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(54) Medical air mattress

(57)

A medical air mattress has a mattress body (30), a lower bedspread (10), an upper bedspread (50) and a guardrail unit (60). The mattress body (30) is formed by multiple air cells parallelly arranged in an air cell row. The upper bedspread (50) covers the mattress body (30) and has two guardrail sleeves (52) formed on the upper bedspread (50). The guardrail unit (60) has multiple guardrail air cells (61) mounted respectively in the guardrail sleeves (52). Since the guardrail sleeves (52) are formed on the upper bedspread (50), the guardrail sleeves (52) from each opposite side of the upper bedspread (50) will draw each other to maintain the guardrail sleeves (52) in position when pressed. Therefore, the guardrail sleeves (52) do not fall down when pressed to remain providing optimal protection purpose.

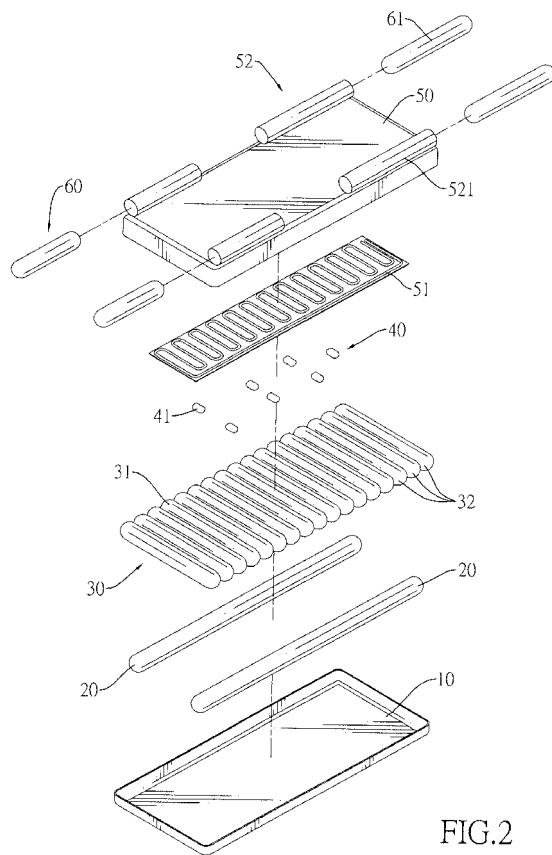


FIG.2

Description

[0001] The present invention relates to a medical air mattress, especially to a medical air mattress for anti-decubitus purposes.

[0002] For patients who have physical difficulties with mobility or bedfast. Patients lying on a mattress over a long period of time are susceptible to develop decubitus ulcers on multiple areas of body due to continuous pressure. In order to minimize or eliminate the development of decubitus ulcers caretakers must turn patients' body over or move patient to alternate the areas of pressure on the body. The conventional medical air mattress was developed to assist in the manual movement of and alternating pressure areas on the patient using multiple odd and even cells alternatively inflated to generate wave motion for changing the contact areas of the patient's body. The conventional medical air mattress has the following inadequacies.

1. Because the patients lying on the conventional air mattress have difficulty with mobility or bedfast, the protective apparatus around the conventional air mattress is important to keep the patient from falling off of the mattress. Hospital beds, which a medical mattress is used on, are equipped with guardrails; which at times can prohibit medical staff from taking care of the patients lying on the hospital beds and cannot always be in optimal position for patient protection. Many patients require the continued therapy of a medical air mattress in their homes. The medical air mattress is also required to assist caretakers move patient with minimal manual labor. In many cases the home is not equipped with guardrails on the bed that the medical air mattress is being used. The conventional medical air mattress has air filled guardrails to protect patients and to assist caretakers, who can easily press down the air guardrails. Such guardrails cannot be inflated or deflated independently. If the patient accidentally compresses either air guardrail, such air guardrails will slant outward and cannot protect the patient anymore, causing the opportunity for the patient to fall from mattress. Such air guardrails have no connection with the upper bedspreads, only being connected to the lower bedspreads restrict the ability to have mutual-drawing power to each other from two-side on the upper bedspreads.

2. To assist patients in turning over, two inclined cells are mounted under the body air cells. When the patients need to turn over, one of the inclined cells inflates to tilt the conventional air mattress. This design offers only one inclined angle. Patients with varying disabilities will require different inclined positions, which are decided by physicians or patient discomfort. In the event that the patient requires a different angle than that offered by the conventional air mattress caretakers may use non-recommended acces-

sories or the therapy cannot be provided. Either of these options put the patient at risk of injury.

[0003] The present invention provides a medical air mattress to mitigate or obviate the aforementioned inadequacies.

[0004] The main objective of the present invention is to provide a medical air mattress that will have mutual-drawing guardrail sleeves to keep the guardrail sleeves from tilting when being pressed. The medical air mattress has a mattress body, an upper bedspread and a guardrail unit. The mattress body is formed by multiple air cells parallelly arranged in an air cell row. The upper bedspread covers the mattress body and has guardrail sleeves on two-side formed on the top of the upper bedspread. The guardrail unit has multiple guardrail air cells mounted respectively in the guardrail sleeves. The guardrail sleeves are formed on the upper bedspread, the upper bedspread and the guardrail sleeves will draw each other on two-side to ensure the guardrail sleeves remain in position when pressed. Therefore, the guardrail sleeves will not fall down when pressed and continue to provide optimal protection for the patient as its intended purpose.

[0005] Other objectives, advantages and novel features of the invention will become more apparent from the following detailed description when reviewed in conjunction with the accompanying drawings.

IN THE DRAWINGS

[0006]

Fig. 1 is a perspective view of a medical air mattress in accordance with the present invention;

Fig. 2 is an exploded perspective view of the medical air mattress in Fig. 1;

Fig. 3 is a pipeline diagram of the medical air mattress in Fig. 1;

Fig. 3A is a pipeline diagram of the medical air mattress in Fig. 1;

Fig. 4 is an operational side view in partial section of the medical air mattress in Fig. 1, showing the body air cells all inflated;

Fig. 5 is an operational side view in partial section of the medical air mattress in Fig. 1, showing the odd body air cells inflated;

Fig. 6 is an operational side view in partial section of the medical air mattress in Fig. 1, showing the even body air cells inflated;

Fig. 7 is an operational end view in partial section of the medical air mattress in Fig. 1, showing the left side inclined air cell inflated;

Fig. 8 is an exploded perspective view of another embodiment of a medical air mattress in accordance with the present invention;

Fig. 9 is a pipeline diagram of the medical air mattress in Fig. 8;

Fig. 10 is an operational end view in partial section of the medical air mattress in Fig. 8, showing the odd body air cells inflated;

Fig. 11 is an operational end view in partial section of the medical air mattress in Fig. 8, showing the even body air cells inflated;

Fig. 12 is an operational end view in partial section of the medical air mattress in Fig. 8, showing the left side inclined air cell and all body air cells inflated;

Fig. 13 is an operational end view in partial section of the medical air mattress in Fig. 8, showing the right side inclined air cell and even body air cells inflated; and

Fig. 14 is an operational end view in partial section of the medical air mattress in Fig. 8, showing the left side inclined air cell and odd body air cells inflated.

[0007] With reference to Figs. 1 and 2, a first embodiment of a medical air mattress in accordance with the present invention comprises a lower bedspread 10, two inclined air cells 20, a mattress body 30, an upper bedspread 50 and a guardrail unit 60.

