(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 465 482 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
20.06.2012 Bulletin 2012/25

(51) Int Cl.:
A61G 7/057 *(2006.01)*

(21) Application number: **11193560.7**

(22) Date of filing: **14.12.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **14.12.2010 IT VR20100239**

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(54) **INFLATABLE MATTRESS WITH DEFLATABLE DEVICE**

(57) It refers to an inflatable mattress to which is connected a deflation device (20) adapted to permit a fast deflation of the mattress.

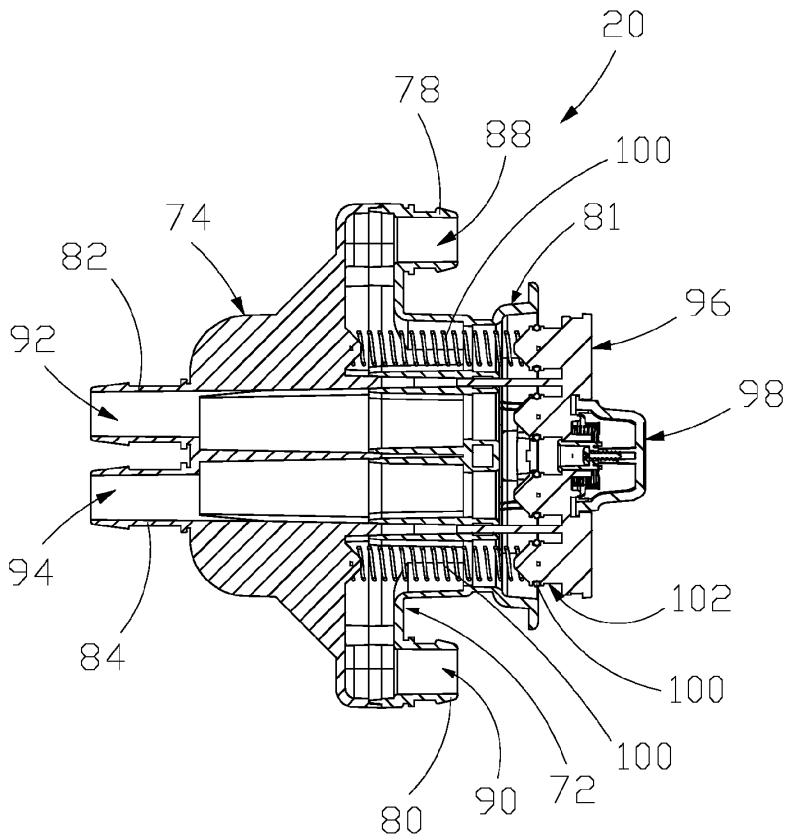

Fig. 7

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Description

[0001] The present invention refers in general to a mattress comprising a deflation device. More particularly, it is an anti-bedsore mattress connected with a deflation device designed to ensure easy, quick deflation of said inflatable mattress.

[0002] The deflation device according to the invention is described below as connected with an anti-bedsore mattress, but it may also of course be attached to any inflatable article, to facilitate deflation.

[0003] As is known, there are many types of anti-bedsore mattress, including at least two series of cells, inflated and deflated alternately according to predefined time cycles, in order to vary the position of the areas on which the patient on the mattress rests over time.

[0004] The anti-bedsore mattresses are inflated by one or more compressors, whose operation is controlled by a suitable management and control system, thereby adjusting the inflation and deflation of each of the two series of cells present in the mattress.

[0005] In the mattresses belonging to prior art, there is a side manifold connected with the feed tube that conveys the air exiting the compressor. The side manifold communicates with the mattress cells so that they can be inflated or deflated as needed.

[0006] Under the mattress cells that support the patient's trunk, there may be a inflatable element is kept compressed during the alternating operation of the cells of the mattress, while a mat of elastic material designed to ensure a minimum level of support to the patient in the event that the mattress is completed deflated is normally placed under the mattress.

[0007] A deflation device connected with the side manifold deflates the mattress cells and the inflatable element below when necessary.

[0008] The deflation devices according to prior art usually have one to three exhaust conduits, for the first and second series of cells and the inflatable element respectively. The opening process is often not easy to use and does not prove suitable to be operated quickly when necessary, being the result of counterintuitive and complicated steps. In other cases, the opening process is too easy, making it dangerous in the event of accidental opening. Furthermore, the positioning of the deflation device on the mattress is often inconvenient, for example set at an angle, interfering with the bed frame or otherwise, or near the feet area, therefore far from the chest area, the typical area of intervention for cardiac resuscitation.

[0009] The purpose of the invention is therefore to make an anti-bedsore mattress that overcomes the problems of prior art.

