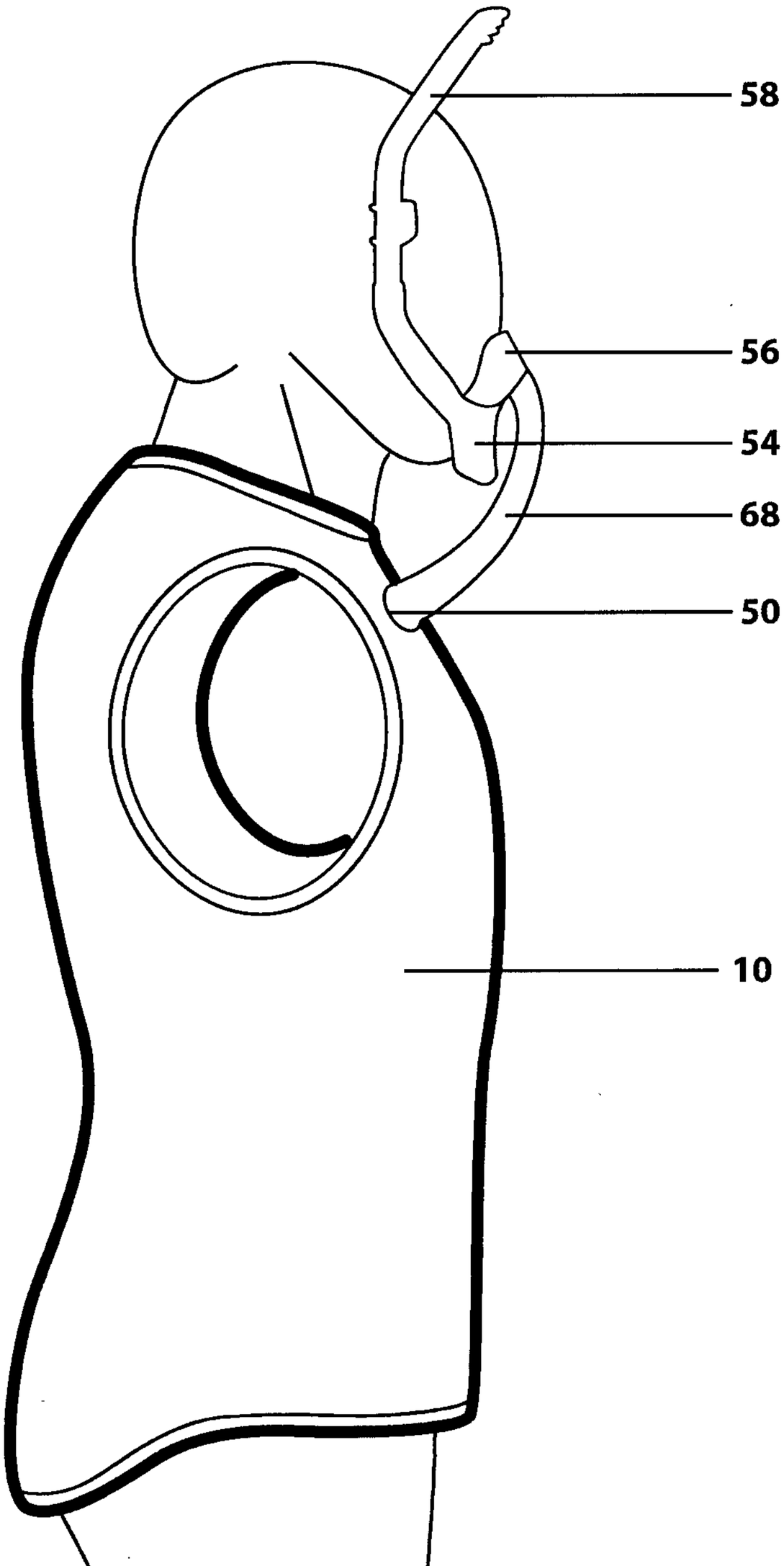


FIG. 4A

