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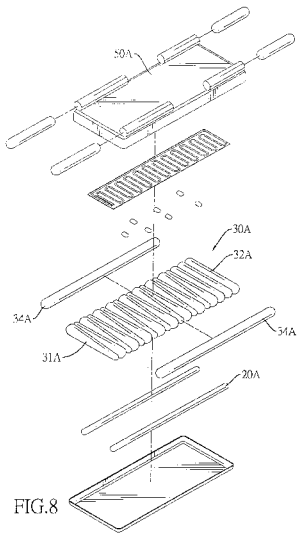


FIG.8

(57) Abstract: A medical air mattress has a mattress body (30), a lower bedspread (10) and an upper bedspread (50). The mattress body (30) is formed by multiple air cells substantially parallel arranged in a row forming an air cell row. The upper bedspread (50) covers the mattress body (30) and is securely connected to the lower bedspread (10). The mattress further comprises a pumping assembly (70) with a pump (71) and at least a pipeline connecting the pump (71) with the air cells such that inflating and/or deflating of the air cells is controllable selectively.

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MEDICAL AIR MATTRESS, METHOD TO INFLATE/DEFLATE A MEDICAL AIR MATTRESS AND METHOD TO INCLINE THE BEARING SURFACE OF A MEDICAL AIR MATTRESS

FIELD OF THE INVENTION

The present invention is related to a medical air mattress according to the first parts of claims 1, 5, 6, 11 12 and 20, especially to a medical air mattress for anti-decubitus purposes. Thus the medical air mattress comprises a lower bedspread and a mattress body mounted on the lower bedspread. The mattress body comprises multiple body air cells substantially parallel to each other arranged in a row forming an air cell row. The mattress can additionally comprise head air cells, wherein the head air cells are arranged at a head end in the air cell row. The mattress further comprises an upper bedspread covering the mattress body and connected securely to the lower bedspread. It further comprises a pumping assembly with a pump and at least a pipeline connecting the pump with the air cells.

The invention is further related to a method for inflating and/or deflating a generic medical air mattress according to the first part of claim 32, to a method to incline the

surface of a medical air mattress according to the first part of claim 33 and to a method to generate in medical air mattress a position for receiving a container according to the first part of claim 36.

TECHNICAL BACKGROUND

Patients who have physical difficulties with mobility or bedfast mostly lie on a mattress over a long period of time and are thus 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 to generate wave motion for changing the contact areas of the patient's body. The conventional medical air mattress has the following inadequacies.

To assist patients in turning over, two inclination providing cells are mounted under the body air cells. When the patients need to turn over, one of the inclination providing cells inflates to tilt the conventional air mattress. This design offers only one inclination angle. Patients with varying disabilities will require different inclination positions, which are decided by physicians or the patient's discomfort. In the event that the patient requires a different angle than that offered by the conventional air mattress caretakers may use non-recommended accessories or the therapy cannot be provided. Either of these options put the patient at risk of injury.

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 mat-

tress is also required to assist caretakers moving the 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 can have air filled guardrails to protect patients and to assist caretakers, who can easily press down the air guardrails. 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.

Further difficulties with handling a conventional air mattress occur when the patients lying on the mattress need to use a bedpan. The conventional air mattress has several detachable air cells, which correspond to the position of the patient's hip. A mattress according to the state of the art is presented in Fig. 11A, which is described more detailed later. When the detachable air cells are removed to form a recess, the bedpan will be able to be put into the recess for use. However, to prevent secondary infection and to be cleaned with ease, the conventional air mattress has an upper bedspread to cover on the air cells. Therefore, the upper bedspread needs to be removed before the detachable air cells are removed. Removing the upper bedspread still requires the need to move the patient lying on the conventional air mattress. The design of detachable air cells is inconvenient to caretakers since the patient still needs to leave the conventional air mattress. Furthermore moving the patient and removing the upper bedspread requires two or more individuals. This is an inefficient use of time and human resources, and the detachable air cells do not function as what the original design expected.

DESCRIPTION OF THE INVENTION

It is an object of the present invention to provide a medical air mattress with improved handling, improved possibilities to assist movement of the patient and to mitigate or obviate the aforementioned inadequacies.

This problem is solved by a medical air mattress according to claims 1, 5, 6, 11 12 and 20. Thus the pipeline connected to the pump and/or to the air cells is adapted to control inflating and/or deflating of the air cells selectively. With respect to this selectively means, that a chosen air cell or a group of chosen air cells can be inflated and/or deflated independently without inflating and/or deflating the rest of the air cells, that is to say without inflating and/or deflating one or more not chosen air cells.

The problem according to the invention is further solved by a method for inflating and/or deflating a medical air mattress according to claim 32, by a method to incline the surface of a medical air mattress according to claim 33 and by a method to generate in a medical air mattress a position for receiving a container according to claim 36. Preferred embodiments of the invention are presented in the sub claims.

In order to generate movement in the bearing surface of the medical air mattress and in order to incline the surface of the mattress it is suggested to provide the medical air mattress with an odd body pipeline connecting the pump with the air cells at odd positions of the air cell row and with an even body pipeline connecting the pump with the air cells at even positions of the air cell row.

In order to improve the handling of a medical air mattress it is suggested to deflate some or all components of the medical air mattress according the invention in a very quick way – e. g. in case of an medical emergency – by a rapidly releasing valve. It can be connected to the pipeline, preferably to the odd body pipeline and the even body pipeline.

In order to provide a multiple inclination mode of the medical air mattress according to the invention additional inclination providing air cells are provided. The inclination providing air cells are mounted longitudinally on the lower bedspread, preferably such that the mattress body is mounted across the inclination providing air cells, near two longitudinal sides of the lower bedspread, and substantially parallel to

each other. Thus the inclination of the surface of the mattress in order to move the patient can (additionally) be modified by inflating/deflating the inclination providing air cells independently, that is to say without inflating and/or deflating other air cells of the mattress.

According to a further aspect of the invention each air cell is gradually taperd in diameter from a wide end to a narrow end. The air cells are arranged with wide ends adjacent to the narrow ends. This on the one hand improves the anti decubitus performance of the medical air mattress so that it can be handled in a more simple way. On the other hand by inflating and/or deflating the gradually taperd body air cells selectively the surface of the mattress can be inclined.

According to a further aspect of the invention a guardrail with guardrail air cells and a guardrail pipeline are provided. The guardrail pipeline connects the pump with the guardrail air cells. By providing a medical air mattress with an inflatable/deflatable guardrail assembly injuries of the patient can be avoided. Moreover the handling of the guardrail is simplified by the medical air mattress according to the invention, because it can be removed by deflating the guardrail air cells independently. Bringing the guardrail in its guarding position can be done by inflating the guardrail air cells.

In order to further improve the handling of the medical air mattress it is suggested to provide mutual-drawing guardrail sleeves to keep the guardrail sleeves from tilting when being pressed. The medical air mattress can additionally have guardrail unit. The upper bedspread covering the mattress body has at least a guardrail sleeve fixed on at least one side of the upper bedspread. The guardrail unit can have multiple guardrail air cells mounted respectively in 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.

Further improvement of the anti decubitus performance of the mattress is achieved by providing a massage unit mounted on the mattress body, preferably having multiple micro vibrators. Alternatively or additionally the medical air mattress according to the invention can be equipped with a heat unit in form of an electro thermal sheet.

In order to further simplify the handling of the mattress and specially to generate a position for receiving a bedpan or any other kind of container without significantly moving the patient independent air cells can be arranged at a central part in the air cell row. The independent air cells can be connected to the pumping assembly. According to this aspect of the invention the mattress body is formed by multiple air cells including independent air cells parallel arranged as an air cell row. The independent air cells can be connected to the independent deflating unit to be deflated independently. When the patient needs to use the bedpan, the independent air cells are deflated to form a recess for receiving the bedpan so that the bedspread and the patient have no need to be moved.

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 drawing.

The above-mentioned components to be used according to the invention, as well as those claimed and described in the examples of embodiments, are not subject in size, shaping, material selection and technical conception to any special exceptional conditions, so that the selection criteria known in the field of application can be applied without restriction.

Additional details, characteristics and advantages of the invention result from the sub claims as well as from the description below of the associated drawing in which, for the sake of example, several embodiments according to the invention are illustrated. Shown in the drawing are:

BRIEF DESCRIPTION OF THE DRAWING

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

Fig. 1B a perspective view of a medical air mattress with guardrail sleeves comprising a flat base connected to the upper bedspread;

Fig. 1C a perspective view of a medical air mattress, the surface of the mattress being inclined on one longitudinal side of the mattress body;

Fig. 2A an exploded perspective view of the medical air mattress according to Fig. 1;

Fig. 2B an exploded perspective view of a massage and heater unit of the medical air mattress according to Fig. 2A;

Fig. 3A-D pipeline diagrams of different embodiments of the medical air mattress;

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

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

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

Fig. 7A/B an operational end view in partial section of a different embodiment of the medical air mattress, showing a body air cell being gradually ta-

pered in diameter from a wide end to a narrow end;

Fig. 7C an operational end view in partial section of a different embodiment of the medical air mattress with two inclination providing air cells, one of them being inflated;

Fig. 8 an exploded perspective view of another embodiment of a medical air mattress;

Fig. 9A/B a pipeline diagram of different embodiments of the medical air mattress;

Fig. 10A-E an operational end view in partial section of the medical air mattress, showing different air cells inflated;

Fig. 10F a scheme of 6 operational end views in partial section of an embodiment of the air mattress, showing different inclination angles ((a) – (f));

Fig. 11A a perspective view a medical air mattress with a removable center portion according to the state of the art;

Fig. 11B an operational side view in partial section of the medical air mattress according to the invention, showing deflated independent air cells in a center region of the mattress body; and

Fig. 12A/B perspective views of a control device of the medical air mattress according to the invention.

DETAILED DESCRIPTION OF THE DRAWINGS

With reference to Figs. 1A, a first embodiment of a medical air mattress in accordance with the present invention comprises a lower bedspread 10, a mattress body

30, an upper bedspread 50 and a guardrail unit (60), with two guardrail sleeves 52 mounted on each longitudinal side of the upper bedspread 50. According to Fig. 1B and 1C each guardrail sleeve 52 comprises two sleeve bodies 521 fixedly stitched with two lines or a double line to the upper bedspread 50. Fig. 1B shows the medical air mattress in perspective view and Fig. 1C shows a schematic picture of a medical air mattress with inclination to the right side of the patient 801 lying on the bearing surface 803 of the medical air mattress.

Each sleeve body 521 of the guardrail according to Fig. 1B and 1C has a flat base 800 which is fixed to the top cover of the – preferably alternating – air mattress in order to firmly hold the sleeves on the upper bedspread. The mounting of the sleeve 52 or the sleeve bodies 521 especially by stitching them to the bedspread 50 is such, that causing air leakage in the guardrail air cells 61 and/or the body air cells 31, 32 is avoided, also in case of mechanically stressing or straining the guardrail unit (60), e. g. by the patient 801. The safety of the patient 801 and the handling of the mattress will so be optimized.

According to Fig. 2A the mattress body 30 is mounted on the lower bedspread 10 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 forming 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.

The upper bedspread 50 covers the mattress body 30 and is connected securely to the lower bedspread 10. A heat unit 51 is installed preferably under the upper bedspread 50 and above mattress body 30 for heating. The heat unit 51 may be a carbon fiber electro thermal sheet. The upper bedspread 50 has guardrail sleeves 52. The guardrail sleeves 52 are formed parallel on both longitudinal sides of the upper

bedspread 50 and are respectively formed adjacent to the edges of both (longitudinal) 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.

Further referring to Fig. 2A 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.

According to Fig. 2B the medical air mattress further comprises a massage unit 40 mounted on or in the mattress body 30 (see also Fig. 2A). The massage unit 40 according to Fig. 2B comprises multiple vibrator units 806 or micro vibrators 41 respectively in order to massage the patients 801 lying on the bearing surface 803 of the medical air mattress as described. Those micro vibrators 806, 41 distribute massage separately and respectively to patient's neck, back, waist, thighs and so on. The massage unit 40 may further comprise a first layer 804 and a second layer 805. Each layer 804, 805 can be made of a material, which is waterproof or nearly waterproof. Below the first layer 804 and/or the second layer 805 the second layer 805 multiple vibrator units 806 are positioned. Each vibrator unit 806 can be placed in a vibrator unit holding bag 807. According to a preferred embodiment in or above the massage unit a heating element 51 can be placed between both layers 804, 805. The heating element 51 can comprise a carbon material. Alternatively the heat unit 51 can be positioned on or in the mattress body 30 separately, that is to say e. g. without a massage unit 40.

With reference to Fig. 3A, the medical air mattress as described comprises a pumping assembly 70. The pumping assembly 70 is connected to and selectively inflates the body air cells 31, the head air cells 32 and independent air cells 23. According to a preferred embodiment and with reference to Fig. 9A the independent air cells can be conically shaped, so that each independent air cell gradually tapers in di-

ameter from one end to the other end, so that each body air cell and each independent air cell has a wide end and a narrow end.

Preferably the pumping assembly 70 comprises a pump 71, an odd body pipeline 73, an even body pipeline 74, an odd independent pipeline 54, an even independent pipeline 55 and a rapidly releasing valve 78, as shown in Fig. 3A. The odd body pipeline 73 connects the pump 71 with the odd body air cells 31 and the head air cells 32 at odd rows of the air cell rows. An even (odd) row means a row at an even (odd) position of the air cell row. The even body pipeline 74 connects the pump 71 with the even body air cells 31 and the head air cells 32 at even rows of the air cell rows. The odd independent pipeline 54 connects the pump 71 with the independent air cells 23 at odd rows of the air cell rows. The even independent pipeline 55 connects the pump 71 with the independent air cells 23 at even rows of the air cell rows. 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 use. For example, when the patient needs cardiopulmonary resuscitation (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. This contributes to the improvement of the handling of the medical air mattress.