[0010] A further purpose of the invention is to provide a mattress comprising a reliable, easy-to-use deflation device.

[0011] These and other purposes are achieved by an inflatable anti-bedsore mattress including a deflation device, characterized in that said deflation device comprises:

- a structure;
- at least one air inlet conduit obtained in the structure and connectable with the inflatable mattress;
- an air exhaust opening, obtained in the structure and connected with at least one conduit;
- a movable cap, positioned alternately in a closing position in which it beats against the structure so as to close the opening or in a opening position in which it is detached from the structure so as to leave the passage of at least one opening free;
- a button connected with the movable cap so as to be moved between a first position in which it is connected with the structure so that the cap is compelled to position in a closing position, and a second position in which it is free in relation to the structure so that the movable cap positions in an opening position.

[0012] Thanks to the configuration of the device referred to in this invention, by simply moving the button, the cap can move away from the structure and leave the passage of air to the opening free.

[0013] Advantageously, the deflation device may include means of coupling designed to secure the button to the structure in a movable manner. As a result, the cap and the button are secured to the structure, to ensure a good attachment of the button to the structure and a stable closed position.

[0014] To make it easy but also safe to open the device, elastic means are placed between the button and the structure to keep the button away from the cap and/or the structure. When the operator wants to open the device, he must voluntarily push the button towards the cap, in order to then detach the button from the structure.

[0015] The cap may comprise means for fixing the cap to the structure, intended to keep the cap away from the structure by only a defined distance, so as to reach the open position.

[0016] In addition, elastic means may be placed between the cap and the structure to keep the cap away from the structure.

[0017] Advantageously, at least one conduit can have a U-shape, while one or more conduits may be rectilinear. Thanks to this configuration, the air inlet opening in the at least one conduit is turned in the same direction as the opening.

[0018] In addition, the inflatable mattress according to the invention may comprise at least one first series of cells and at least one second series of cells, the first series of cells being connected with the at least one first conduit and the second series of cells being connected with the at least one second conduit. Advantageously, the anti-bedsore air mattress according to the invention may comprise a left manifold and a right manifold, where the left manifold is connected with the first series of cells

and the right manifold is connected with the second series of cells. The left manifold is placed on the left side of the inflatable mattress while the right manifold is placed on the right side of the inflatable mattress. In this way, deflation is more uniform compared to the prior art which envisaged a single manifold.

[0019] For exemplary and non-exhaustive purposes, the invention's additional specifications and features are provided in greater detail within the description below, as well as within the attached diagrams, which include:

figure 1	showing an axonometric projection of an anti-bedsore mattress, according to the invention;
figure 2	showing an alternative axonometric projection of the antibedsore mattress in figure 1, with one transparent element;
figure 2A	showing a detail of the anti-bedsore mattress in figure 2, marked A;
figure 3	showing an exploded view of some internal components of the anti-bedsore mattress;
figures 4 and 5	respectively showing an axonometric projection and a side view in section of a deflation device, according to the invention, prepared according to a closed configuration;
figures 6 and 7	showing an axonometric projection and a side view in section of the deflation device, according to the invention, prepared according to an open configuration;
figures 8 and 9	showing two exploded views of the deflation device, according to the invention.

[0020] With reference to the attached figures, in particular to figures 1 and 2, 10 indicates an anti-bedsore mattress comprising an upper sheet (12) and a feed tube (14) designed to be connected with the management and control system (not shown in the figure) by means of a connector (16).

[0021] From the upper sheet (12) on which a foot area (18) can be identified, a rapid deflation device (20), described in detail below, protrudes at the side on the head side.

[0022] With reference to figures 2 and 2A, the upper sheet (12) is joined to a lower sheet (22) by means of a zip (24). Between the upper sheet (12) and the lower sheet (22), there are 26 cells, held in position by a pair of bands (28) for each cell (26) by a right manifold (30) and a left manifold (32), the latter shown in figure 3, connected with the right manifold (30) by a thin sheet.

[0023] With reference to figure 3, the feed tube (14) communicates with the right manifold (30) and the left manifold (32).

[0024] The feed tube (14) is connected with suitable inflation means via channels present on one side (36), thus enabling it to communicate compressed air to the right manifold (30) via a right nozzle (38) and to the left manifold (32) via a left nozzle (40).

[0025] The right nozzle (38) is connected with a first right track (42) on the right manifold (30), which also comprises a second right track (44) and a third right track (46). Similarly, the left nozzle (40) is connected with a first left track (48) on the left manifold (32), which also comprises a second left track (50) and a third left track (52).