[0008] The inclined air cells 20 are mounted longitudinally on the lower bedspread 10; respectively near two sides of the lower bedspread 10 and are parallel to each other.

[0009] The mattress body 30 is mounted on the lower bedspread 10, which is mounted across the inclined air cells 20 comprising of multiple body air cells 31 and multiple head air cells 32. In a preferred embodiment, the mattress body 30 comprises three head air cells 32. Each body air cell 31 and each head air cell 32 are tubular and respectively uniform in diameter. The head air cells 32 have the same diameter with the body air cells 31. The body air cells 31 and the head air cells 32 are parallel to each other and are arranged in a row to form an air cell row. The head air cells 32 are arranged at a head end in the air cell row, i.e. the head air cells 32 arranged at first to third in the air cell row. The body air cells 31 are arranged at fourth to seventeenth in the air cell row.

[0010] The upper bedspread 50 covers the mattress body 30 and is connected securely to the lower bedspread 10. A heat unit 51 is installed right under the upper bedspread 50 and above mattress body 30 for heating. The heat unit 51 may be carbon fiber electrothermal sheet. The upper bedspread 50 has guardrail sleeves 52. The guardrail sleeves 52 are formed parallel on two-side of the upper bedspread 50 and are respectively formed adjacent to the edges of two sides of the upper bedspread 50. In a preferred embodiment, the guardrail sleeves 52 are stitched on the upper bedspread 50. Each guardrail sleeve 52 has at least one sleeve body 521. In a preferred embodiment, each guardrail sleeve 52 has two sleeve bodies 521 formed separately and aligning with and coaxial to each other.

[0011] The medical air mattress as described further comprises a massage unit 40 mounted on the mattress body 30. The massage unit 40 comprises multiple micro

vibrators 41 to massage the patients lying on the medical air mattress as described. Those micro vibrators 41 distribute massage separately and respectively to patient's neck, back, waist, thighs and so on.

[0012] The guardrail air unit 60 is mounted in the guardrail sleeves 52 and comprises multiple guardrail air cells 61. The guardrail air cells 61 are mounted respectively in the sleeve bodies 521 of the guardrail sleeve 52.

[0013] With reference to Fig. 3, the medical air mattress as described comprises a pumping assembly 70. The pumping assembly 70 is connected to and selectively inflates the inclined air cells 20, the body air cells 31, the head air cells 32 and the guardrail air cells 61. In a preferred embodiment, the pumping assembly 70 comprises a pump 71, an inclined pipeline 72, an odd body pipeline 73, an even body pipeline 74, a guardrail pipeline 77 and a rapidly releasing valve 78. The inclined pipeline 72 connects the pump 71 with the inclined air cells 20. The odd body pipeline 73 connects the pump 71 with the body air cells 31 and the head air cells 32 at odd rows of the air cell rows. The even body pipeline 74 connects the pump 71 with the body air cells 31 and the head air cells 32 at even rows of the air cell rows. The guardrail pipeline 77 connects the pump 71 with the guardrail air cells 61. The rapidly releasing valve 78 is connected to the odd body pipeline 73 and the even body pipeline 74 for rapidly releasing the air in the mattress body 30 for emergency uses. For example, when the patient needs C.P.R., the medical air mattress as described needs not be removed or the patient needs not be moved since the mattress body 30 is rapidly deflated to rescue the patient immediately.

[0014] In a preferred embodiment, the pump 71 is connected to an inclined alternating-valve 701 and a body alternating-valve 702. An inclined solenoid valve 703 is also connected between the inclined alternating-valve 701 and the pump 71. The inclined alternating-valve 701 is connected between the inclined solenoid valve 703 and the inclined pipeline 72. The body alternating-valve 702 is connected between the pump 71 with the body pipelines 73, 74 and the guardrail pipeline 77. The guardrail pipeline 77 is connected to the body alternating-valve 702 via a guardrail solenoid valve 772. The odd body pipeline 73 is connected to the head air cells 32 via a check valve 731. The even body pipeline 74 is connected to the head air cells 32 via a check valve 741. The body alternating-valve 702 is connected to the guardrail solenoid valve 772 via a check valve 771.

[0015] With reference to Fig. 3A, the deflating unit for the guardrail air cells 61 may be a manual alternating device 772A. The user controls the manual alternating device 772A to stop inflating the guardrail air cells 61. The manual alternating device 772A has an air inlet, an inflating opening, a deflating opening, a linking rod, two airflow washers, an air restricting washer and a resilient element. The air inlet is connected to the body alternating-valve 702. The inflating opening is connected to the guardrail air cells 61 through the guardrail pipeline 77.

The deflating opening communicates with the exterior. When inflating, the deflating opening is closed and the inflating opening is opened to inflate the guardrail air cells 61. When deflating, the resilient element, the linking rod and the air-resisting washer are manually moved to close the inflating opening and to open the deflating opening. Then the guardrail air cells 61 are deflated independently.

[0016] When the medical air mattress as described is operated, the pump 71, the alternating-valves and the solenoid valves are actuated to inflate the air cells and to adjust the inflating. The inflating and the deflating operations are described detailedly below.

[0017] For guardrail air cells 61, when the pump 71 is operated, the guardrail air cells 61 are inflated to expand the guardrail sleeves 52 to provide side protections on the upper bedspread 50. When the patients lying on the upper bedspread 50 accidentally press on the guardrail sleeves 52, the guardrail sleeves 52 on both sides are drawn by each other since the guardrail sleeves 52 are formed on two-side of the upper bedspread 50. The drawing force keeps the guardrail sleeves 52 maintaining their shapes even being pressed. Therefore, the guardrail sleeves 52 are kept in position to protect the patients lying on the medical air mattress as described. Further, the check valve 771 keeps the air from back flowing when the body alternating-valve 702 is operated.

[0018] For the mattress body, when the pump 71 is operated, user may select different modes.

1. Full inflating mode:

With reference to Figs. 3 and 4, the pump 71 is operated to inflate the body air cells 31 and the head air cells 32.

2. Alternating inflating mode:

With reference to Figs. 3, 5 and 6, the pump 71 is operated and inflates the body air cells 31 at odd or even rows of the air cell rows alternately. In a preferred embodiment, the body alternating-valve 702 accomplishes the alternating inflating. The pump 71 supplies air into the body alternating-valve 702. The body alternating-valve 702 alternately supplies air into odd or even body pipelines 73, 74. When the odd body pipeline 73 is inflated, the body air cells 31 at odd rows of the air cell rows are inflated and the body air cells 31 at even rows of the air cell rows are deflated as shown in Fig. 5. When the even body pipeline 74 is inflated, the body air cells 31 at even rows of the air cell rows are inflated and the body air cells 31 at odd rows of the air cell rows are deflated as shown in Fig. 6. Moreover, since the check valves 731, 741 are connected between the head air cells 32 with the odd and even body pipelines 73, 74, the head air cells 32 are kept inflated without deflating by the body

alternating-valve 702 to support the patient's head stably.

[0019] For the inclined air cells 20 as shown in Figs. 3 and 7, the pump 71 is operated to inflate one of the inclined air cells 20 to tilt one side of the medical air mattress as described so that the patient is to be turned over easily. In a preferred embodiment, the inclined alternating-valve 701 is operated to inflate the inclined air cells 20 alternately.