According to Fig. 3A the pump 71 is connected to a body alternating-valve 702. The body alternating-valve 702 is connected between the pump 71 and the body pipelines 73, 74 and the independent pipelines 54, 55. The independent air cells 23 are connected to an independent deflating unit to be deflated independently. The independent deflating unit comprises an odd solenoid valve 541 and an even solenoid valve 551. The odd and even solenoid valves 541, 551 are three-way valves and respectively have deflating opening to the exterior so that the independent air cells 23 are selectively deflated independently via the odd and even solenoid valves 541, 551. The odd independent pipeline 54 is connected to the pump 71 via the odd body pipeline 73. The even independent pipeline 55 is connected to the pump 71

via the even body pipeline 74. In a preferred embodiment, the odd independent pipeline 54 is connected to the odd body pipeline 73 via the odd independent solenoid valve 541, and the even independent pipeline 55 is connected to the even body pipeline 74 via the even independent solenoid valve 551. The odd body pipeline 73 is connected to the head air cells 32 via a first check valve 731. The even body pipeline 74 is connected to the head air cells 32 via a second check valve 741.

With reference to Fig. 3B, the independent deflating unit for the independent air cells 23 may be a manual alternating device 80. The user controls the manual alternating device 80 to stop inflating the independent air cells 23. The manual alternating device 80 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 independent air cells 23 through the independent pipelines 54, 55. The deflating opening communicates with the exterior. When inflating, the deflating opening is closed and the inflating opening is opened to inflate the independent air cells 23. When deflating, the resilient element, the linking rod and the air restricting washer are manually moved to close the inflating opening and to open the deflating opening. Then the independent air cells 23 are deflated independently.

Thus according to the invention sanitation aspects of the medical air mattress become improved, so that the air mattress can be better handled. It is no longer necessary to remove the top cover of the mattress in order to get access to a removable part of the mattress, e. g. like it can be seen in the state of the art according to Fig. 11A.

With reference to Fig. 3C, the medical air mattress as described comprises a pumping assembly 70. The pumping assembly 70 is connected to and selectively inflates the inclination providing 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 inclination providing pipeline 72, an odd body pipeline 73, an even body pipeline 74, a guardrail pipeline 77 and a rapidly releasing valve 78. The inclination providing pipeline 72 connects the pump 71 with the inclination providing 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 positions 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 positions 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 and the guard rail assembly as described needs not be removed or the patient needs not be moved since the mattress body 30 and the guardrail assembly is rapidly deflated to rescue the patient immediately.

According to Fig. 3C the pump 71 is connected to an inclination providing alternating-valve 701 and a body alternating-valve 702. An inclination providing solenoid valve 703 is also connected between the inclination providing alternating-valve 701 and the pump 71. The inclination providing alternating-valve 701 is connected between the inclination providing solenoid valve 703 and the inclination providing 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.

With reference to Fig. 3D, 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, one or more

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.

When the medical air mattress as described in Fig. 3A and 3B is operated, the pump 71, the alternating-valves 702 and the solenoid valves 541, 551 are actuated to inflate the air cells and to alternatively adjust the inflating. The inflating and the deflating operations are described detailed below.

For the mattress body according to Fig. 3A and 3B, when the pump 71 is operated, user may select different modes.

Full inflating mode: With reference to Figs. 3A and 3B, the pump 71 is operated to inflate the body air cells 31, the head air cells 32 and the independent air cells 23.

Alternating inflating mode: With reference to Figs. 3A and 3B, the pump 71 is operated and inflates the body air cells 31 and the independent air cells 23 at odd or even rows of the air cell rows alternatively. 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 alternatively supplies air into the odd or even body pipelines 73, 74. When the odd body pipeline 73 is inflated, the body air cells 31 and the independent air cells 23 at odd rows of the air cell rows are in-flated and the body air cells 31 and the independent air cells 23 at even rows of the air cell rows are deflated as shown in Fig. 5. When the even body pipeline 74 is in-flated, the body air cells 31 and the independent air cells 23 at even positions of the air cell rows are inflated and the body air cells 31 and the independent air cells 23 at odd positions 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, 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.

For the independent air cells 23 as shown in Figs. 3A and 3B, the user may stop inflating the independent air cells 23 independently. In a preferred embodiment, the odd solenoid valve 541 and the even solenoid valve 551 are used to stop inflating the independent air cells 23. Each solenoid valve 541, 551 has an air inlet, an inflating opening and a deflating opening. The air inlet is connected to the body alternating-valve 702. The inflating opening is connected to the independent air cells 23 through the independent pipelines 54, 55. The deflating opening is connected to the exterior. When the independent air cells 23 are inflated, the deflating opening is closed and the inflating opening is opened. When the independent air cells 23 are deflated independently, the inflating opening is closed and the deflating opening is opened. The central part of the upper bedspread 50 corresponding to the independent air cells 23 is not supported when the independent air cells 23 are deflated. If required the central part of the upper bedspread 50 can be recessed to form space or place for receiving the bedpan. Therefore, the patient 801 lying on the bearing surface 803 of the medical air mattress as described does not have to move and can use the bedpan while lying on the medical air mattress as described.

When the medical air mattress as described in Fig. 3C and 3D 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 detailed below.

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 801 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 both sides 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.

For the mattress body according to the embodiment shown in Fig. 3C and 3D, when the pump 71 is operated, user may select different modes.

Full inflating mode: With reference to Figs. 3C and 3D, the pump 71 is operated to inflate the body air cells 31 and the head air cells 32. The condition where all air cells of the mattress body are inflated is shown in Fig. 4.

Alternating inflating mode: With reference to Figs. 3C and 3D, 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 positions of the air cell rows are inflated and the body air cells 31 at even positions 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.

For the inclination providing air cells 20 as shown in Figs. 3C and 7C, the pump 71 is operated to inflate one of the inclination providing 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 inclination providing alternating-valve 701 is operated to

inflate the inclination providing air cells 20 alternately.

With reference to Figs. 8, 9A and 9B, a second embodiment of a medical air mattress in accordance with the present invention is described. The body air cells 31A of the body mattress 30A according to Fig. 8 are conical. An end view of the air mattress with conical mattress bodies is shown in Fig. 7A and 7B. 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 positions of the air cell rows align with the narrow ends of the body air cells 31A at even positions 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.

When the medical air mattress as described in Fig. 8 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 embodiment of the medical air mattress according to Fig. 8. For mattress body 30A, when the pump 71A is operated, user may select different modes.

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

Alternating inflating mode: With reference to Figs. 9A, 9B and 10A to 10F, 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. 10A. Since the body air cells 31A at odd positions 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. 10B. Since the body air cells 31A at even positions 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 inclination angle. In this embodiment, the body air cells 31A provides inclination angle at, said 10 degrees or nearly 10 degrees. "Nearly" in this connection means, that the inclination angle may be a few degrees smaller or larger than the given angle.

With reference to Figs. 9A, 9B and 10C to 10E, the alternating inflating of the body air cells 31A associated with the inclination providing air cells 20A provides more different inclination angles.

When all of the body air cells 31A are inflated and one of the inclination providing 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 inclination angle at, said 20 degrees or nearly 20 degrees.

When the body air cells 31A at even positions of the air cell rows are inflated and the body air cells 31A at odd positions of the air cell rows are deflated, the inclination providing air cell 20A at right side is also simultaneously inflated to provide a totally added inclination angle at, said 30 degrees or nearly 30 degrees.

When the body air cells 31A at odd rows of the air cell rows are inflated and the body air cells 31A at even positions of the air cell rows are deflated, the inclination providing air cell 20A at left side is also inflated to provide an inclination angle at, said 30 degrees or nearly 30 degrees.

An overview about the inclination conditions of the aforementioned medical air mattress and the possibility of inclining or rotating the patient with multiple angles is

shown in Fig. 10F. The figure parts of Fig. 10F are related to a method to inflate/deflate a medical air mattress as described above. The air cells are inflated and/or deflated selectively. The even and/or odd air cells are inflated and/or deflated separately, such that either all even or all odd air cells are inflated or deflated, or such that all even and odd air cells are inflated. At least three inclination angles are achievable by selectively inflating and/or deflating inclination providing air cells and/or even body cells and/or odd body cells and/or even and odd body cells.

According to figure parts (a) and (b) either the even or the odd body air cells 32 are inflated. The inclination providing air cells 20 are both deflated. In this condition the surface is inclined in a first small angle, e. g. 10 degree or nearly 10 degree.

According to figure parts (c) and (d) the inclination providing air cells (20, 20A) are inflated either on the right or on the left side of the mattress body (30, 30A). Both, the even and the odd body air cells (31, 31A, 32, 32A, 23, 23A) are also inflated, so that the inclination angle according to figure part (c) and (d) is larger than it is the case in figure parts (a) and (b), e. g. nearly 20 degrees.

According to figure parts (e) and (f) the even or the odd body air cells (31, 31A, 32, 32A, 23, 23A) are inflated and one of the inclination providing air cell (20, 20A) is also inflated simultaneously. So the total inclination angle becomes even larger, e. g. nearly 30 degrees.

All of the conditions of the medical air mattress can be controlled by a control device shown in Fig. 12 and 12B. The control device is connected to the pumping assembly and to all valves of the medical air mattress, e. g. shown in Fig. 3A to 3D, 9A and 9B. Most of the conditions can be handled with a one touch-operation of the control device. Especially the inflation/deflation of the guardrail, of the cells which are engaged when inclining the mattress, or of independent air cells in order to provide a center portion of the mattress with a space to receive a container like a bedpan can be controlled with one-hand- or one touch-operation of the control device. All these functions and conditions can be operated by pressing only one button of

the control device.

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 two opposite sides of the upper bedspread 50 holds the guardrail sleeves 52 in position to protect the patient 801 lying on the medical air mattress. Furthermore, the body air cells 31A in conical shape associated with the inclination providing air cells 20A provide multiple inclination angles. Therefore, different patients may choose a proper inclination angle they need or as instructed by the doctor.

Referring to Fig. 2A, 2B and 8 a heat unit 51 is attached in the mattress body. Preferably it is positioned under the upper bedspread 50 for heating the upper bedspread. The heat unit 51 may be a carbon fiber electro thermal sheet. The heat unit 51 can be a component or in integral part of a heat-and-massage unit show in Fig. 2B.

A medical air mattress with independent air cells 23 is shown in Fig. 11B. According to Fig. 11B a side view of the air mattress is shown. The body air cells 31 and the head air cells 32 are inflated. The independent air cells 23 are deflated, so that in the center region of the mattress body 30 a position for receiving a container like a toilet or a bedpan is generated. The position for receiving the container can have a nearly conical shape. Inflation or deflation of the independent air cells 23 can be controlled with the controller according to Fig. 12A/B. By generating a concave position for receiving the bedpan it is no longer necessary to e. g. remove a part of the mattress body according to the state of the art (see Fig. 11A).

According to Figures 12A/B the controller of the medical air mattress is constructed in a way that several functions of the air mattress can be controlled by touching only one button. The inflation/deflation of the guardrail unit can be controlled with a one-touch-button for the guardrail-function (Fig. 12A, see arrow). One-touch-button

means that touching the button once enables or disables the related function of the mattress. The inflation/deflation of the independent air cells 23 can be controlled with a one-touch-button of the toilet function. The inclination of the mattress surface at different angles can be controlled with a one touch-button for the inclination function (pitch, see arrow Fig. 12B). Touching the "pitch"-button increases or decreases the angle of the mattress surface according to the method described above. The alternating of the inflation of the (body and/or head) air cells can be controlled with a one-touch-button for the static/alternation function. The heating of the mattress can be controlled with a one-touch-button for the heater-function. The massage unit of the mattress can be controlled with a one-touch-button of the massage function. The controller according to Figs. 12A/B can be positioned near the mattress body so that it can be operated by the medical staff or the patient himself.

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.

REFERENCE NUMBERS

10	lower bedspread
20	inclination providing air cell
23	independent air cell
30, 30A	mattress body
31, 31A	body air cell
32, 32A	head air cell
34A	offset air cell
40	massage unit
41	micro vibrator
50, 50A	upper bedspread
51	heat unit
52	guardrail sleeve
54	odd independent pipeline
55	even independent pipeline
60	guardrail unit
61	guardrail air cell
70	pumping assembly
71, 71A	pump
72	inclination providing pipeline
73	odd body pipeline
74	even body pipeline
77	guardrail pipeline
78	rapidly releasing valve
80	manual alternating device
521	sleeve body
541	odd solenoid valve
551	even solenoid valve
701	inclination providing alternating valve
702	body alternating valve
703	inclination providing solenoid valve
731	first check valve
741	second check valve
771	third check valve
772	guardrail solenoid valve
772A	manual alternating device
800	base
801	patient
803	bearing surface
804	first layer
805	second layer
806	vibration unit
807	holding bag

CLAIMS:

1. A medical air mattress, comprising
a lower bedspread (10);
a mattress body (30) mounted on the lower bedspread (10), comprising multiple body air cells (31) and, preferably, multiple head air cells (32), substantially parallel to each other and arranged in a row forming an air cell row;
an upper bedspread (50) covering the mattress body (30), connected securely to the lower bedspread (10); and
a pumping assembly (70) comprising:
a pump (71); and
at least a pipeline connecting the pump (71) with the air cells;
characterized in the pipeline connecting the pump (71) with the air cells to control inflating and/or deflating of the air cells selectively.

2. The medical air mattress according to claim 1, characterized in an odd body pipeline (73) connecting the pump (71) with the air cells (31) at odd positions of the air cell row; and an even body pipeline (74) connecting the pump (71) with the air cells (31) at even positions of the air cell row.

3. The medical air mattress according to claim 1 or 2, characterized in a rapidly releasing valve (78) connected to the pipeline, preferably to the odd body pipeline (73) and the even body pipeline (74).