[0026] The first left track (48) transmits compressed air to a first series of cells (54) by means of a first connection (56), while the first right track (42) transmits compressed air to a second series of cells (58) by means of a second connection (59). The first series of cells (54) and the second series of cells (58) are shown in the figure in their minimum number in order to make it easier to understand the invention. There are, in fact, more cells, and they alternate consecutively with each other, as shown in figure 2.

[0027] The first series of cells (54) includes a dynamic portion (60), fed directly by the first connection (56), and a static portion (62), adjoining the third left track (52) on the left manifold (32) by means of a static connection (64). Likewise, the second series of cells (58) includes a dynamic portion (66), fed directly by the second connection (59), and a static portion (68), adjoining the third right track (46) on the right manifold (30) by means of a static connection (70). The second right track (44) and the second left track (50) can be used to inflate and deflate two further series of cells for parts of the body other than those subject to the effect of the first series of cells (54) and the second series of cells (58).

[0028] The rapid deflation device (20) is connected with the right manifold (30) and the left manifold (32) by means of a first channel (71), a second channel (73), a third channel (75) and a fourth channel (77), connected with the first right track (42), the first left track (48), the third right track (46) and the third left track (52) respectively, thus enabling sudden deflation when necessary.

[0029] As shown in figure 4 in the closed configuration, the deflation device (20) comprises an upper body (72) secured to a lower body (74) by means of four screws (76). A first plug (78), a neck (81) and a second plug (80) protrude from the upper body, while a third plug (82) and a fourth plug (84) protrude from the end of the lower body.

[0030] As shown in figure 5, in the first plug (78), in the second plug (80), in the third plug (82) and in the fourth plug (4), a first conduit (88), a second conduit (90), a third conduit (92) and a fourth conduit (94) are obtained and reach the inside of the neck (81).

[0031] The first conduit (88) and the second conduit (90) are U-shaped, while the third conduit (92) and the fourth conduit (94) are mainly rectilinear.

[0032] The communication of the collar (81) outwards is controlled by the position of a cap (96) on which a button (98) is pivoted, with a mainly tapered shape. The

cap (96) is pushed outwards by two springs (100) which rest on the lower body (74) and are housed in the first conduit (88) and in the second conduit (90) inside the neck (81) respectively.

[0033] As shown in figures 6 and 7, the deflation device (20), in its open configuration, has the cap (96) distanced from the upper body (72), thus placing the internal part of the neck (81) in communication with the exterior.

[0034] The first plug (78) and the second plug (78) on the deflation device (20) are connected with the left manifold (32) by means of the second channel (73) and the fourth channel (77), respectively, as can be seen in figure 3. The third plug (82) is connected with the first channel (71) while the fourth plug (84) is connected with the third channel (75). This arrangement of the connections minimizes the length of the channels that put the right and left manifolds (30, 32) in communication with the deflation device (20).

[0035] The U-shape of the first conduit (88) and the second conduit (90) and the rectilinear direction of the third conduit (92) and the fourth conduit (94) makes it possible to have four air inlet plugs facing in two different directions, while the air outlet opening, i.e. the neck (81), develops in a single direction.

[0036] As can be seen in figure 8, four elements (102) to which four seal rings (104) are connected protrude from the cap (96).

[0037] There is a through hole (106) in the cap (96), through which a hollow cylinder (108) passes, connected with the button (98) by means of a screw (110).

[0038] The hollow cylinder (108) is designed to act as an end run for the relative movement of the button (98) in relation to the cap (96). In fact the button (98), in addition to being able to move, can also rotate in relation to the cap (96) if not secured to the upper body (72) as described below.

[0039] A first ring (112), a spring (114) and a second ring (116) are placed between the cap (96) and the button (98). The first and second ring (112, 116) reduce friction and wear to the cap (96) and the button (98) when they rotate relative to each other, while the spring (114) tends to distance the button (98) from the cap (96).

[0040] As can be seen in figure 9, two legs (118), which both have a foot (120) at the end protrude from the cap (96) in proximity to the four elements (102). The foot (120) is shaped to act as an end run for the relative movement between the upper body (72) and the cap (96). In fact, in the upper body (72), there are two seats (122) inside which the two legs (118) are conveniently placed. Inside the free end of the neck (81), there are two edges (124), mirroring each other and shaped like a sector of a circle of less than a quarter of a turn. The edges (124) each include a tooth (126) protruding towards the inside of the neck (81).

[0041] Two thin profiles (128) protrude near the base of the button (98), also mirroring each other and with development less than a quarter of a turn. There is a groove (130) halfway along their length.

[0042] The operation of the inflatable mattress (10) according to the invention, with reference to figure 3, is described below.