[0020] With reference to Figs. 8 and 9, a second embodiment of a medical air mattress in accordance with the present invention is similar to the first embodiment as described, but the body air cells 31A of the body mattress 30A are conical. Each body air cell 31A gradually tapers in diameter from one end to the other end so that each body air cell 31A has a wide end and a narrow end. The body air cells 31A are arranged with wide ends adjacent to the narrow ends. For example, the wide ends of the body air cells 31A at odd rows of the air cell rows align with the narrow ends of the body air cells 31A at even rows of the air cell rows. The medical air mattress as described further comprises two offset air cells 34A mounted longitudinally and mounted respectively on two sides of the mattress body 30A to enlarge the area of the medical air mattress and to support the upper bedspread 50A. The offset air cells 34A are connected to the pipeline connecting to the head air cells 32A and are also protected by the check valves 731, 741 to maintain inflating.

[0021] When the medical air mattress as described is operated, the pump 71A, the alternating-valves and the solenoid valves are also actuated to inflate the air cells and to alternatively adjust the inflating. Since most operations are discussed above, only different operations are described below for the second embodiment of the medical air mattress.

[0022] For mattress body 30A, when the pump 71A is operated, user may select different modes.

1. Full inflating mode:

The pump 71A is operated to inflate all the body air cells 31A and the head air cells 32A.

2. Alternating inflating mode:

With reference to Figs. 9 to 11, the pump 71A is operated and inflates the body air cells 31A at odd or even rows of the air cell rows alternatively. When the body air cells 31A at odd rows of the air cell rows are inflated, the body air cells 31A at even rows of the air cell rows are deflated as shown in Fig. 10. Since the body air cells 31A at odd rows of the air cell rows have wide left ends and narrow right ends, the mattress body 30A is higher at left side and lower at right side to tilt the patient rightward. When the body air cells 31A at even rows of the air cell rows are

inflated, the body air cells 31A at odd rows of the air cell rows are deflated as shown in Fig. 11. Since the body air cells 31A at even rows of the air cell rows have wide right ends and narrow left ends, the mattress body 30A is higher at right side and lower at left side to tilt the patient leftward. Therefore, the alternating inflating of the body air cells 31A not only provides the alternative wave of the mattress body 30A, but also tilts the patient at certain inclined angle. In this embodiment, the body air cells 31 A provides inclined angle at, said 20 degrees.

[0023] With reference to Figs. 9 and 12 to 14, the alternating inflating of the body air cells 31A associated with the inclined air cells 20A provides more different inclined angles.

[0024] When all of the body air cells 31A are inflated and one of the inclined air cells 20A is inflated as shown in Fig. 12, the top surface of the upper bedspread 50A is tilted to one side to provide an inclined angle at, said 10 degrees.

[0025] When the body air cells 31 A at even rows of the air cell rows are inflated and the body air cells 31A at odd rows of the air cell rows are deflated, the inclined air cell 20A at right side is also simultaneously inflated to provide a totally added inclined angle at, said 30 degrees.

[0026] When the body air cells 31A at odd rows of the air cell rows are inflated and the body air cells 31A at even rows of the air cell rows are deflated, the inclined air cell 20A at left side is also inflated to provide an inclined angle at, said 30 degrees.

[0027] The medical air mattress in accordance with the present invention has numerous advantages. With the guardrail sleeves 52 formed on the top of the upper bedspread 50, the mutual drawing-force between the guardrail sleeves 52 from 2-opposite side of the upper bedspread 50 holds the guardrail sleeves 52 in position to protect the patient lying on the medical air mattress. Furthermore, the body air cells 31A in conical shape associated with the inclined air cells 20A provide multiple inclined angles. Therefore, different patients may choose a proper inclined angle they need or as instructed by the doctor.

[0028] Even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and features of the invention, the above disclosure is illustrative only. Changes may be made in the details, especially in matters of shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

Claims

1. A medical air mattress, **characterized in that** the medical air mattress has
 - a lower bedspread (10);
 - two inclined air cells (20) mounted longitudinally on the lower bedspread (10), respectively near two sides of the lower bedspread 10 and parallel to each other;
 - a mattress body (30) mounted on the lower bedspread (10), mounted across the inclined air cells (20) and comprising multiple body air cells (31) and multiple head air cells (32) parallel to each other and arranged in a row to form an air cell row, wherein the head air cells (32) are arranged at a head end in the air cell row;
 - an upper bedspread (50) covering the mattress body (30), connected securely to the lower bedspread 10 and having guardrail sleeves (52) stitched separately on two-side of the upper bedspread (50), respectively formed adjacent to the edges of two sides of the upper bedspread (50), each guardrail sleeve having at least one sleeve body (521);
 - a guardrail unit (60) mounted in the guardrail sleeves (52) and comprising multiple guardrail air cells (61) mounted respectively in the sleeve bodies of the guardrail sleeve; and
 - a pumping assembly (70) to control inflating and deflating connected to and selectively inflating the inclined air cells (20), the body air cells (31), the head air cells (32) and the guardrail air cells (61), the pumping assembly (70) comprising:
 - a pump (71);
 - an inclined pipeline (72) connecting the pump (71) with the inclined air cells (20);
 - an odd body pipeline (73) connecting the pump (71) with the body air cells (31) and the head air cells (32) at odd rows of the air cell rows;
 - an even body pipeline (74) connecting the pump (71) with the body air cells (31) and the head air cells (32) at even rows of the air cell rows;
 - a guardrail pipeline (77) connecting the pump (71) with the guardrail air cells (61); and
 - a rapidly releasing valve (78) connected to the odd body pipeline (73) and the even body pipeline (74).
2. The medical air mattress as claimed in claim 1, wherein each guardrail sleeve has two sleeve bodies formed separately and aligning with and coaxial to each other.
3. The medical air mattress as claimed in claim 2, wherein the pumping assembly (70) further comprises:
 - a body alternating-valve (702) connected be-

- tween the pump (71) with the body pipelines (73,74) and the guardrail pipeline (77);
 a first check valve (731) connected between the odd body pipeline (73) and the head air cells (32) at odd rows of the air cell rows; and
 a second check valve (741) connected between the even body pipeline 74 and the head air cells (32) at even rows of the air cell rows.
4. The medical air mattress as claimed in claim 3, wherein the pumping assembly (70) further comprises:
- a guardrail solenoid valve (772) connected between the body alternating-valve (702) and the guardrail pipeline (77); and
 a third check valve (771) mounted between the body alternating-valve (702) and the guardrail solenoid valve.
5. The medical air mattress as claimed in claim 1, wherein the pumping assembly (70) further comprises:
- an inclined solenoid valve (703) connected to the pump (71); and
 an inclined alternating-valve (701) connected between the inclined solenoid valve (703) and the inclined pipeline (72).
6. The medical air mattress as claimed in claim 2, wherein the pumping assembly (70) further comprises:
- an inclined solenoid valve (703) connected to the pump (71); and
 an inclined alternating-valve (701) connected between the inclined solenoid valve (703) and the inclined pipeline (72).
7. The medical air mattress as claimed in claim 2, wherein each body air cell (31) and each head air cell (32) are respectively uniform in diameter.
8. The medical air mattress as claimed in claim 1, wherein each body air cell (31) gradually tapers in diameter from a wide end to a narrow end, and the body air cells (31) are arranged with wide ends adjacent to the narrow ends.
9. The medical air mattress as claimed in claim 2, wherein each body air cell (31) gradually tapers in diameter from a wide end to a narrow end, and the body air cells (31) are arranged with wide ends adjacent to the narrow ends.
10. The medical air mattress as claimed in claim 8, wherein the pumping assembly (70) further comprises:
- an inclined solenoid valve (703) connected to the pump (71); and
 an inclined alternating-valve (701) connected between the inclined solenoid valve (703) and the inclined pipeline (72).
11. The medical air mattress as claimed in claim 9, wherein the pumping assembly (70) further comprises:
- an inclined solenoid valve (703) connected to the pump (71); and
 an inclined alternating-valve (701) connected between the inclined solenoid valve (703) and the inclined pipeline (72).
12. The medical air mattress as claimed in claim 11, wherein the pumping assembly (70) further comprises:
- a body alternating-valve (702) connected between the pump (71) with the body pipelines and the guardrail pipeline (77);
 a first check valve (731) connected between the odd body pipeline (73) and the head air cells (32) at odd rows of the air cell rows; and
 a second check valve (741) connected between the even body pipeline (74) and the head air cells (32) at even rows of the air cell rows.
13. The medical air mattress as claimed in claim 2 further comprising a massage unit (40) mounted on the mattress body (30) and having multiple micro vibrators (41).
14. The medical air mattress as claimed in claim 2 further comprising a heat unit (51) made of carbon fiber electro thermal sheet and attached under-the upper bed-spread (50).
15. The medical air mattress as claimed in claim 3, wherein the pumping assembly (70) further comprises:
- a manual alternating device connected between the body alternating-valve (702) and the guardrail pipeline (77); and
 a third check valve (771) mounted between the body alternating-valve (702) and the manual alternating device.