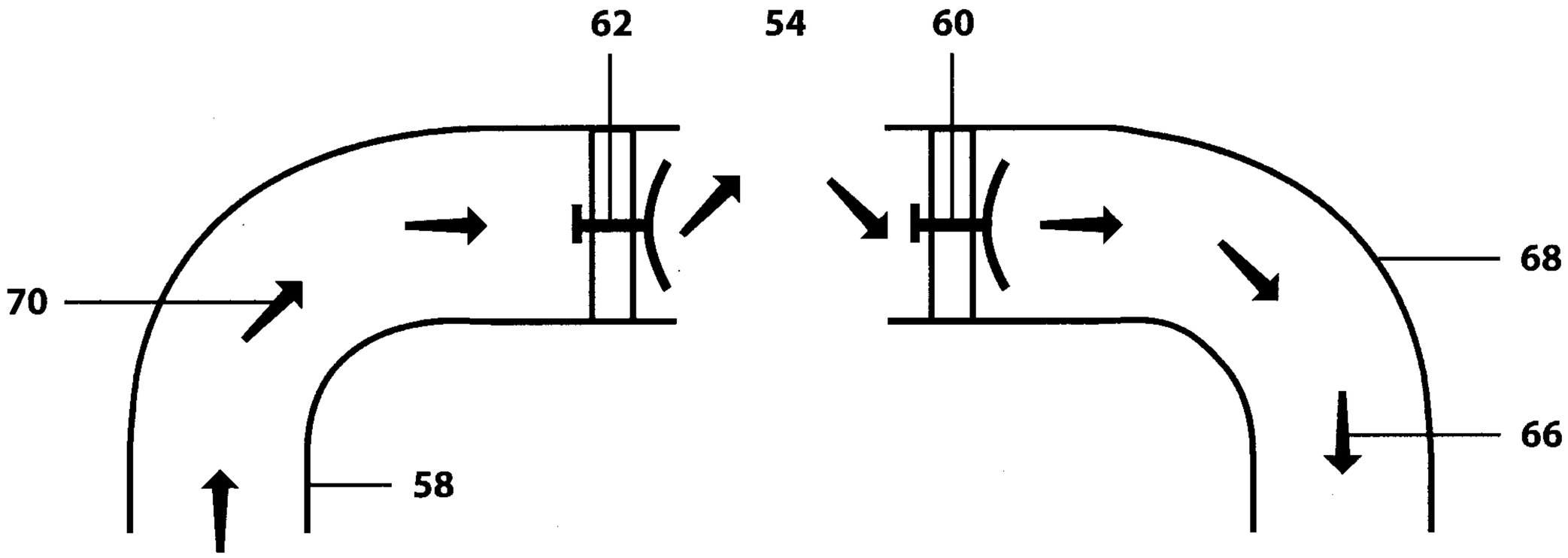


FIG. 5

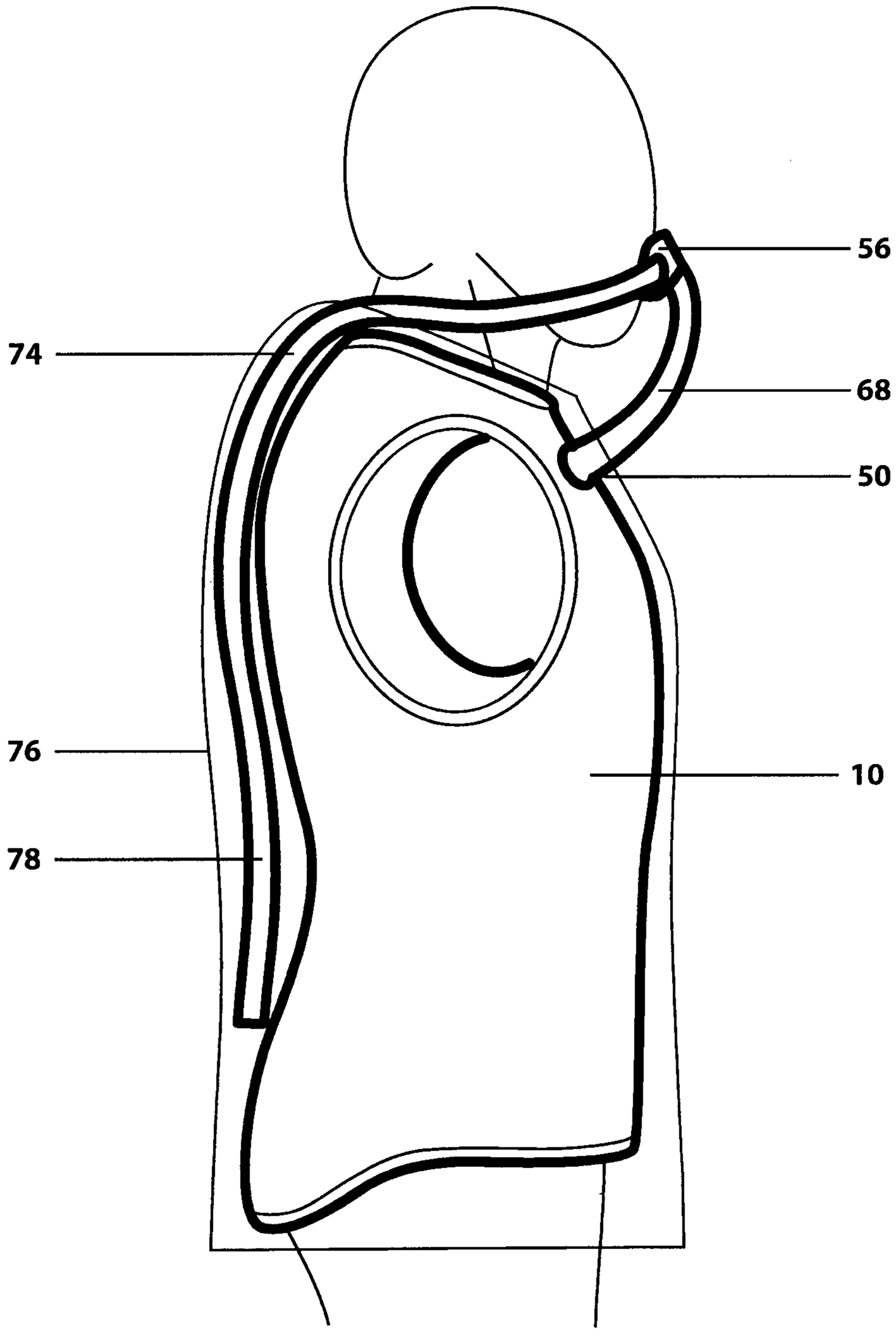