[0043] The feed tube (14), connected with the management and control system, comprising the appropriate means of inflation that control the pressure of the air introduced into each of the two channels in the side (36), transmits the compressed air to each element of the inflatable mattress (10) described beforehand, thus determining its behaviour in relation to a patient lying on top of the inflatable mattress (10) itself.

[0044] Varying the pressure set on the right manifold (30) and the left manifold (32) ensures independent behaviour of the first series of cells (54) compared to the second series of cells (58) e.g. by inflating and deflating the two series alternately to create rest areas that vary constantly for the patient lying on top. Only the pressure in the dynamic portions (60, 66) of the first and second series of cells (54, 58) is controlled, while the static portions (62, 68) result as communicating between each other and fed by the dynamic portions (60, 66) by means of a non-return valve (not shown in the figure). The static portions (62, 68) communicate with the third right and left tracks (46, 52), obtaining the effect of having a uniform average pressure between the various static portions.

[0045] During the normal operation of the anti-bedsore mattress (10), the deflation device (20) is in its closed configuration, as can be seen in figures 4 and 5, with the grooves (130) on the button (98) by the teeth (126) on the neck (81), the latter visible in figure 9. In this way, the edges (124) hold back the thin profiles (128), preventing the button (98) from moving away from the upper body (72) and thus preventing the cap (96) moving away from the upper body (72).

[0046] The four elements (102) on the cap (96) are thus inserted into the neck (81) of the upper body (72). The four seal rings (104) ensure the seal and prevent unwanted leakage of air from the anti-bedsore mattress (10).

[0047] If necessary, an operator acts on the rapid deflation device (20), pressing the button (98), thus compressing the spring (114). In this way, the grooves (130) are moved away from the teeth (126) and the operator can rotate the button (98) itself by a quarter of a turn.

[0048] After this rotation, the thin profiles (128) are offset from the edges (124), so these two elements can no longer come into contact with each other.

[0049] When the operator releases the button (98), the cap (96) is pushed outwards by the springs (100), no longer secured by the button (98) itself.

[0050] The cap (96) then comes out from inside the neck (81) until the feet (120) reach the end of the seats (122), blocking the cap (96) from coming out further.

[0051] The deflation device (20) is now arranged according to its open configuration, as can be seen in figures 6 and 7.

[0052] The four elements (102) on the cap (96) are now outside the neck (81) of the upper body (72). The

first conduit (88), the second conduit (90), the third conduit (92) and the fourth conduit (94) are then opened to the outside and the air contained in the mattress can come out freely.

[0053] The first and the second series of cells (54, 58) are deflated at the same time, providing less and less support for the patient who, after a few seconds is resting on a harder surface.

[0054] Anti-bedsore mattresses belonging to prior art comprise only one side manifold to which both the first and the second series of cells are connected. Deflation therefore leads to an imbalance in the mattress pressure trend, also unbalancing the patient and creating discomfort.

[0055] In contrast, during rapid deflation, the anti-bedsore mattress (10), according to the invention, does not lead to pressure gradients for the patient, thanks to alternation between the first series of cells (54) and the second series of cells (58) and the consequent alternation of the connection of the cells (26) with the right manifold (30) and the left manifold (32).

[0056] The division of the static part in each individual cell according to the invention means it is possible to ensure better pressure distribution compared to the prior solution of having a single inflatable element under the cells.

[0057] Moreover, while in prior mattresses, the inflatable element is deflated via a single conduit, the construction with two side manifolds on the anti-bedsore mattress (10), according to the invention, makes it possible to divide deflation of the static part, including the static portions (62, 68) and the third left and right tracks (46, 52), thus making it possible to deflate the whole anti-bedsore mattress (10) more quickly.

[0058] The procedure for opening the deflation device (20), as described according to the invention, is easy to use, due to the fact that it envisages the pressing of the button (98) following by a small rotation as the main movements required from the operator.

[0059] At the same time, the succession of the two main movements does not lend itself to unintentional opening, as pressing the button (98) accidentally is not sufficient to trigger the opening of the cap (96) and consequently deflation. The positioning of the deflation device (20) near the head area facilitates rapid interventions, in which the operator, after having activated the deflation device (20), is in front of the chest area to provide cardiac resuscitation, for example.

[0060] The compact design of the deflation device (20), in which the first plug (78) and the second plug (80) are connected with the left manifold (32) and facing the cap (96), the third plug (82) and the fourth plug (84) are connected with the right manifold (30) and facing the away from the plug (96), makes it possible to house the deflation device (20) in the seat (31) in the left manifold (32), meaning that only the cap (96) and the button (98) are visible from outside. This construction is very different from deflation devices belonging to prior art, which appear, in some cases, to be very large, occupying valuable space in the mattress and constituting a hard obstacle after deflation. In other anti-bedsore mattresses, on the other hand, the small size of the deflation device is achieved through excessive simplification, at the expense of practicality and safety.