4. The medical air mattress according to any of the claims 1 to 3, characterized in two inclination providing air cells (20) mounted longitudinally on the lower bedspread (10), preferably such that the mattress body (30) is mounted across the inclination providing air cells (32), near two longitudinal sides of the lower bedspread (10), and substantially parallel to each other.

5. The medical air mattress according to the first part of claim 1, preferably according to any of the claims 1 to 4, **characterized** in each air cell

being gradually taperd in diameter from a wide end to a narrow end, and the air cells being arranged with wide ends adjacent to the narrow ends.

6. The medical air mattress according to the first part of claim 1, preferably according to any of the claims 1 to 5, **characterized** in a guardrail with guardrail air cells (61); and in a guardrail pipeline (77), connecting the pump (71) with the guardrail air cells (61).

7. The medical air mattress according to claim 6, characterized in that the guardrail further comprises at least one guardrail sleeve (52) fixed on at least one side of the upper bedspread (50), respectively formed adjacent to the longitudinal edges of the upper bedspread (50), each guardrail sleeve having at least one sleeve body (521).

8. The medical air mattress according to claim 6 or 7, characterized in that the guardrail further comprises a guardrail unit (60) mounted in the guardrail sleeve (52), the guardrail unit (60) comprising at least one guardrail air cell (61), and the guardrail air cell (61) mounted in the sleeve body (521) of the guardrail sleeve (52).

9. The medical air mattress according to claim 7 or 8, characterized in that each guardrail sleeve (52) has two sleeve bodies (521) formed separately, preferably aligning with and coaxial to each other.

10. The medical air mattress according to any of the claims 7 to 9, characterized in the guardrail sleeve (52) having a flat base (800), preferably with a double stitched line, and directly fixed on the surface of the upper bedspread.

11. The medical air mattress according to the first part of claim 1, preferably according to any of the claims 1 to 10, **characterized** in a massage unit (40) mounted on the mattress body (30), preferably having multiple micro vibrators (41).

12. The medical air mattress according to the first part of claim 1, preferably according to any of the claims 1 to 11, **characterized** in a heat unit (51) in form of an electro thermal sheet.

13. The medical air mattress according to claim 12, characterized in that the heat unit (51) is attached to the upper bedspread (50).

14. The medical air mattress according to claim 12 or 13, characterized in that the heat unit (51) is made of carbon fiber.

15. The medical air mattress according to any of the claims 2 to 14, characterized in the pumping assembly (70) further comprising:
a body alternating-valve (702) connected to the pump (71), preferably between the pump (71) with body pipelines (73,74) and the guardrail pipeline (77);
a first check valve (731) connected between the odd body pipeline (73) and head air cells (32) at odd positions of the air cell row; and
a second check valve (741) connected between the even body pipeline 74 and head air cells (32) at even positions of the air cell row.

16. The medical air mattress according to any of the claims 6 to 15, characterized in the pumping assembly (70) further comprising:
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 (772); and/or

an inclination providing solenoid valve (703) connected to the pump (71); and
an inclination providing alternating-valve (701) connected between the inclination providing solenoid valve (703) and the inclination providing pipeline (72); and/or

an inclination providing solenoid valve (703) connected to the pump (71); and an inclination providing alternating-valve (701) connected between the inclination providing solenoid valve (703) and the inclination providing pipeline (72).

17. The medical air mattress according to any of the claims 1 to 16, characterized in that each body air cell (31) and/or each head air cell (32) are essentially uniform in diameter.

18. The medical air mattress according to any of the claims 1 to 17, characterized in the pumping assembly (70) further comprising:
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 positions of the air cell row; and
a second check valve (741) connected between the even body pipeline (74) and the head air cells (32) at even positions of the air cell row.

19. The medical air mattress according to any of the claims 1 to 18, characterized in the pumping assembly (70) further comprising:
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.

20. The medical air mattress according to the first part of claim 1, preferably according to any of the claims 1 to 19, **characterized** in independent air cells (23) arranged at a central part in the air cell row and connected to the pumping assembly.

21. The medical air mattress according to claim 20, characterized in that the pumping assembly comprises an independent deflating unit connected to the independent air cells (23).

22. The medical air mattress according to claim 20 or 21, characterized in that each body air cell (31) and/or each head air cell (32) and each independent air cell (23) are respectively uniform in diameter.

23. The medical air mattress according to any of the claims 20 or 22, characterized in that each independent air cell (23) gradually tapers in diameter from a wide end to a narrow end.

24. The medical air mattress according to claim 23, characterized in that the independent air cells (23) are arranged with wide ends adjacent to the narrow ends.

25. The medical air mattress according to any of the claims 20 to 24, characterized in that the pumping assembly (70) further comprises:
an odd independent pipeline (54) connecting the pump (71) with the independent air cells (23) at odd positions of the air cell row; and
an even independent pipeline (55) connecting the pump (71) with the independent air cells (23) at even positions of the air cell row.

26. The medical air mattress according to any of the claims 20 to 25, characterized in that the independent deflating unit comprises an odd solenoid valve (541) and an even solenoid valve (551) and has a deflating opening to the exterior, so that the independent air cells (23) are selectively deflated independently via the odd and even solenoid valves (541, 551);
the odd independent pipeline (54) is connected to the odd body pipeline (73) via the odd independent solenoid valve (541); and
the even independent pipeline (55) is connected to the even body pipeline (74) via the even independent solenoid valve (551); and

the pumping assembly (70) comprises a body alternating-valve (501) connected between the pump (71) with the body pipelines (73, 74) and the independent pipelines (54, 55).

27. The medical air mattress according to any of the claims 20 to 26, characterized in that the independent deflating unit comprises an odd solenoid valve (541) and an even solenoid valve (551), having a deflating opening to the exterior, so that the independent air cells (23) are deflatable independently via the odd and even solenoid valves (541, 551),

wherein the odd independent pipeline (54) is connected to the odd body pipeline (73) via the odd independent solenoid valve (541),
and the even independent pipeline (55) is connected to the even body pipeline (74) via the even independent solenoid valve (551).

28. The medical air mattress according to any of the claims 20 to 27, characterized in that the independent deflating unit comprises a manual alternating device (80) connected between the body pipelines (73, 74) and the independent pipelines (54, 55).

29. The medical air mattress according to any of the claims 20 to 28, characterized in that the independent deflating unit comprises a manual alternating device (80) connected between the body pipelines (73, 74) and the independent pipelines (54, 55); and in that the pumping assembly (50) further comprises:

a body alternating-valve (702) connected between the pump (71) with the body pipelines (73, 74) and the independent pipelines (54, 55);
a first check valve (731) connected between the odd body pipeline (73) and the odd head air cells (32); and
a second check valve (741) connected between the even body pipeline (73) and the even head air cells (32).

30. The medical air mattress according to any of the claims 1 to 29, characterized in at least one offset air cells (34A) mounted longitudinally and on one side of the mattress body (30) and enlarging the bearing surface (803) of the medical air mattress and/or supporting the upper bedspread (50).

31. The medical air mattress according to claim 30, characterized in that the offset air cell (34) is connected to the pipeline connecting to the body air cells (31) and/or to the head air cells (32), preferably protected by the check valves (731, 741).

32. Method to inflate/deflate a medical air mattress, preferably a medical air mattress according to any of the claims 1 to 31, the mattress comprising a lower bedspread (10), a mattress body (30) mounted on the lower bedspread (10) with multiple body air cells (31) and, preferably, multiple head air cells (32), substantially parallel to each other and arranged in a row forming an air cell row, a pumping assembly (70) with a pump (71) and at least a pipeline connecting the pump (71) with the air cells, **characterized** in that the air cells are inflated and/or deflated selectively.

33. Method to incline the bearing surface (803) of a medical air mattress, preferably of a medical air mattress according to any of the claims 5 to 31, the medical air mattress comprising a lower bedspread (10), a mattress body (30) mounted on the lower bedspread (10) with multiple air cells arranged in a row forming an air cell row,

wherein even air cells are on a even positions of the air cell row and odd air cells on odd positions of the air cell row, and the air cells are gradually tapered in diameter from a wide end to a narrow end, the air cells being arranged with wide ends adjacent to the narrow ends,

characterized in that the even and/or odd air cells are inflated and/or deflated separately, such that either all even or all odd air cells are inflated or deflated.

34. Method according to claim 32 or 33, characterized in that the inflating/deflating of selectively chosen air cells is performed by a one-hand operation, preferably by operating a control device with at least one one-touch button controlling the inflation/deflation.

35. Method according to any of the claims 32 to 34, characterized in that at least three inclination angles are achievable by selectively inflating and/or deflating inclination providing air cells and/or even body cells and/or odd body cells and/or even and odd body cells.

36. Method to generate in medical air mattress a position for receiving a container, preferably a toilet bedpan, the mattress preferably arranged according to any of the claims 1 to 31, the mattress comprising a lower bedspread (10), a mattress body (30) mounted on the lower bedspread (10) with multiple body air cells (31) and, preferably, multiple head air cells (32), substantially parallel to each other and arranged in a row forming an air cell row, a pumping assembly (70) with a pump (71) and at least a pipeline connecting the pump (71) with the air cells, **characterized** in that the air cells are inflated and/or deflated independently, such that independent air cells (23) arranged at a central part in the air cell row being independently connected to the pumping assembly are deflated to create a substantially concave position in the central part of the mattress body (30).