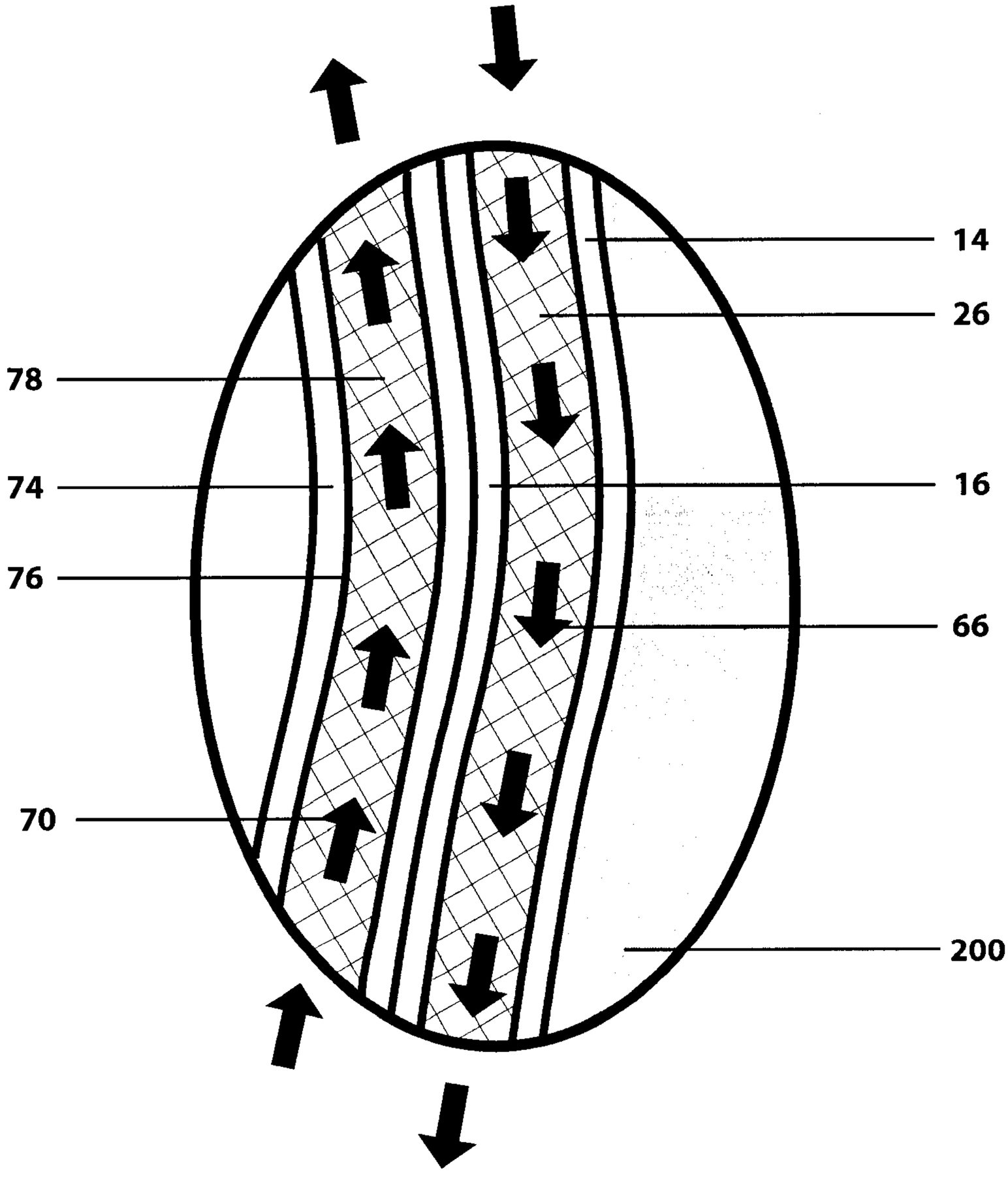
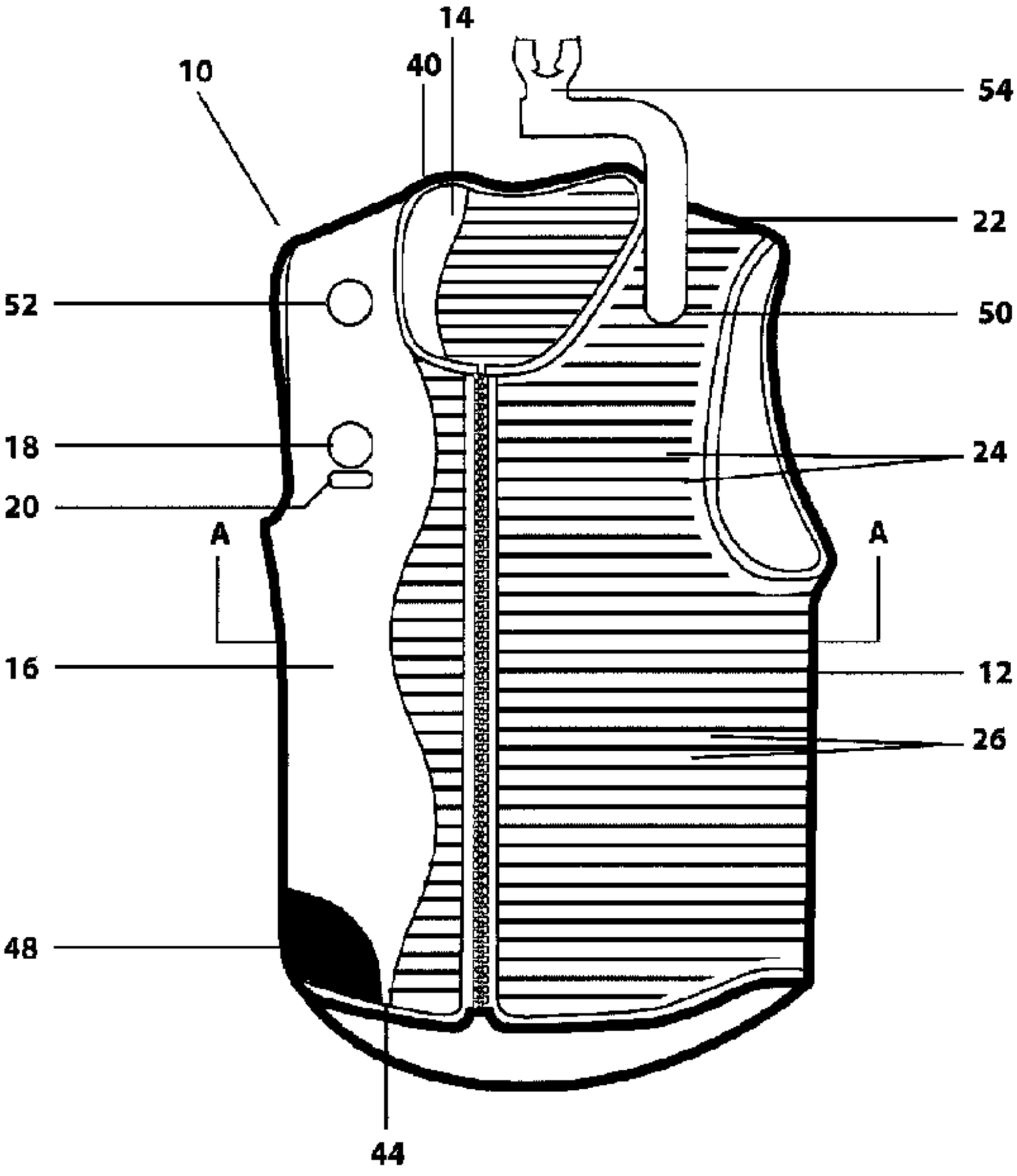


FIG. 5A

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