[0061] The deflation device (20) is, in fact, a construction that meets two main objectives. The first objective is to have an opening system that is hard to activate accidentally, but at the same time easy to activate when needed. The second objective is to ensure rapid deflation of the anti-bedsore mattress (10) on which it is installed.

[0062] There are also additional variations and methods of creation, to be considered included in the scope of protection defined by the following claims.

Claims

1. Anti-bedsore inflatable mattress comprising a deflation device (20), **characterized in that** said deflation device comprises:

   - a structure (72, 74);
   - at least one air inlet conduit (88, 90, 92, 94), obtained in the structure (72, 74) and connectable with the inflatable or deflatable article;
   - an air exhaust opening (81), obtained in the structure (72, 74) and connected with the at least one air inlet conduit (88, 90, 92, 94);
   - a movable cap (96), positioned alternately in a closing position in which it beats against the structure (72, 74) so as to close the opening (81) or in a opening position in which it is detached from the structure (72, 74) so as to let free the passage of the at least one opening (81);
   - a button (98) connected with the movable cap (96) so as to be moved between a first position in which it is connected with the structure (72, 74) so that the cap (96) is compelled to position in a closing position, and a second position in which it is free in relation to the structure (72, 74) so that the movable cap (96) positions in an opening position.

2. Inflatable mattress according to claim 1, wherein coupling means (124, 126, 128, 130) are comprised and are adapted to constrain the button (98) to the structure (72, 74) so as to be moved.

3. Inflatable mattress according to claim 2, wherein elastic means (114) are placed between the button (98) and the structure (72, 74) and are adapted to move the button (98) away from the movable cap (96) and/or from the structure (72, 74).

4. Inflatable mattress according to any of the preceding claims, wherein the cap (96) comprises fixing means

(118, 120) which secure the cap (96) to the structure (72, 74) and allow the cap (96) to be moved away from the structure (72, 74) for a fixed distance in order to reach the opening position,

5. Inflatable mattress according to any of the preceding claims, wherein elastic means (100) are placed between the cap (96) and the structure (72, 74) and are adapted to move the cap (96) away from the structure (72, 74).

6. Inflatable mattress according to any of the preceding claims, wherein the at least one conduit (88, 90) is shaped like a "U" so that the air inlet opening in the at least one conduit is turned in the same direction of the opening (81).

7. Inflatable mattress according to any of the preceding claims, wherein at least two conduits (88, 90, 92, 94) are comprised, at least one first conduit (88, 90) being shaped like a "U", and at least one second conduit (92, 94) being rectilinear.

8. Inflatable mattress (10) according to the preceding claim, wherein at least one first series of cells (54) and at least one second series of cells (58) are comprised; the first series of cells (54) being connected with the at least one first conduit (88, 90), and the second series of cells (58) being connected with the at least one second conduit (92, 94).

9. Inflatable mattress (10) according to claim 8, wherein a left manifold (32) and a right manifold (30) are comprised, the left manifold (32) being connected with the first series of cells (54) and the right manifold (30) being connected with the second series of cells (58), the left manifold (32) being placed on the left side of the inflatable bedsore mattress (10) and the right manifold (30) being placed on the right side of the inflatable bedsore mattress (10).