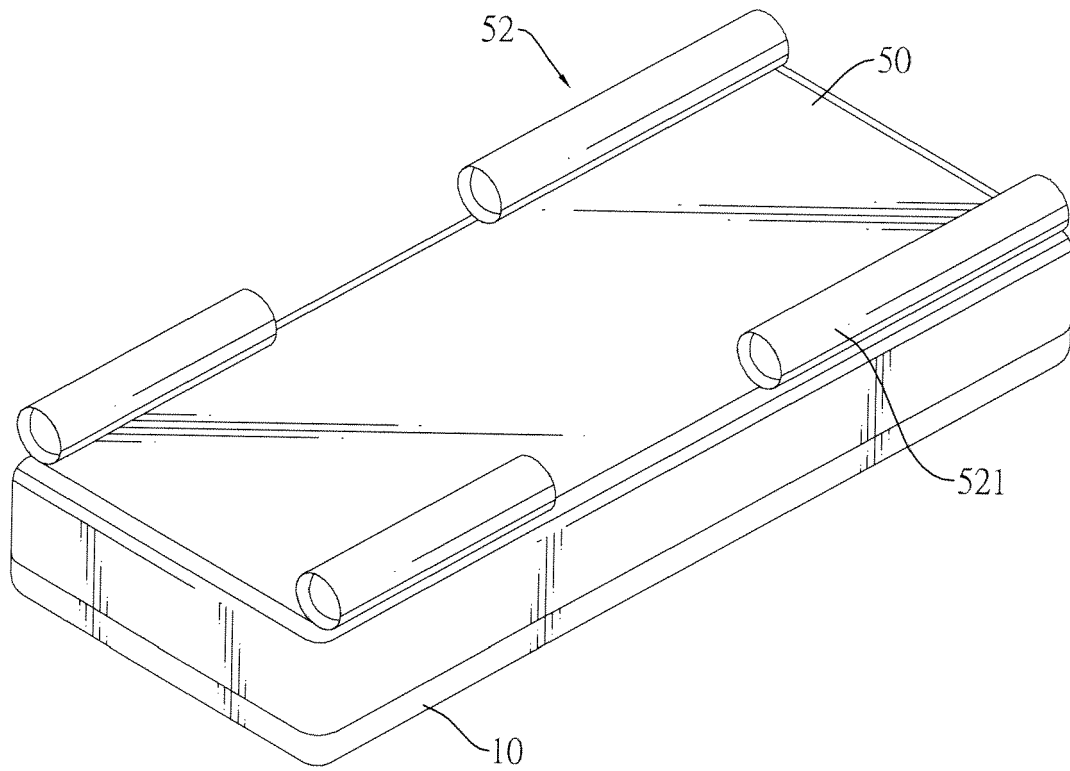


FIG.1

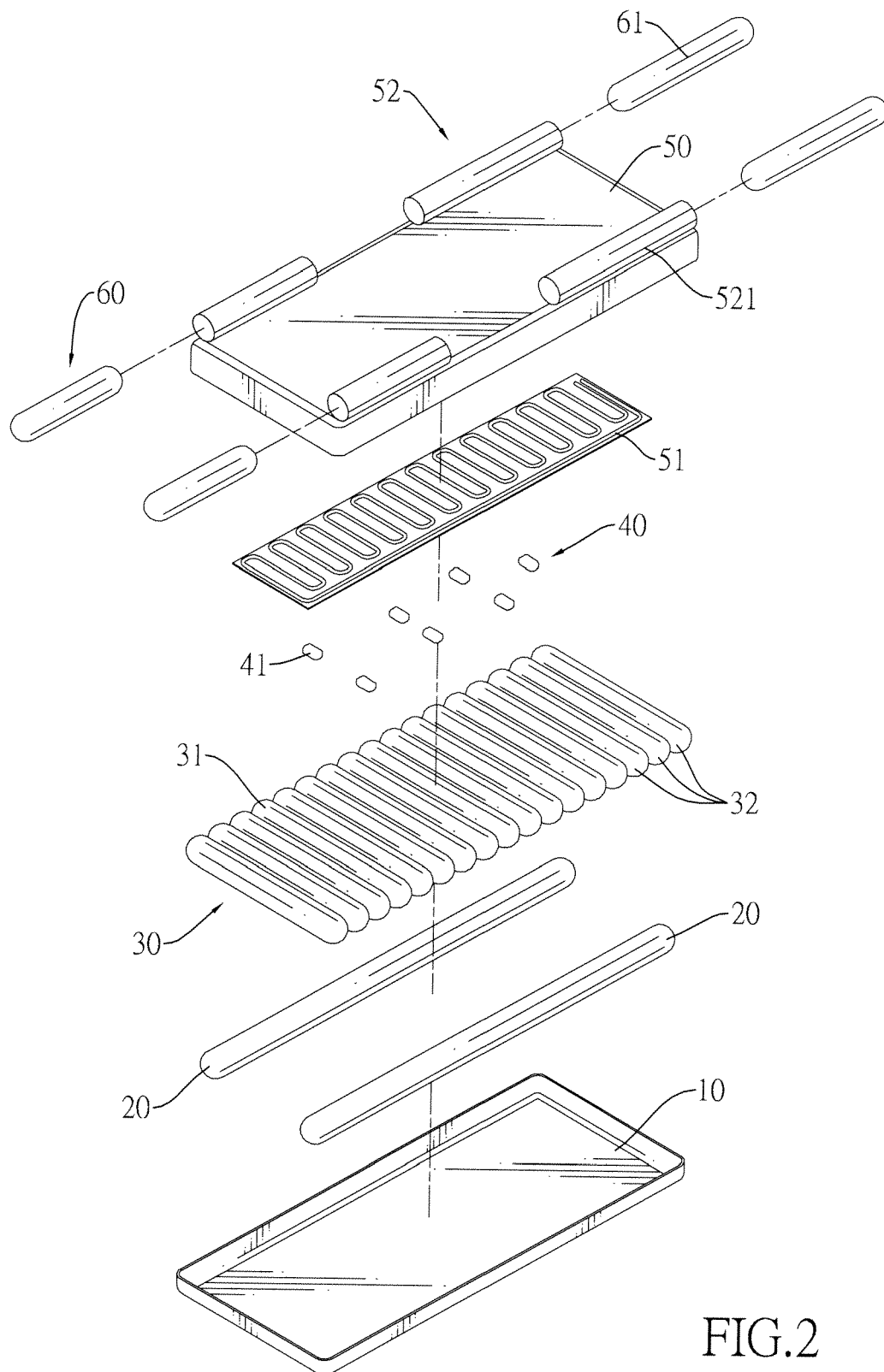


FIG.2

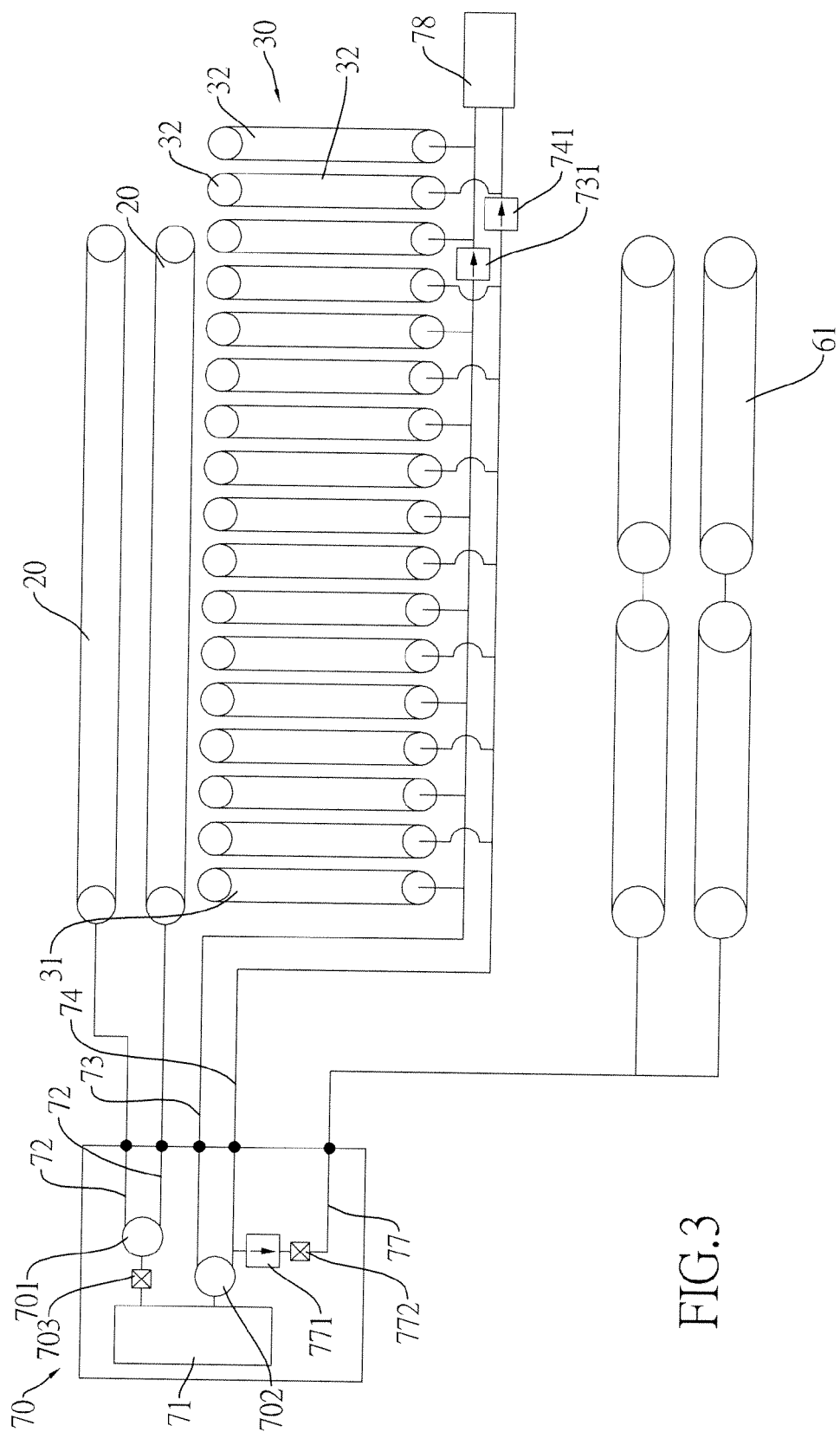