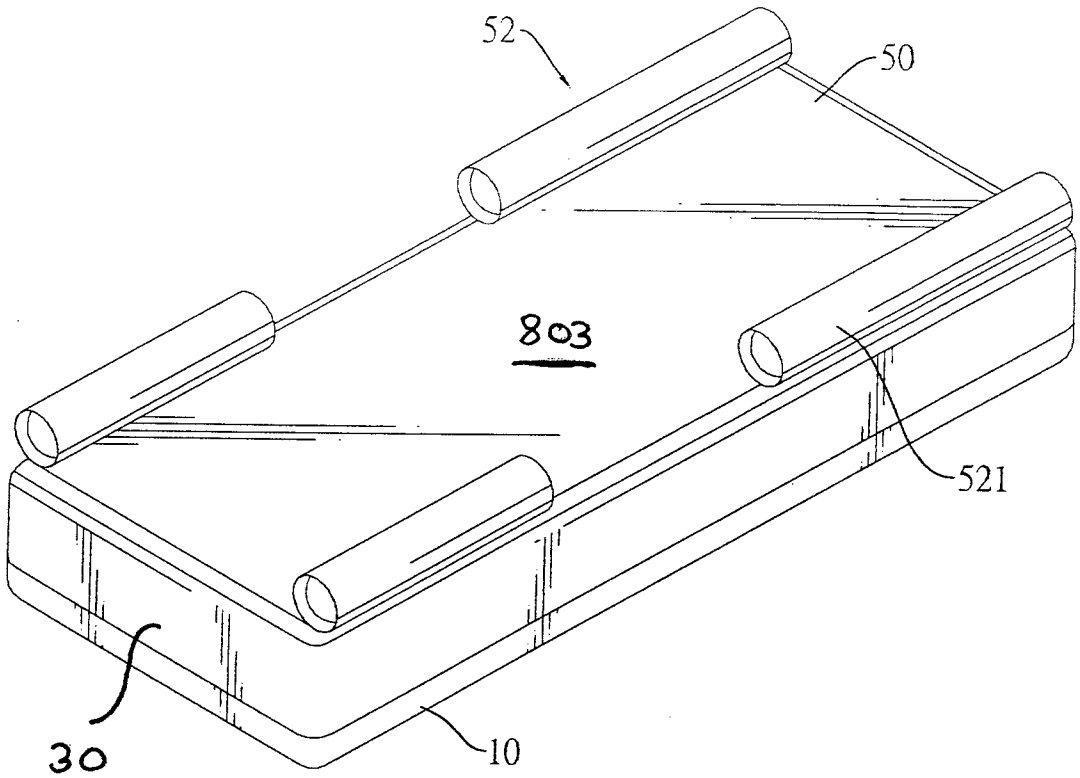


Fig. 1A

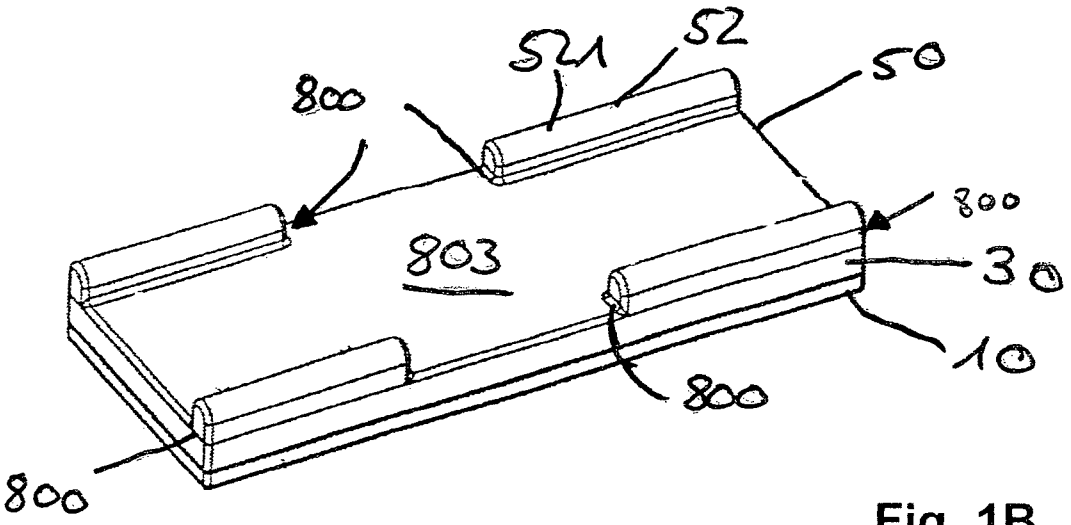

521
52
50
800
800
803
30
10
800
800

Fig. 1B

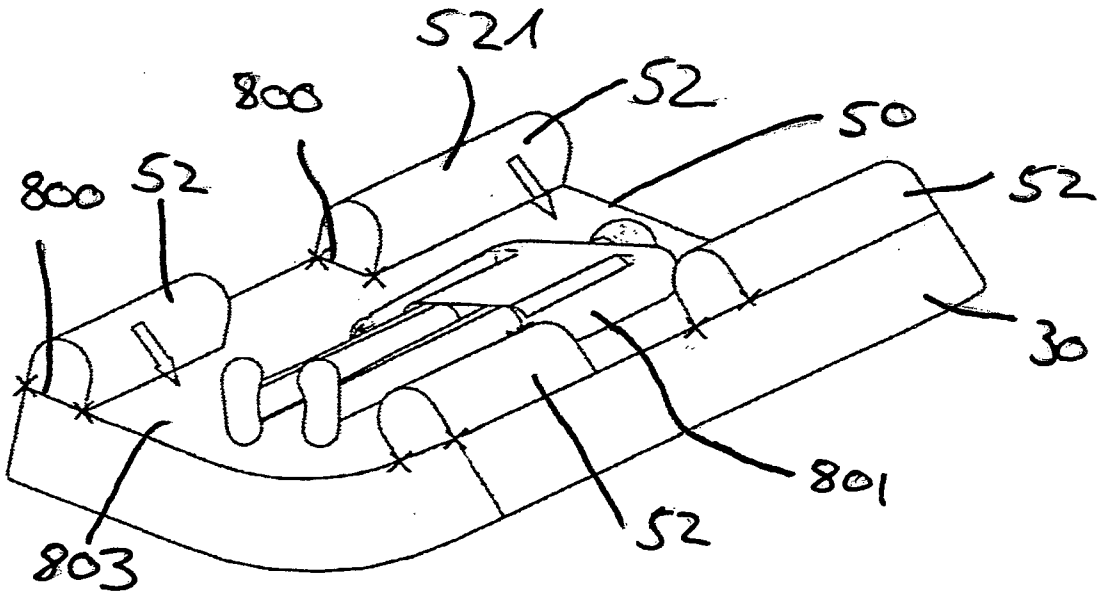

521
800
52
50
800
52
52
30
801
52
803

Fig. 1C

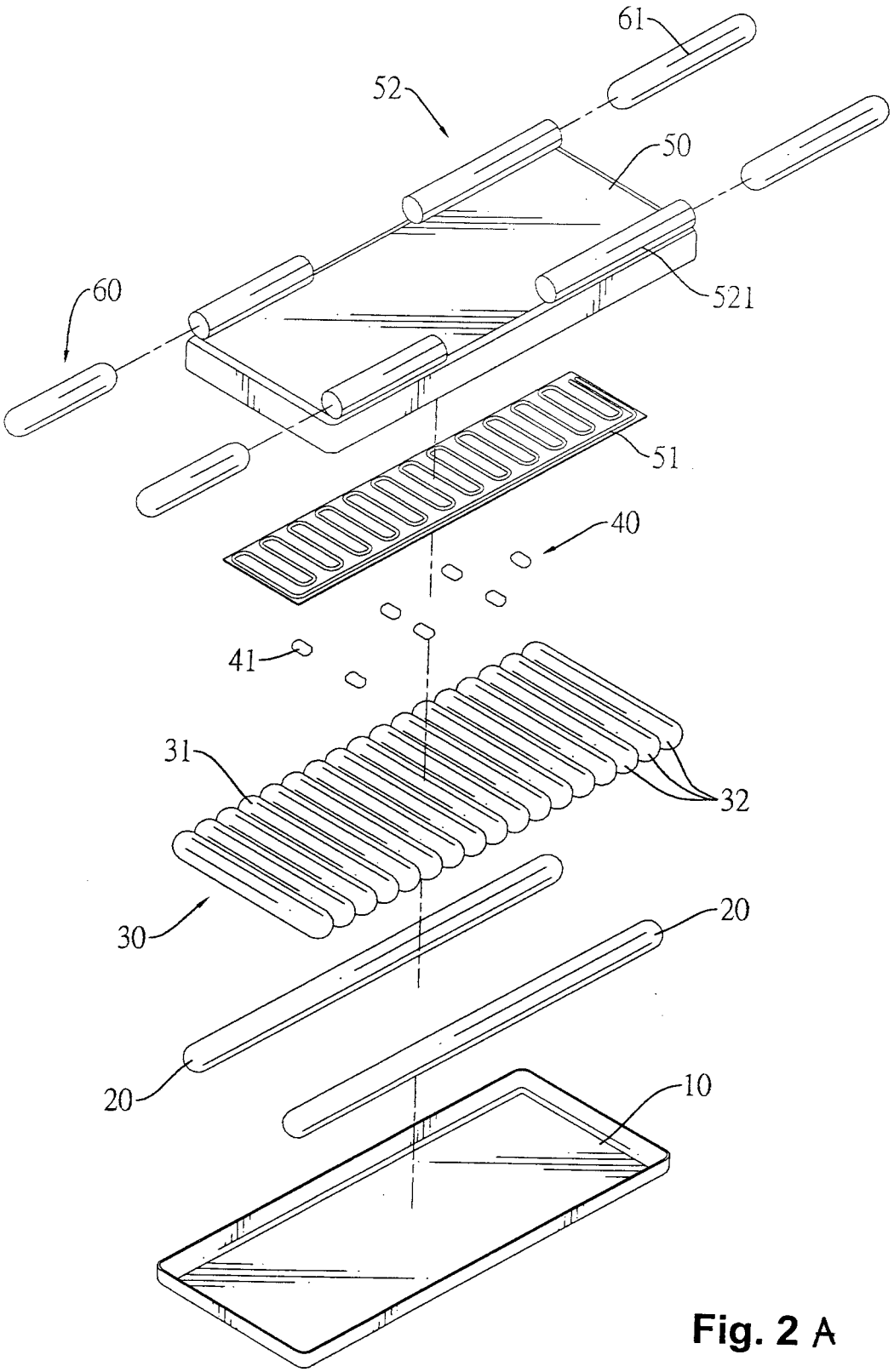


Fig. 2 A

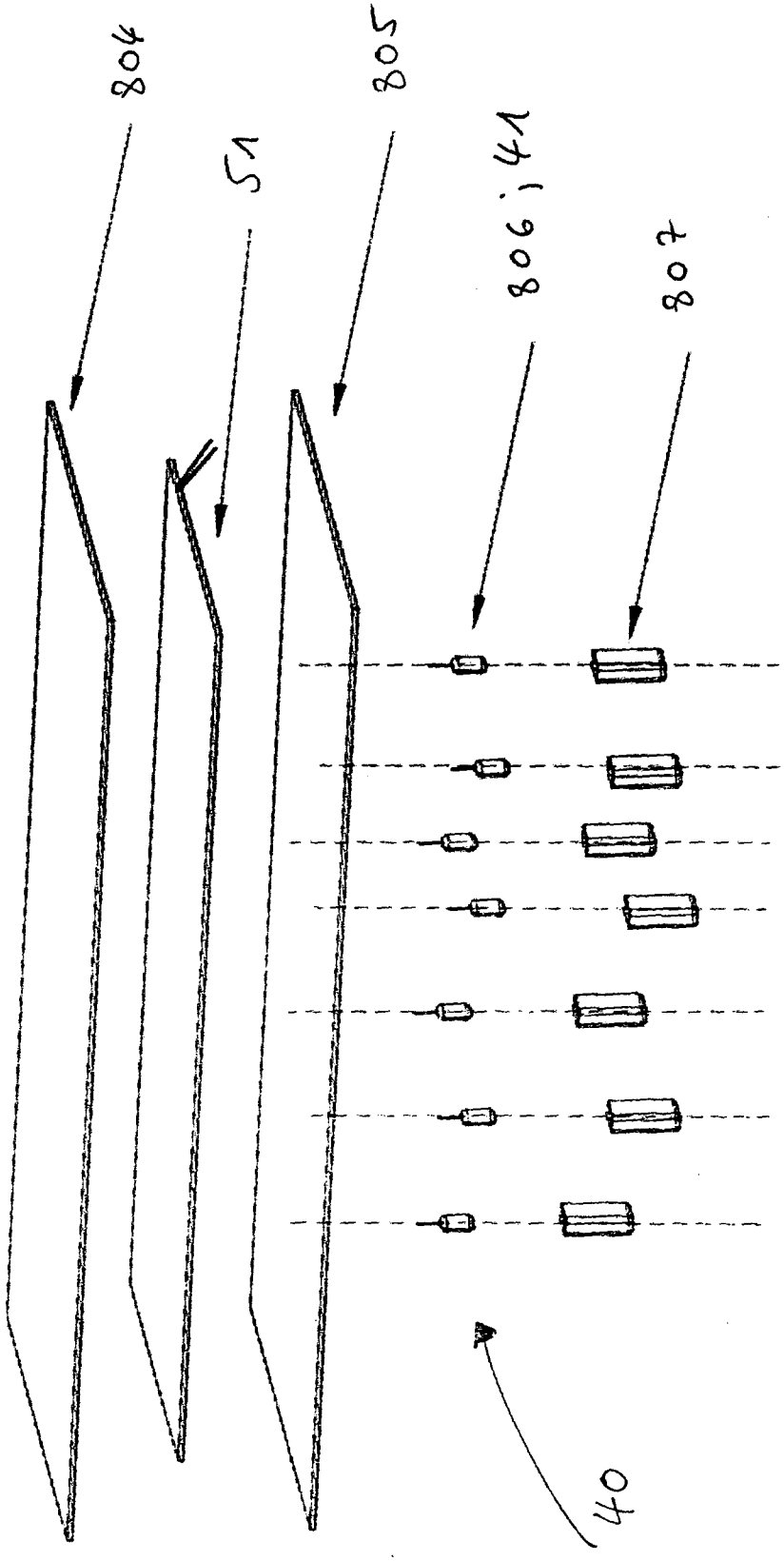


Fig. 2B

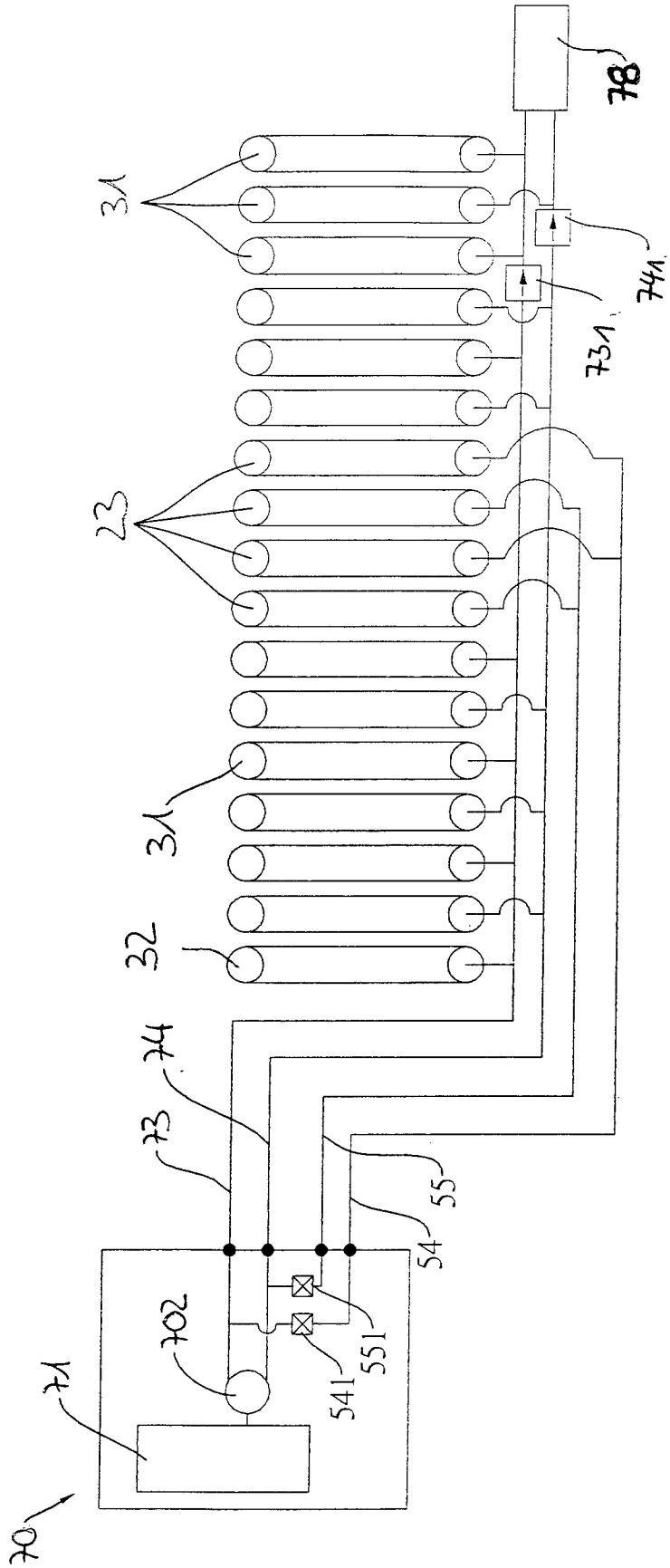


Fig. 3A

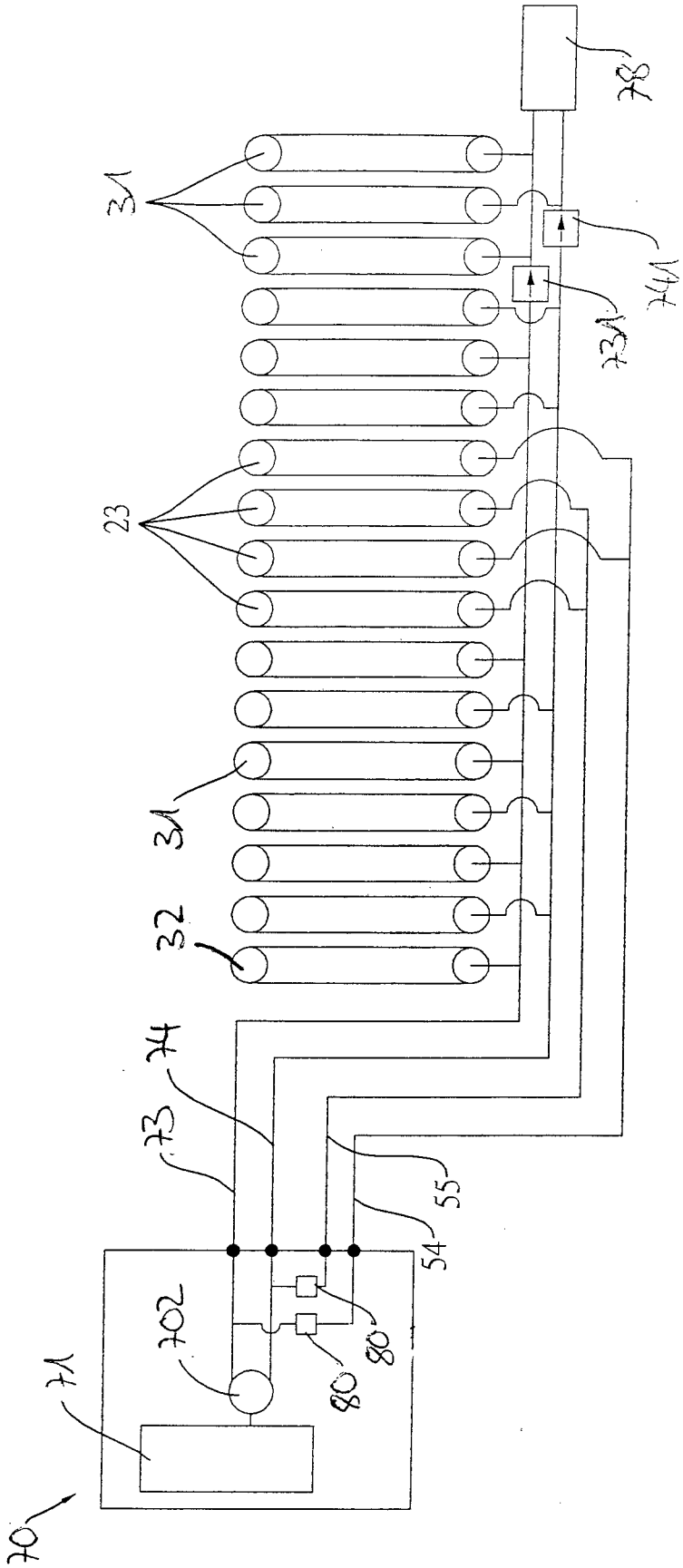


Fig. 3B

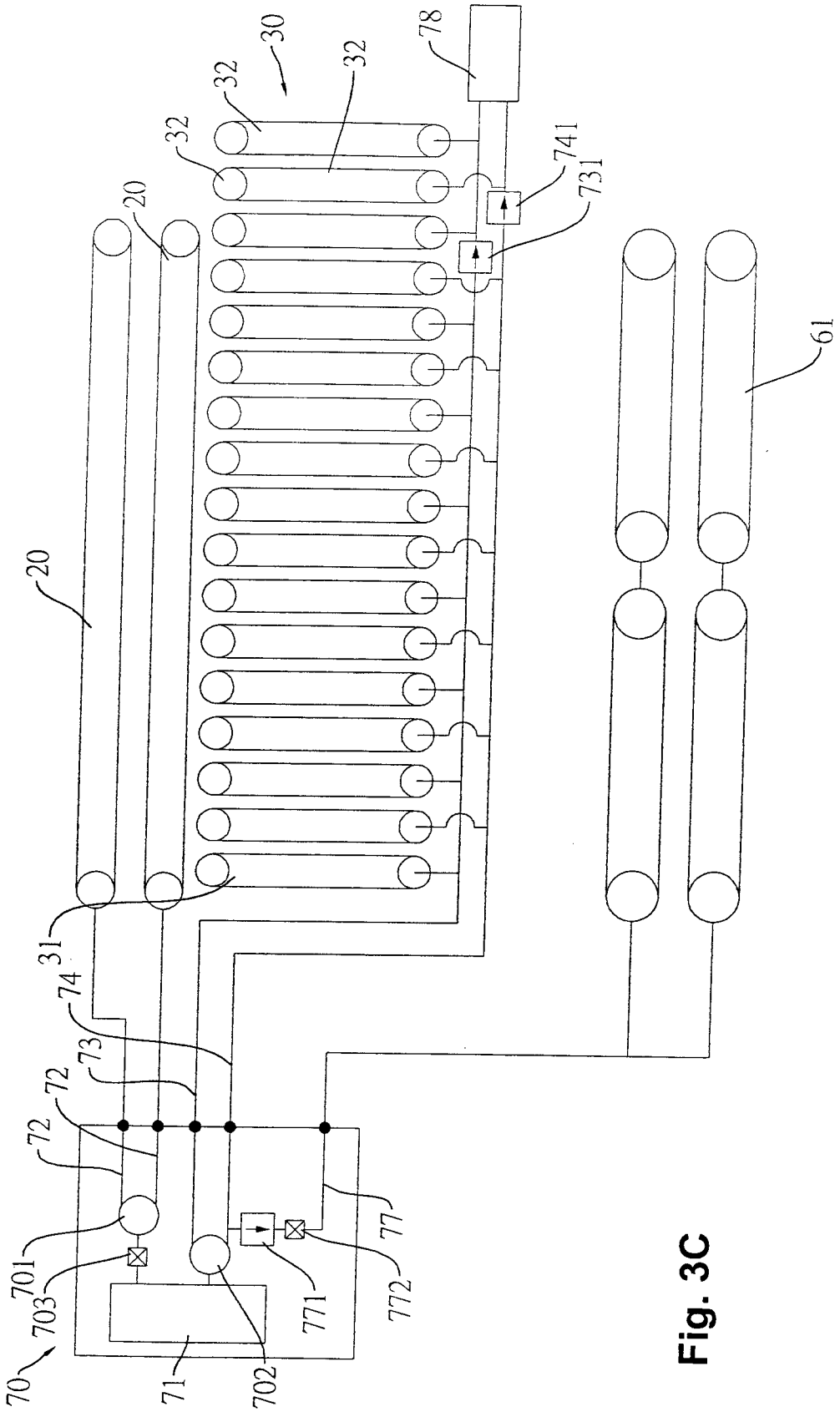

70
701
703
71
702
772
771
77
72
72
73
74
31
20
20
32
32
30
78
741
731
61

Fig. 3C

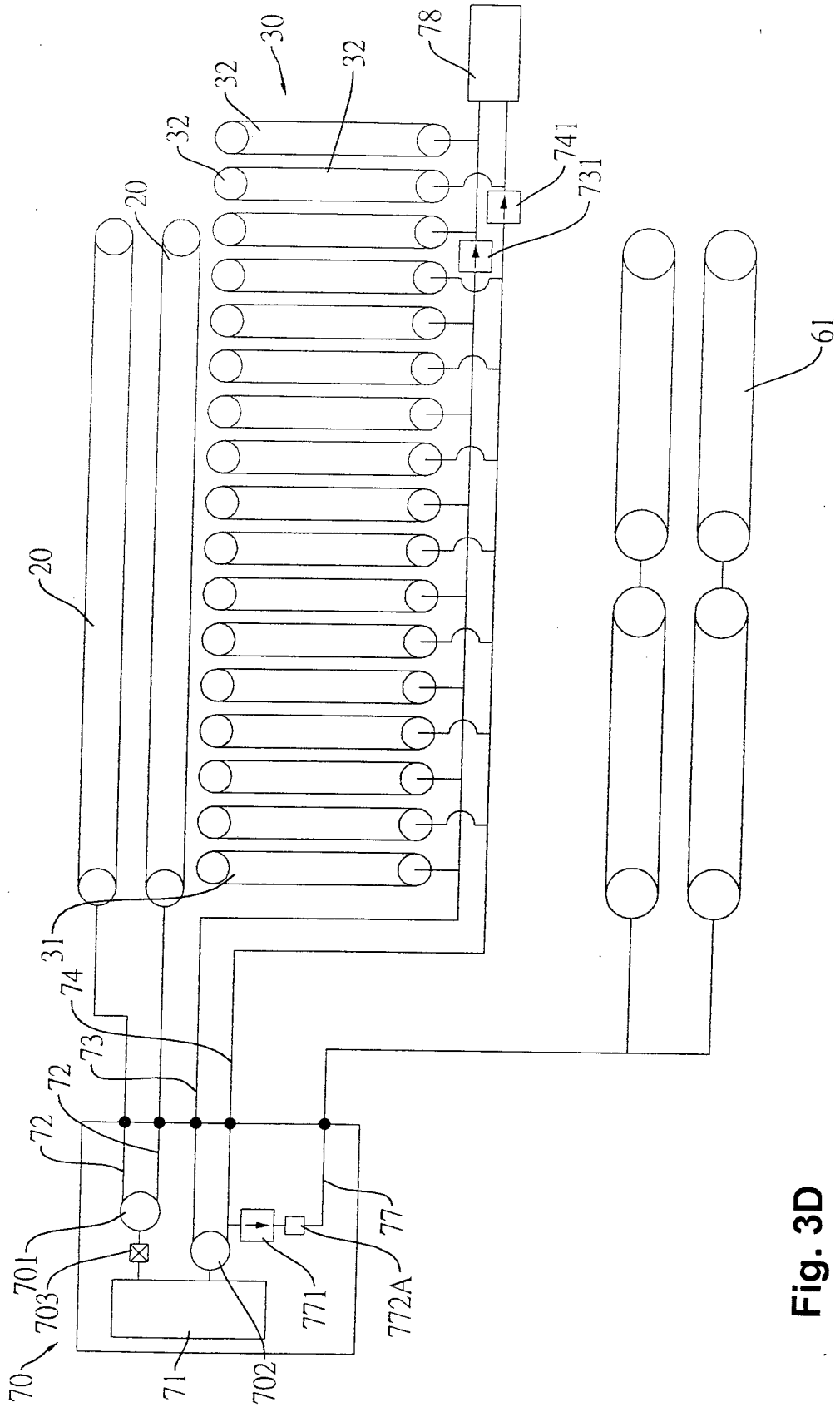

78
30
32
32
32
741
731
20
20
61
20
31
74
73
72
72
701
703
70
71
702
771
772A
77

Fig. 3D

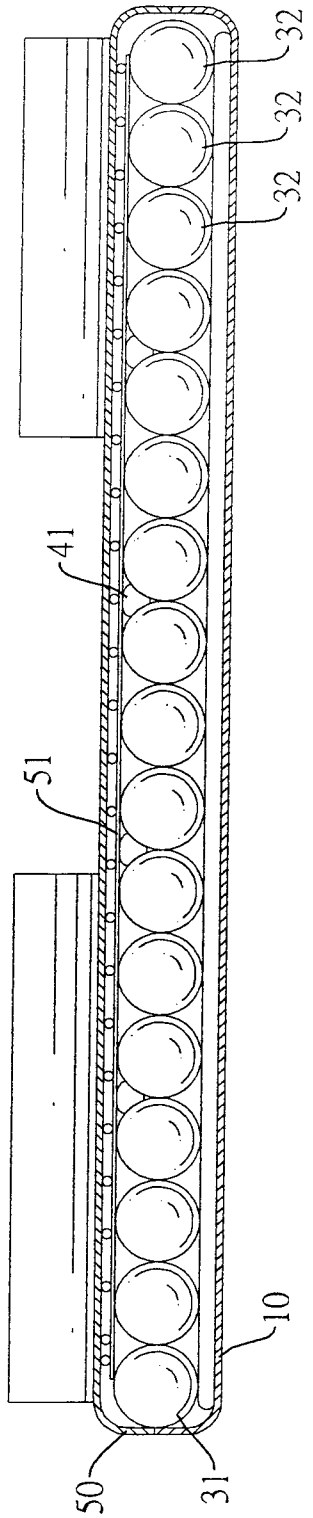


FIG.4

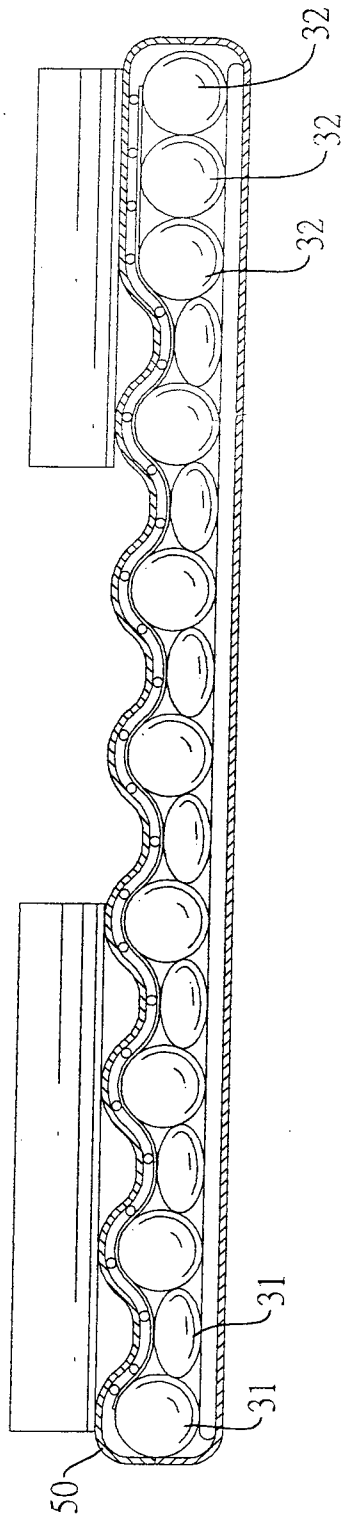


FIG.5

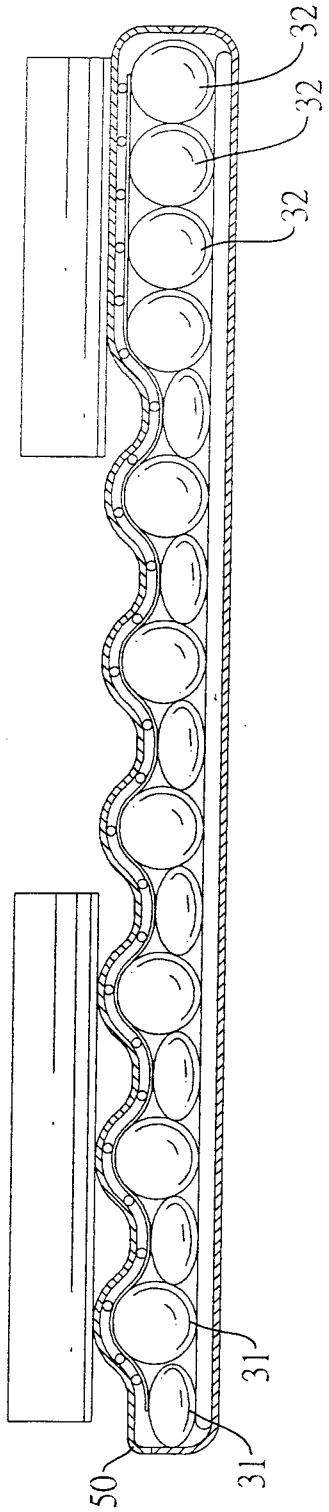


FIG.6

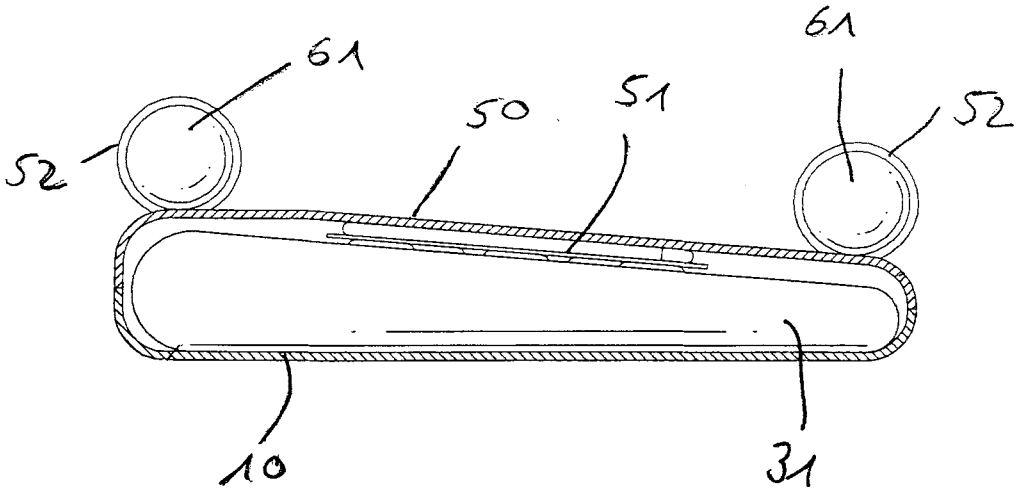


Fig. 7A

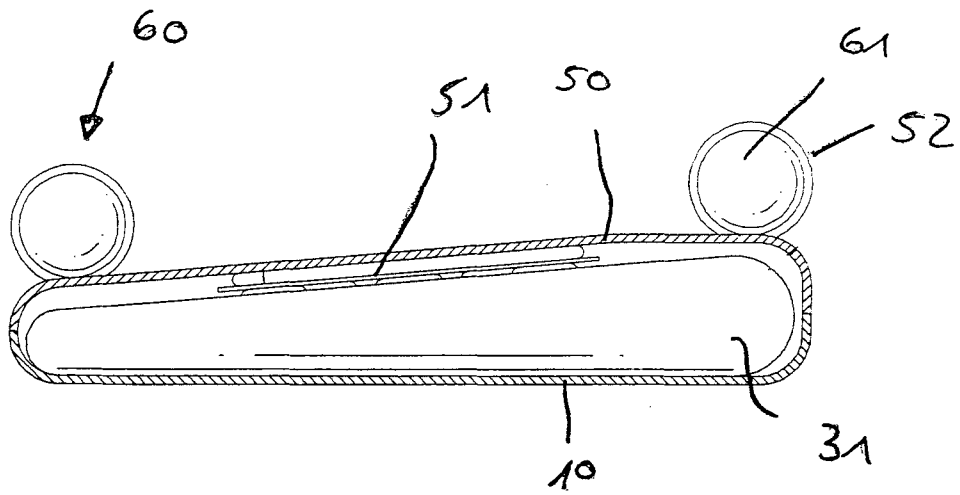


Fig. 7B

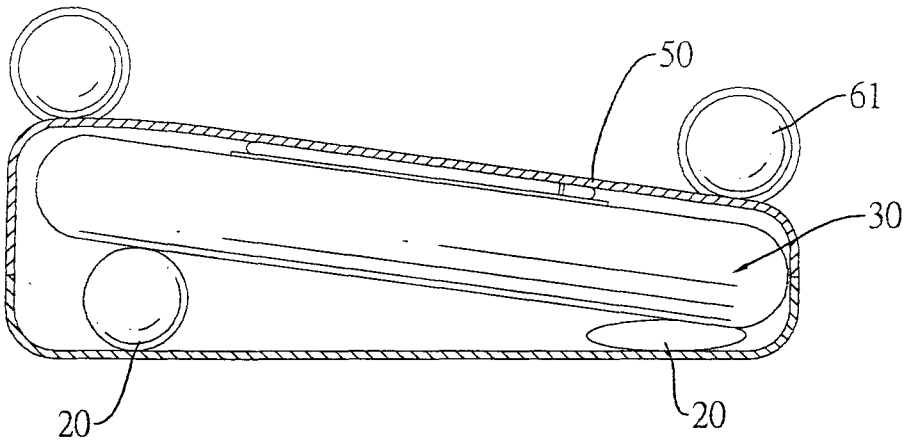


Fig. 7C