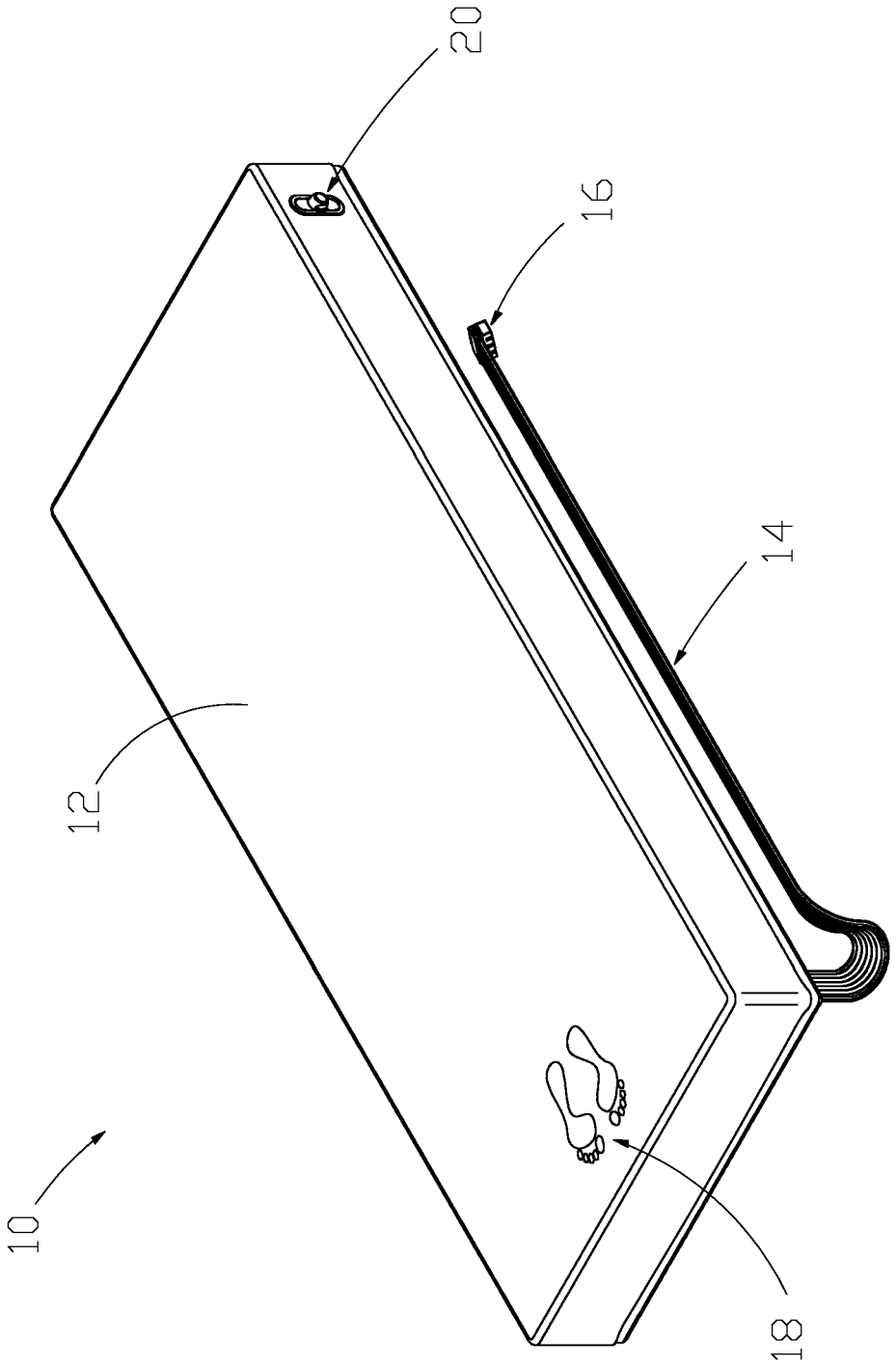

Fig. 1

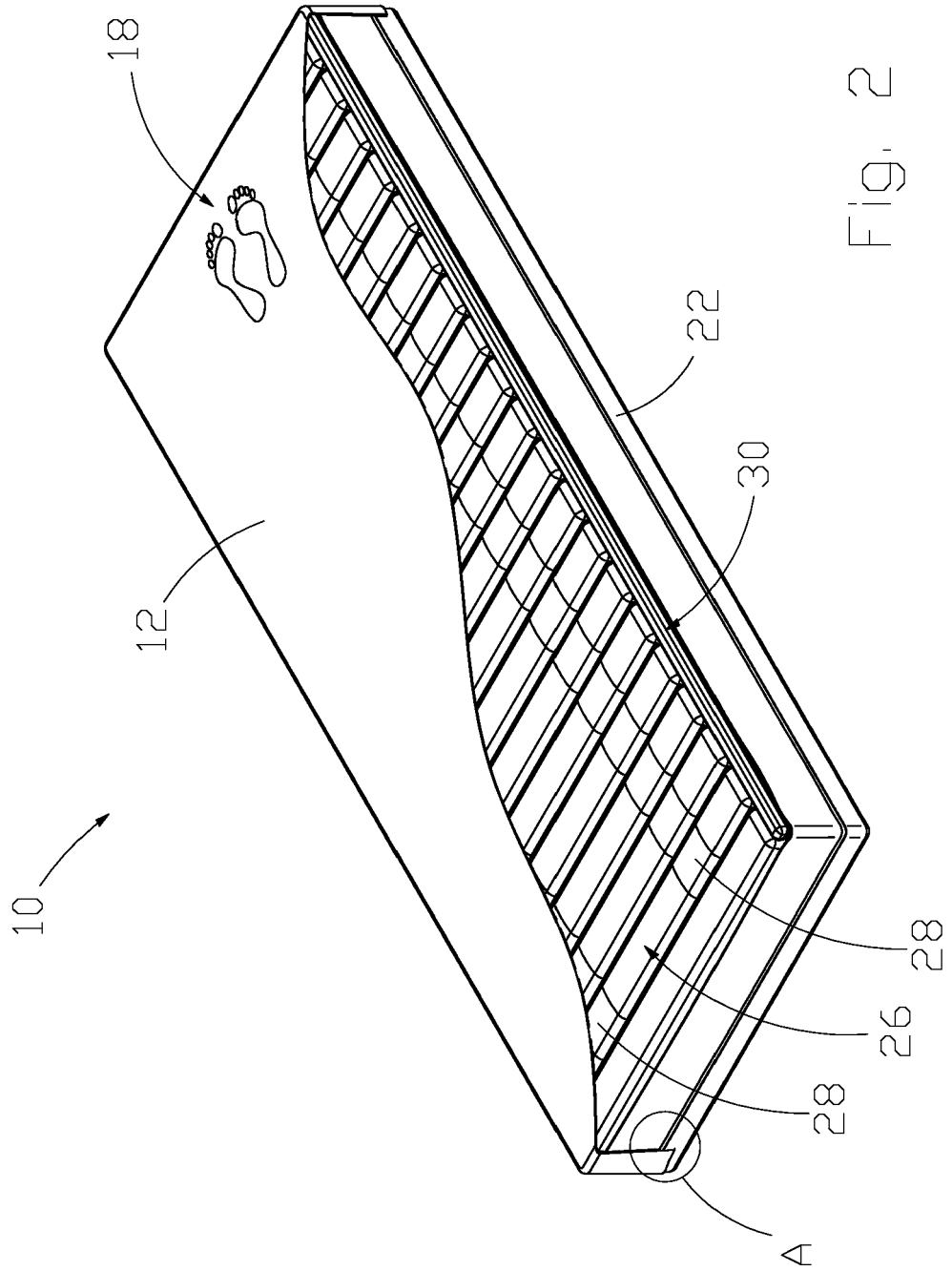

Fig. 2

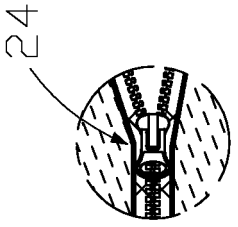