FIG.3

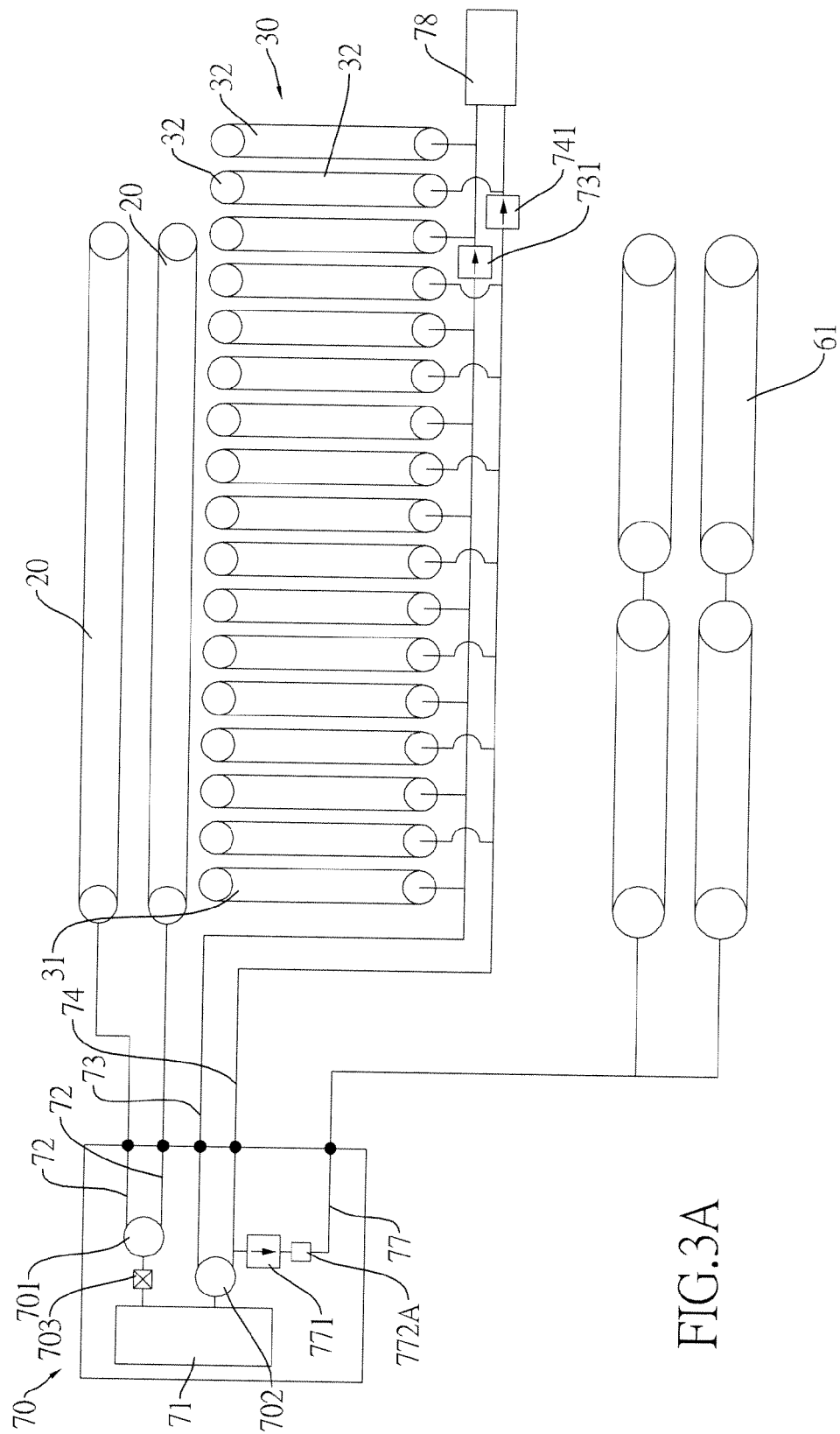


FIG.3A

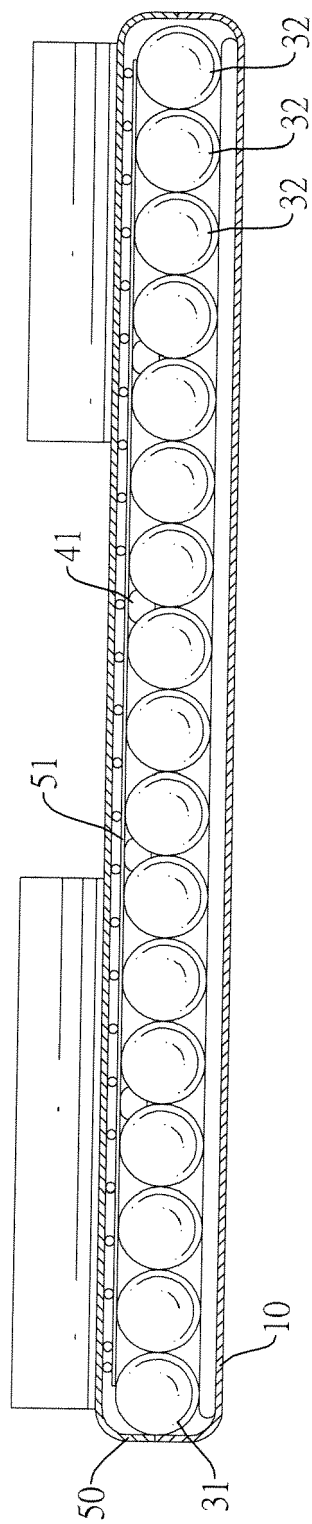


FIG. 4

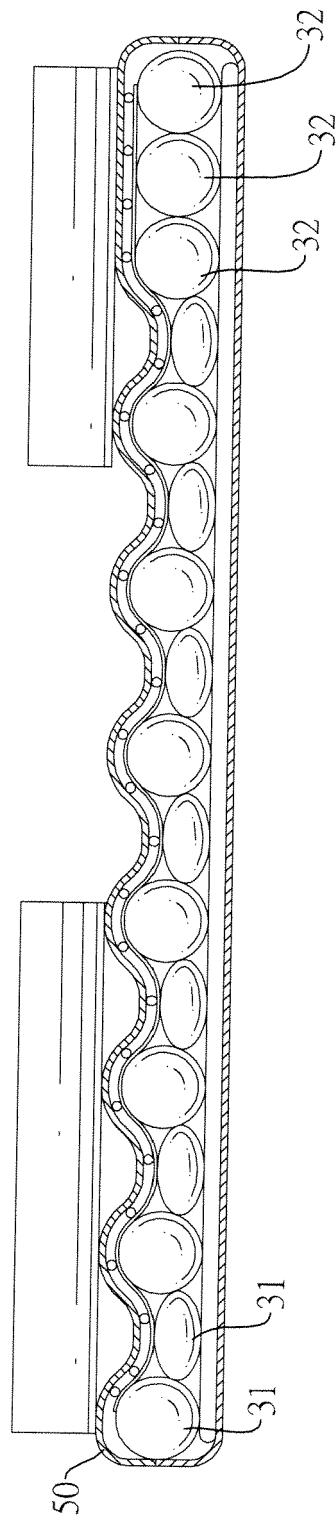