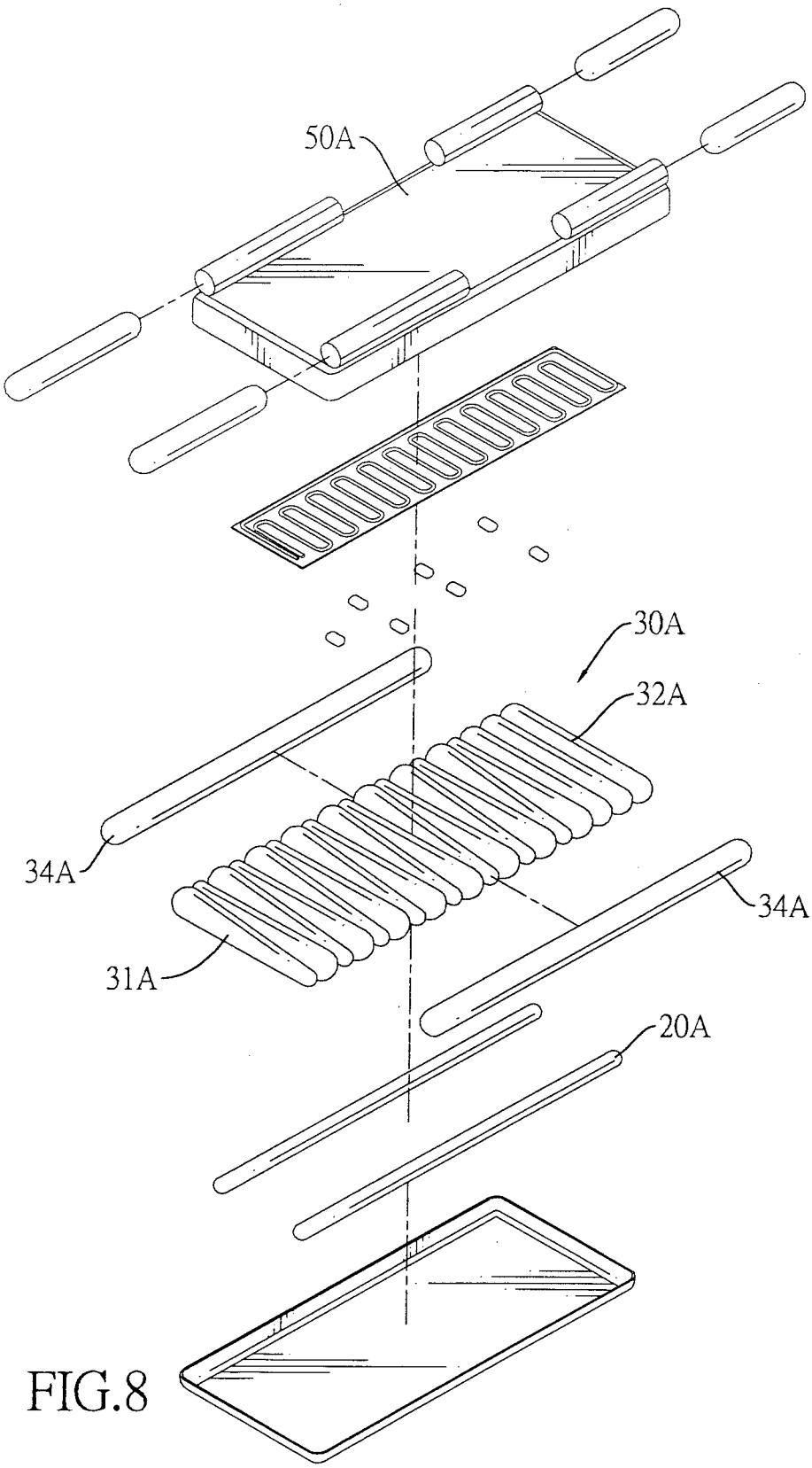


FIG.8

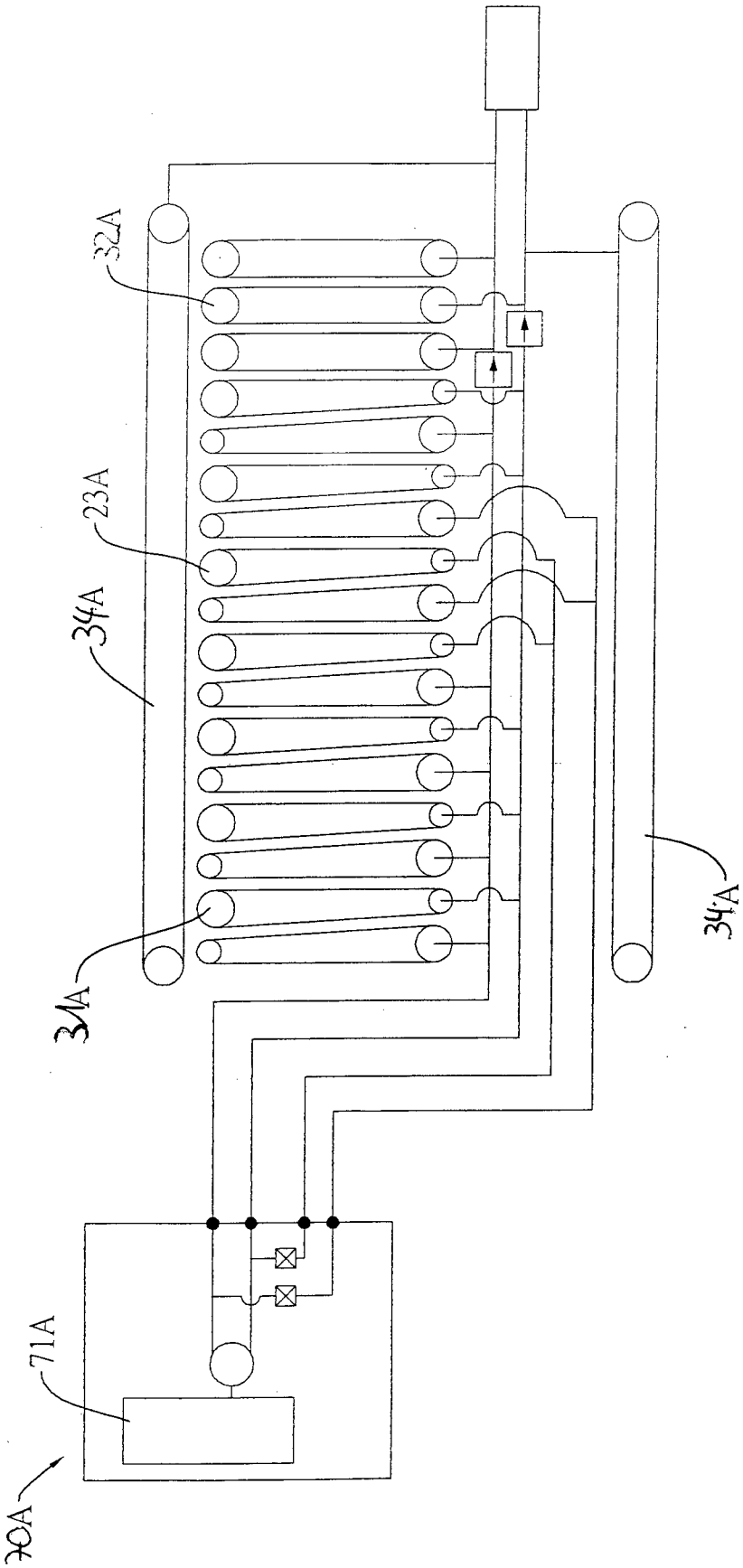


Fig. 9A

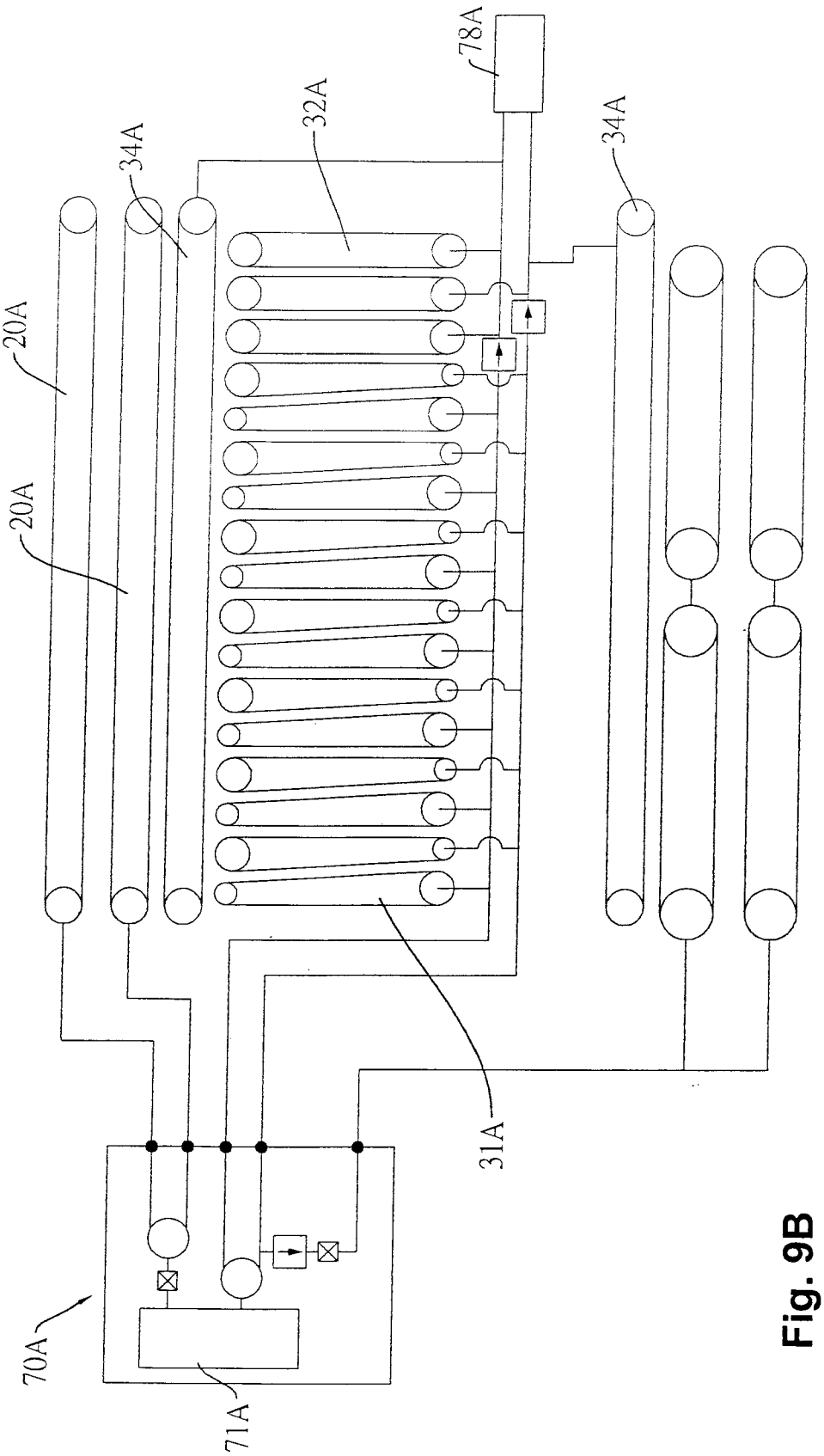


Fig. 9B

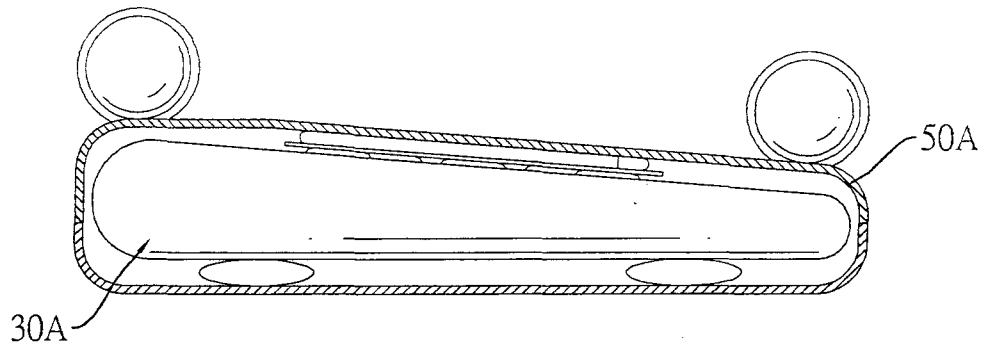


Fig. 10A

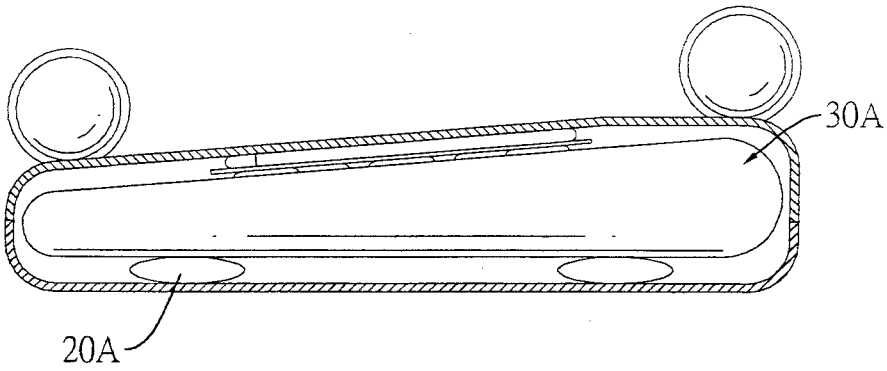


Fig. 10B

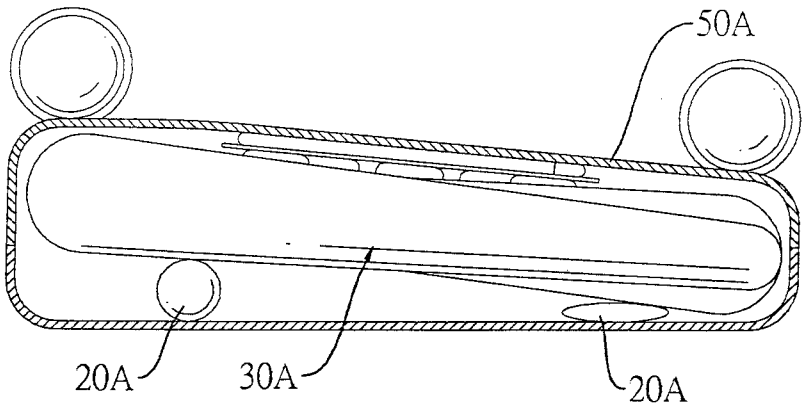


Fig. 10C

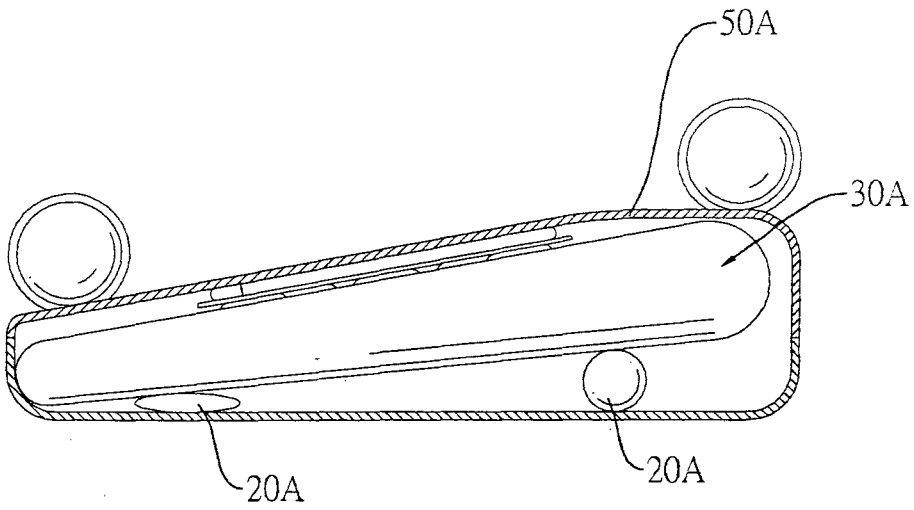


Fig. 10D

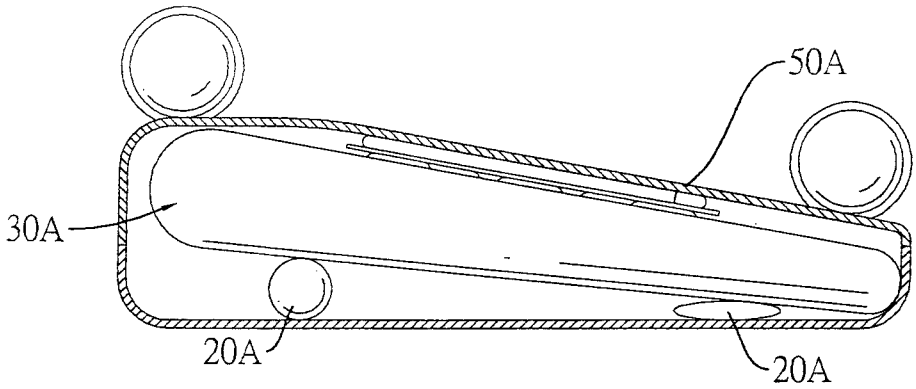


Fig. 10E

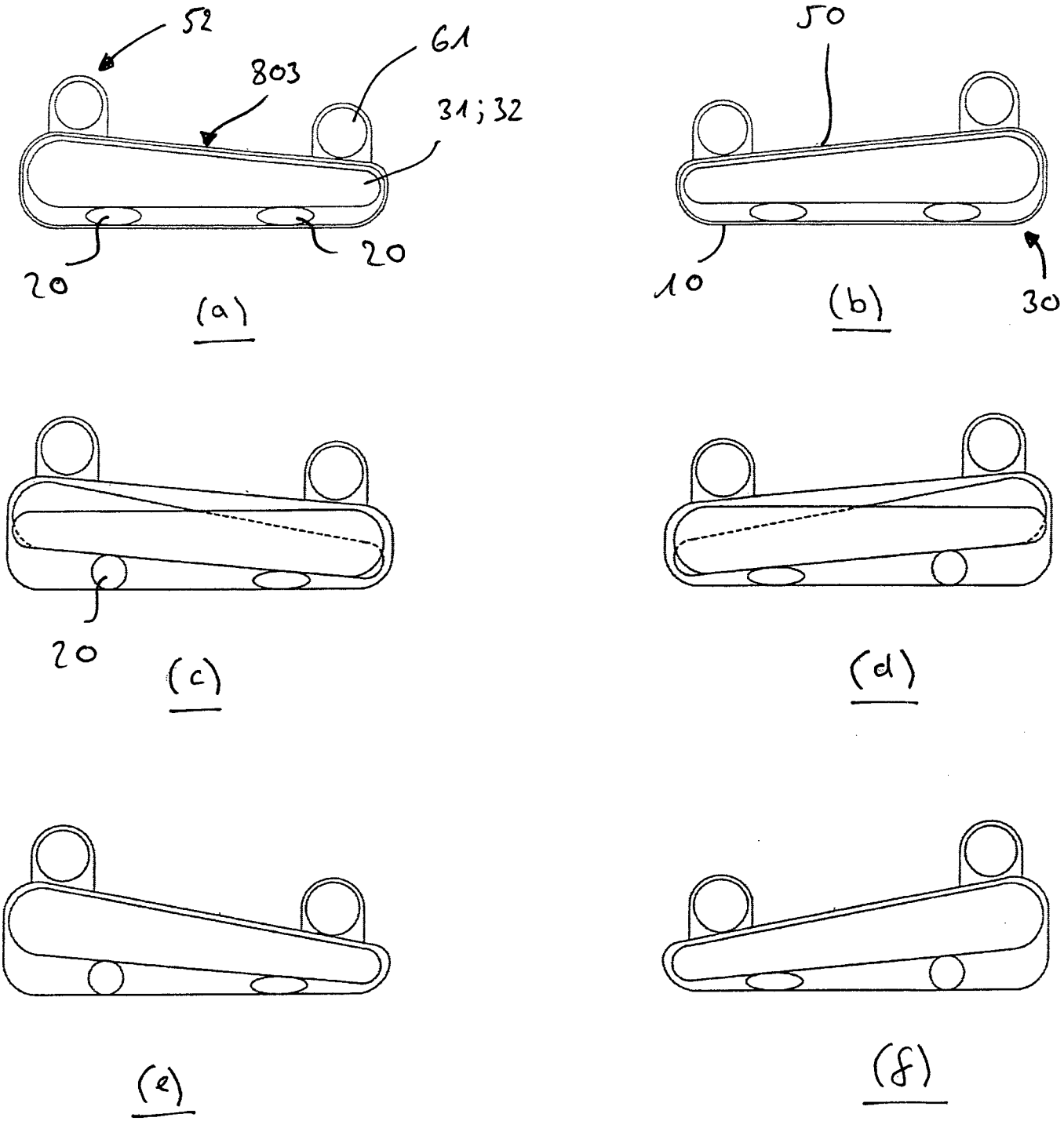


Fig. 10F

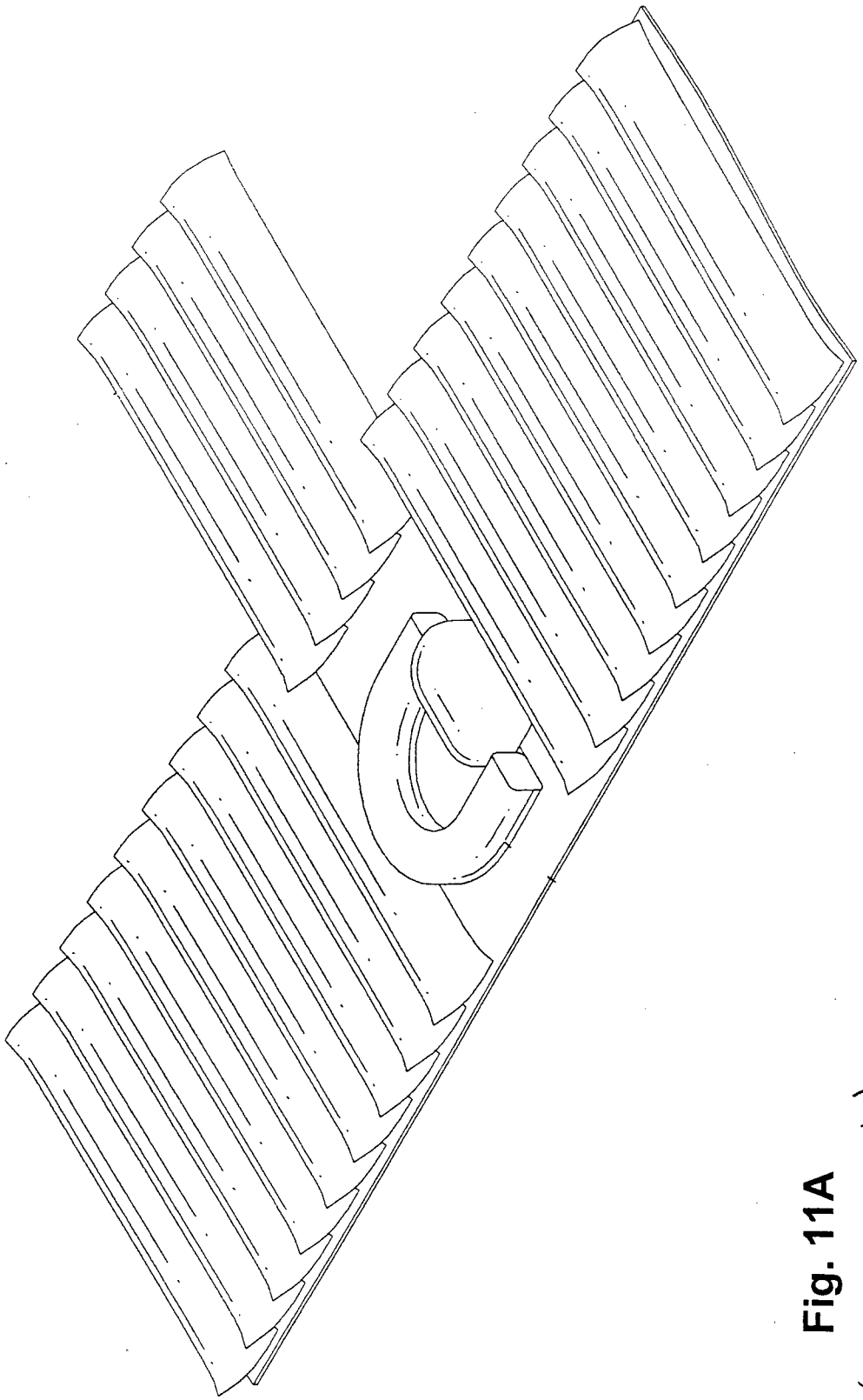


Fig. 11A
(State of the art)

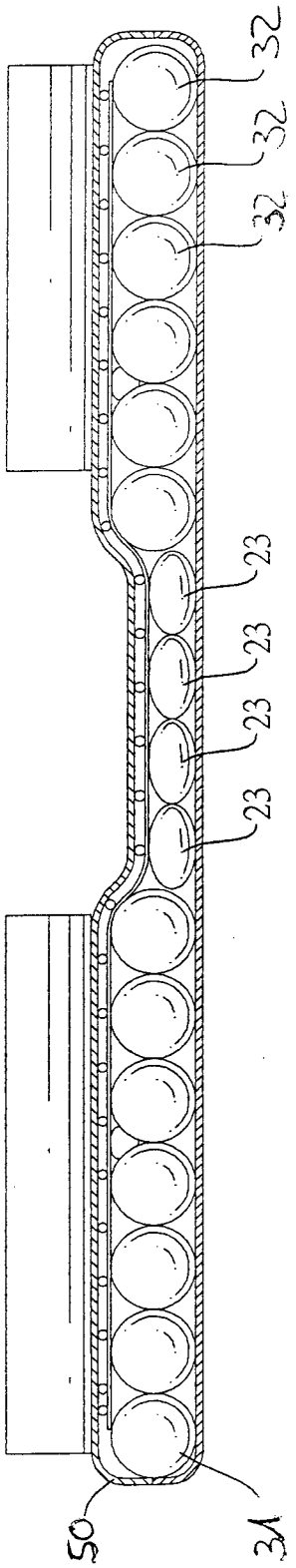


Fig. 11B

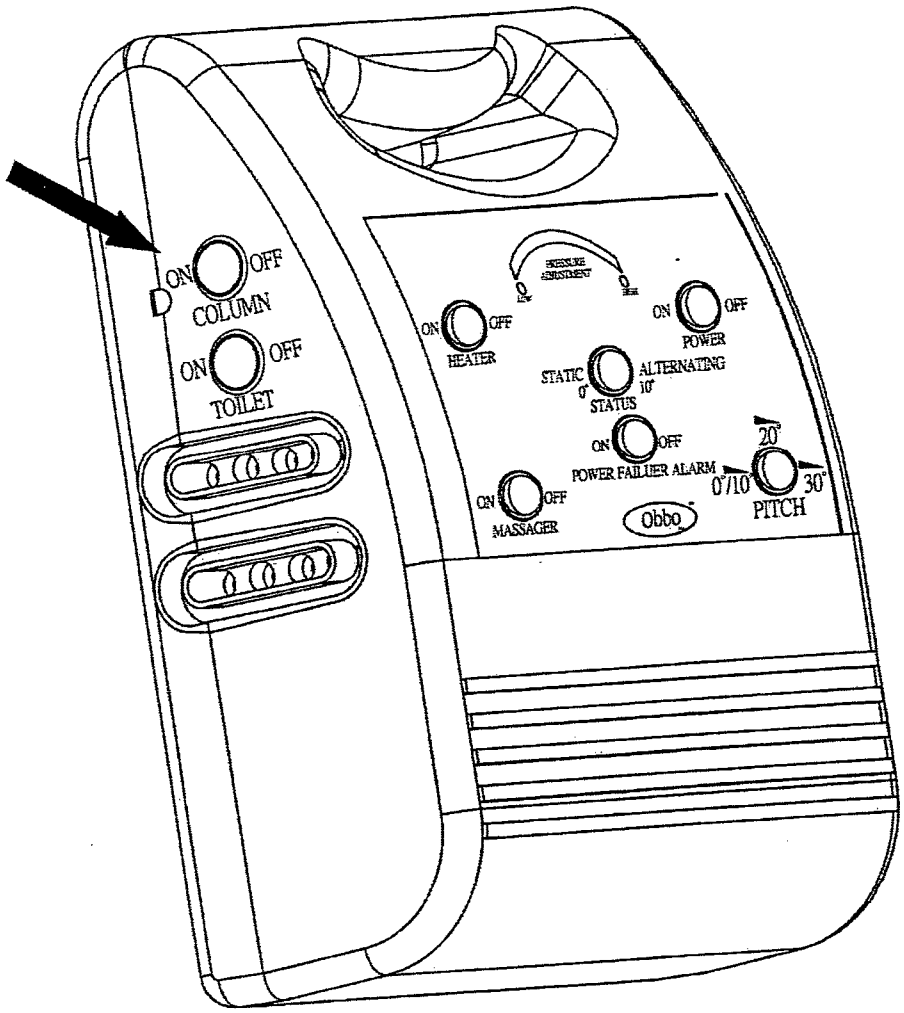

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OFF
TOILET
ON
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HEATER
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OFF
POWER
STATIC
ALTERNATING
STATUS
ON
OFF
POWER FAILUER ALARM
ON
OFF
MASSAGER
Obbo
20°
0°/10°
30°
PITCH

Fig. 12A

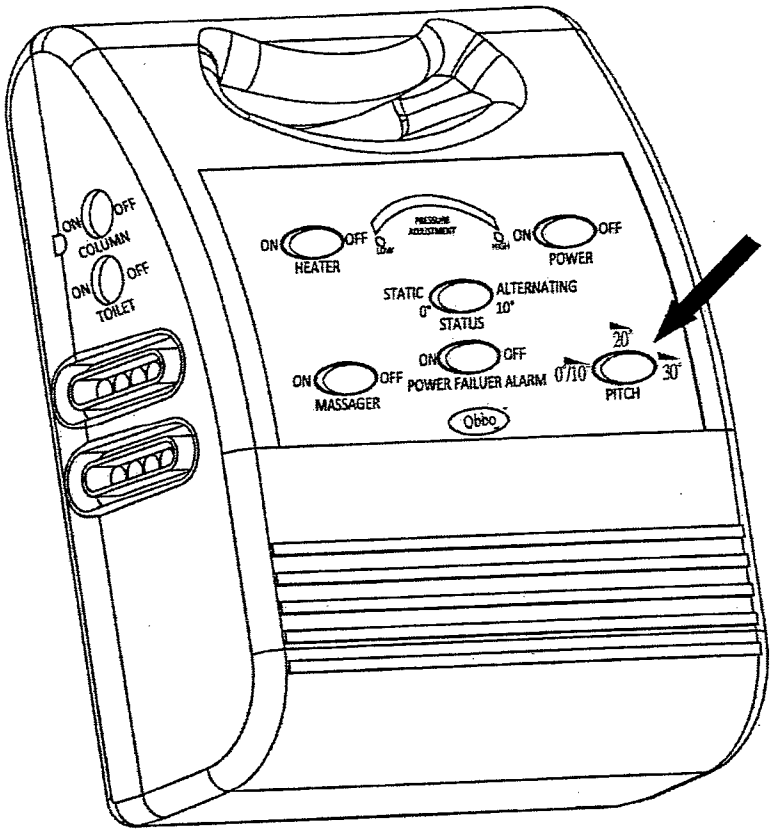

ON