Fig. 2A

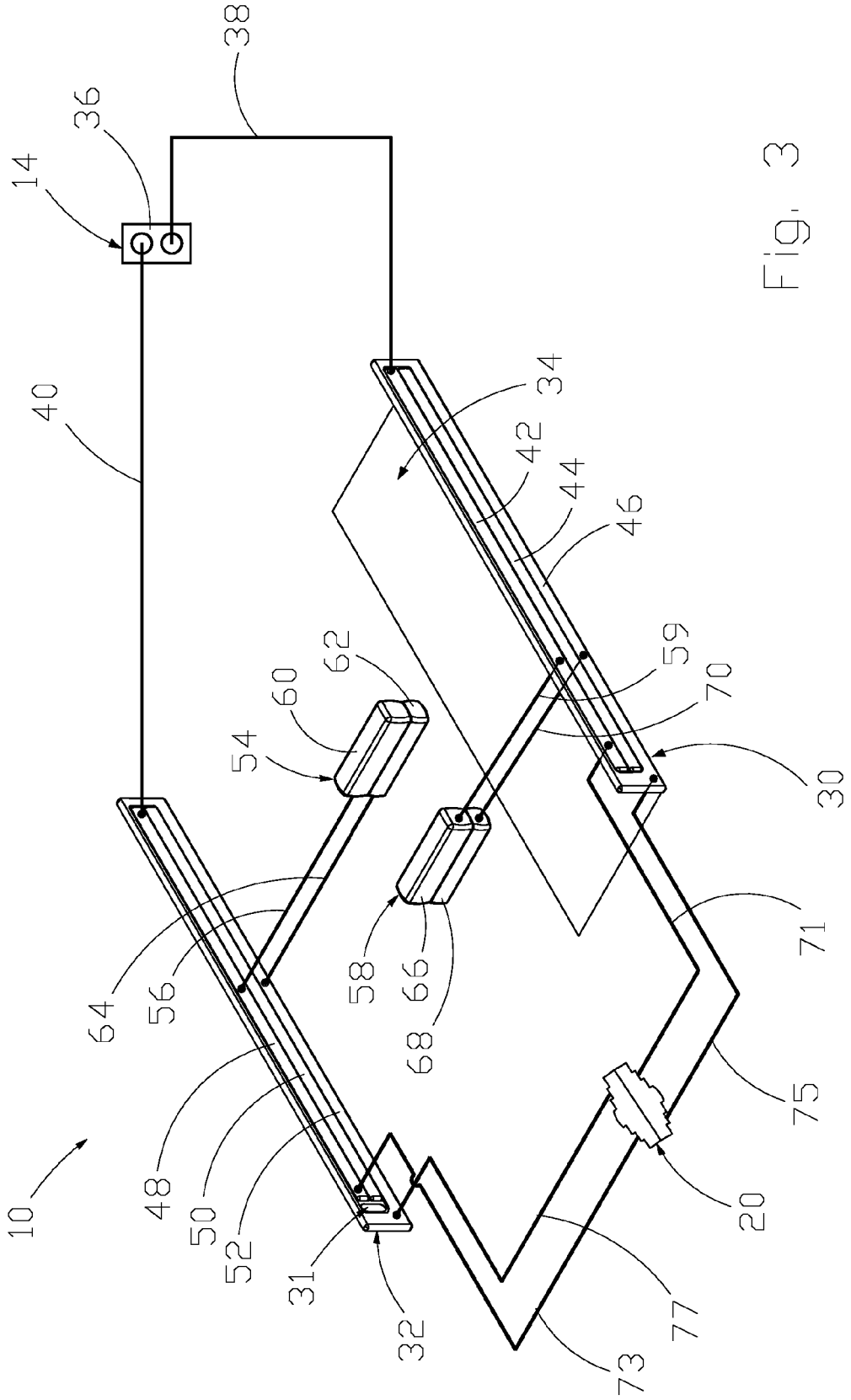
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Fig. 3