FIG. 5

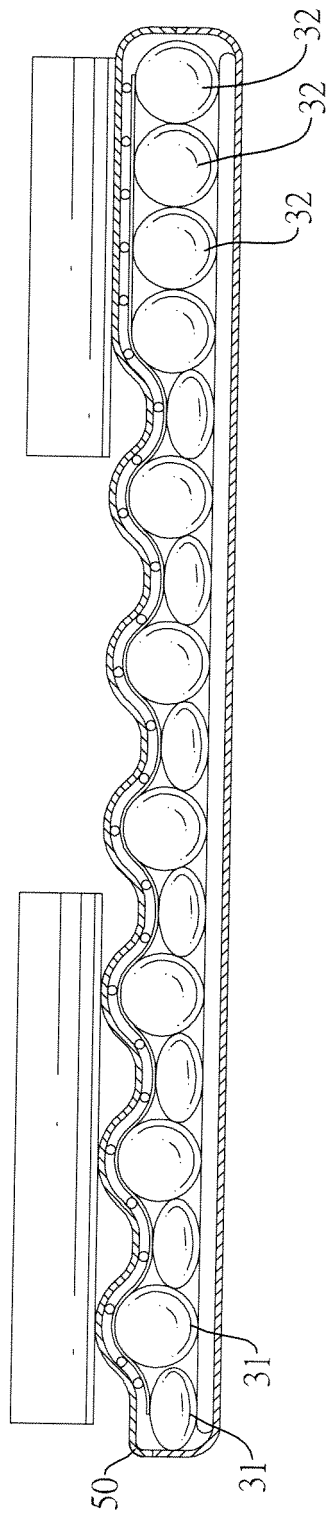


FIG.6

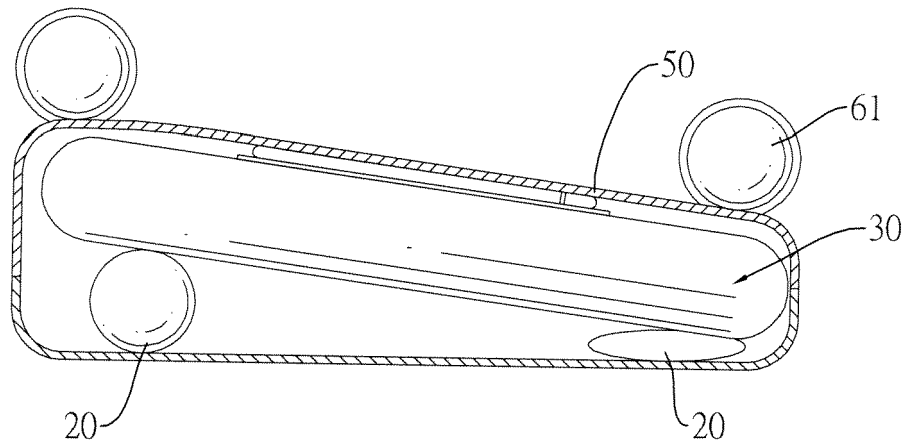
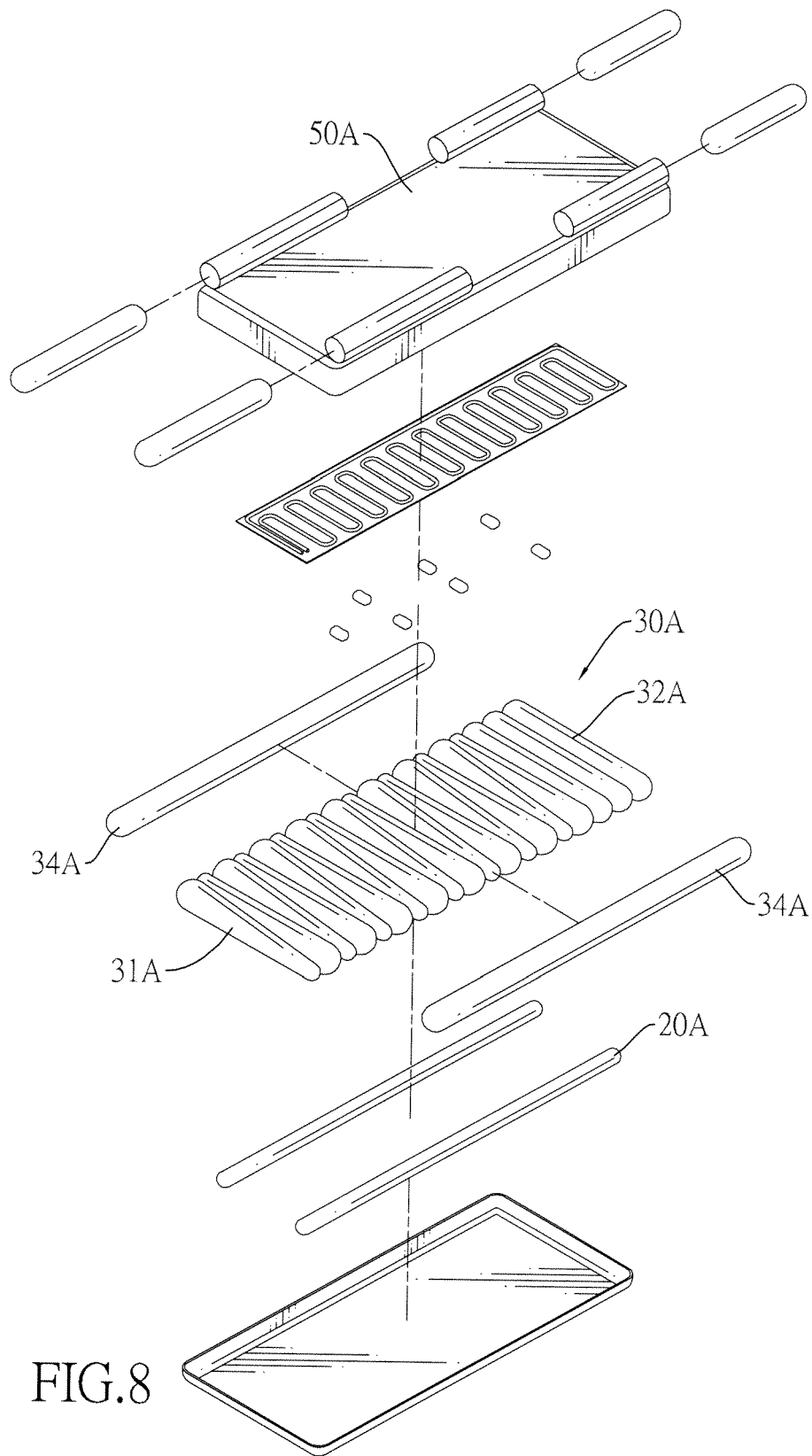