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TOILET
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HEATER
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POWER
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0"
STATUS
ALTERNATING
10"
20°
ON
OFF
MASSAGER
ON
OFF
POWER FAILUER ALARM
0°
10°
PITCH
30°
Obbo

Fig. 12B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2012/001202

A. CLASSIFICATION OF SUBJECT MATTER

See the extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: A61G, A47C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CPRSABS, CNTXT, CNKI, EPODOC, WPI

inflat+, deflat+, pump+, massage, vibrat+, heat+, warm+, cushion, cell?, air, liquid, hydro+, odd, even,valve?, solenoid, alternat+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E	CN102525768A(DONGGUAN PEIJIA MEDICAL HEALTH CARE TECHNOLOGY CO LTD), 04 Jul.2012(04.07.2012), description, paragraph [0052] to paragraph [0080], figures 1-14.	1-19,30-33,35
E	CN102551974A(DONGGUAN PEIJIA MEDICAL HEALTH CARE TECHNOLOGY CO LTD), 11 Jul.2012(11.07.2012), description, paragraph [0047] to paragraph [0068], figures 1-12.	1-5,11-15,17,20-33,35,36
E	CN202478036U(DONGGUAN PEIJIA MEDICAL HEALTH CARE TECHNOLOGY CO LTD), 10 Oct.2012(10.10.2012), description, paragraph [0052] to paragraph [0080], figures 1-14.	1-19,30-33,35
E	CN202446403U(DONGGUAN PEIJIA MEDICAL HEALTH CARE TECHNOLOGY CO LTD), 26 Sept.2012(26.09.2012), description, paragraph [0047] to paragraph [0068], figures 1-12.	1-5,11-15,17,20-33,35,36

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

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"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 Nov.2012(07.11.2012)	**15 Nov. 2012 (15.11.2012)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer ZHANG, Qingnan Telephone No. (86-10)62085610

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2012/001202

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US2010180384A1(B.G.INDUSTRIES, INC.), 22 Jul.2010(22.07.2010), description, paragraph [0028] to paragraph [0042], figures 1-13.	1,2,5,11-14,17,30,32-34
Y		3,4,6-10,20-25,35
Y	CN1442613A(GUI, Zaixing), 17 Sept.2003(17.09.2003), description, page 4 line 25 to page 8 line 10, figures 1-7.	3,4,6-10,20-25,35
Y	CN101716113A(UNIV ZHEJIANG), 02 Jun.2010(02.06.2010), description, paragraph [0011] to paragraph [0018], figures 1-3.	4,6-10,20-25,35
Y	CN101803983A(UNIV SHANGHAI DIANJI), 18 Aug.2010(18.08.2010), description, paragraph [0036] to paragraph [0080], figure.	6-10,20-25,35
A	JP2000189288A (FRANCE BED KK), 11 Jul.2000(11.07.2000), the whole document.	1-36

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB2012/001202

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN102525768A	04.07.2012	None	
CN102551974A	11.07.2012	None	
CN202478036U	10.10.2012	None	
CN202446403U	26.09.2012	None	
US2010180384A1	22.07.2010	WO2006105169A2	05.10.2006
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB2012/001202

CLASSIFICATION OF SUBJECT MATTER:

A61G 7/057 (2006.01) i

A47C 27/10 (2006.01) i