FIG.7



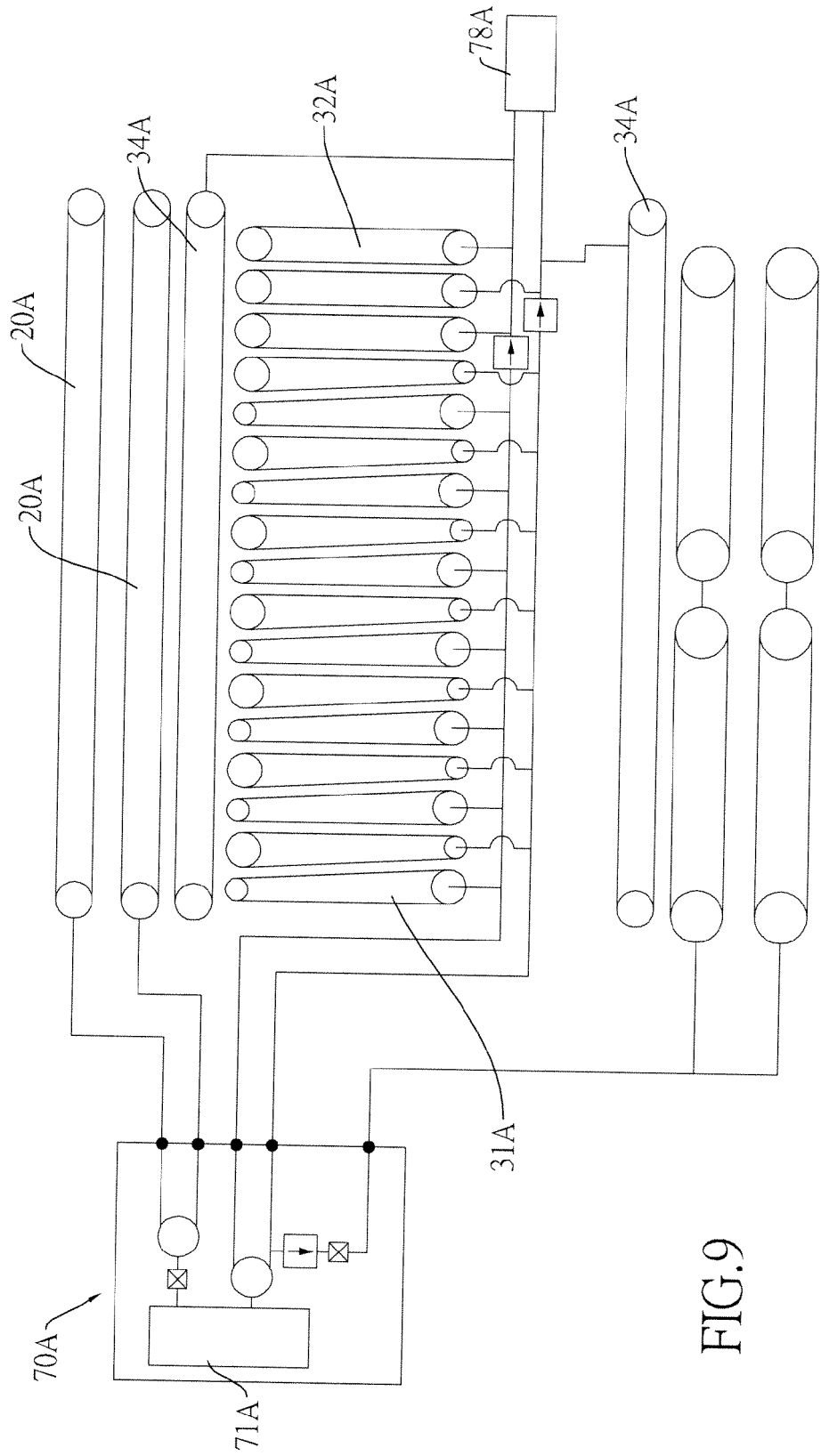


FIG.9

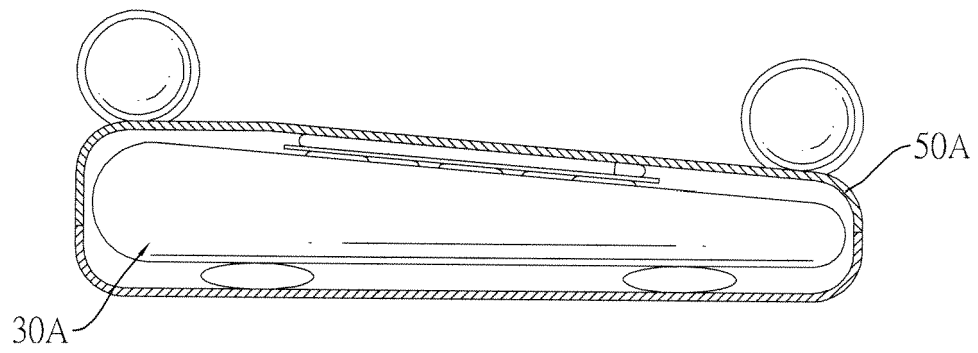


FIG.10

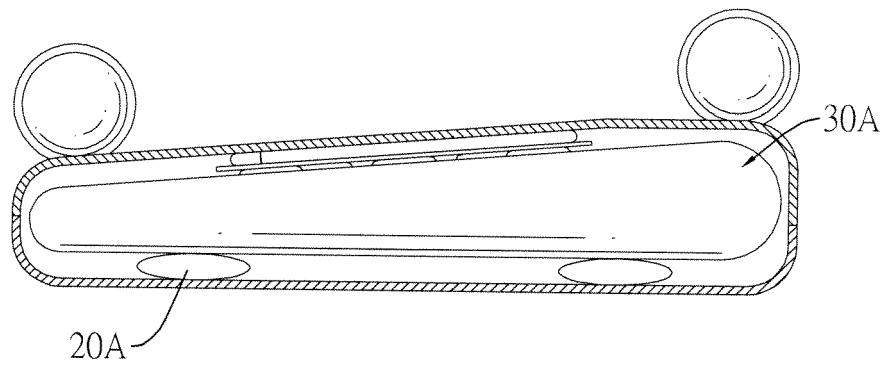


FIG.11

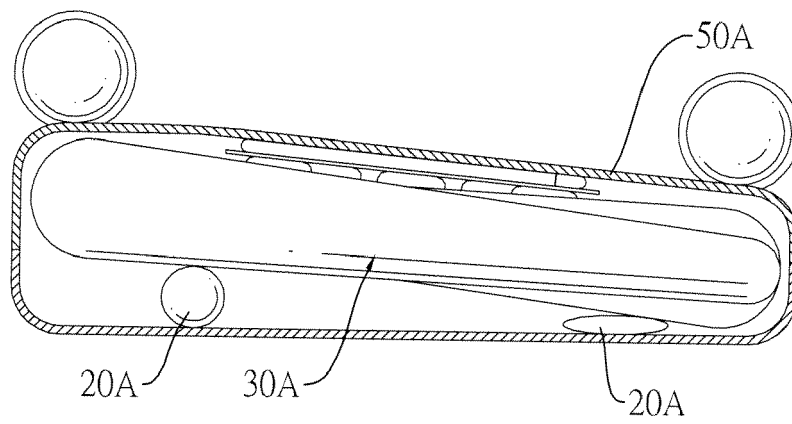


FIG.12

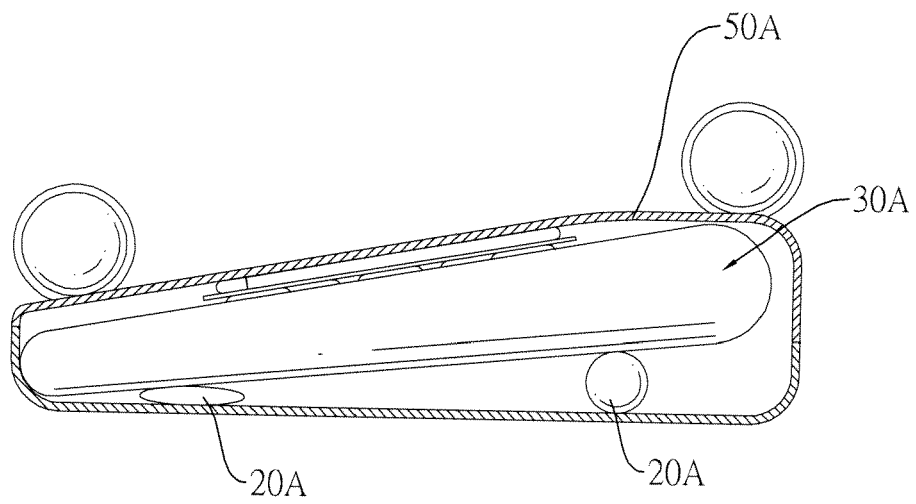


FIG.13

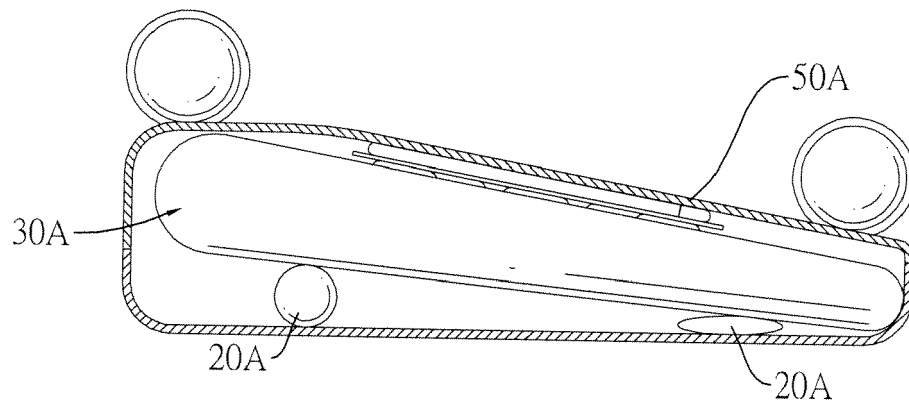


FIG.14



EUROPEAN SEARCH REPORT

Application Number
EP 11 17 0166

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 611 096 A (BARTLETT ALAN L [US] ET AL) 18 March 1997 (1997-03-18) * column 1, line 34 - line 37 * * column 2, line 6 - line 9 * * column 6, line 4 - column 7, line 34 * * column 8, line 44 - column 12, line 61 * * column 13, line 29 - line 54 * * column 14, line 23 - line 55 * * figures 3,4,7-12 * -----	1-15	INV. A61G7/057 ADD. A61G7/05
X	WO 02/38099 A2 (TEMPUR WORLD INC [US]; WYATT CHARLES C [US]; FONTAINE RICKY J [US]) 16 May 2002 (2002-05-16) * page 9 - page 11 * * figures 1-4,8-11 * -----	1	
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A	GB 2 469 540 A (OUTRAM FRANCIS WILLIAM [GB]) 20 October 2010 (2010-10-20) * page 5 - page 9 * * figures 1-11 * -----	1	TECHNICAL FIELDS SEARCHED (IPC) A61G A47C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 16 November 2011	Examiner Schiffmann, Rudolf
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 17 0166

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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