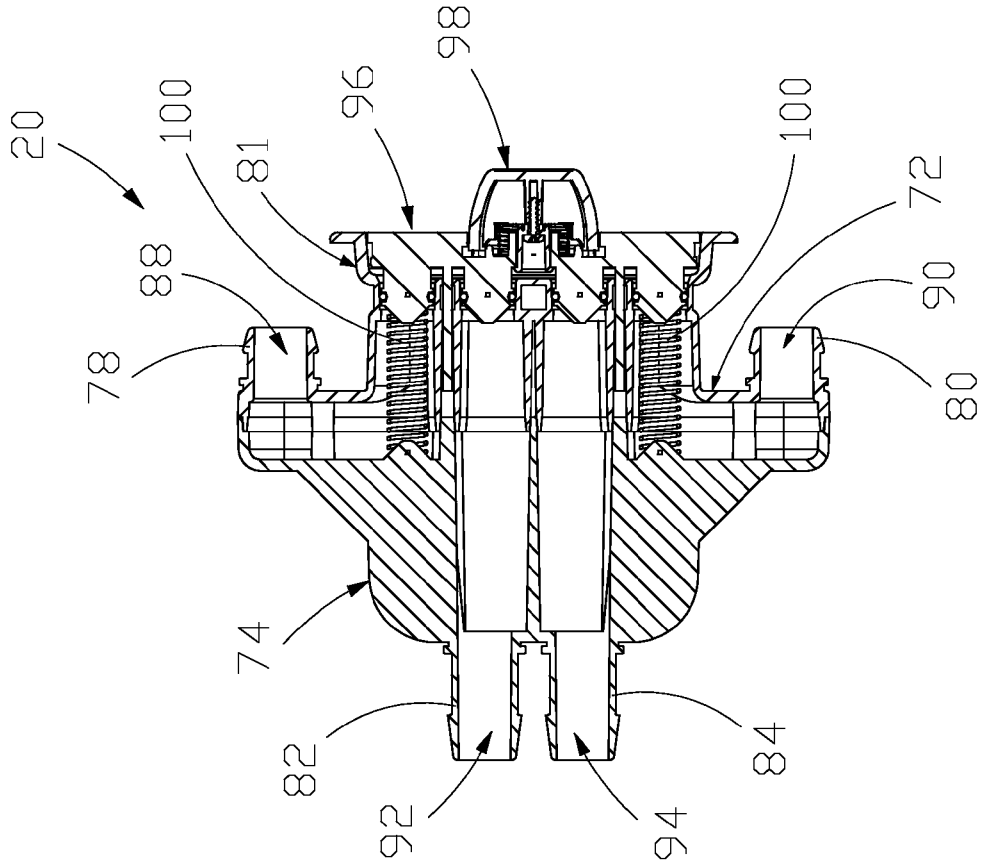
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Fig. 5

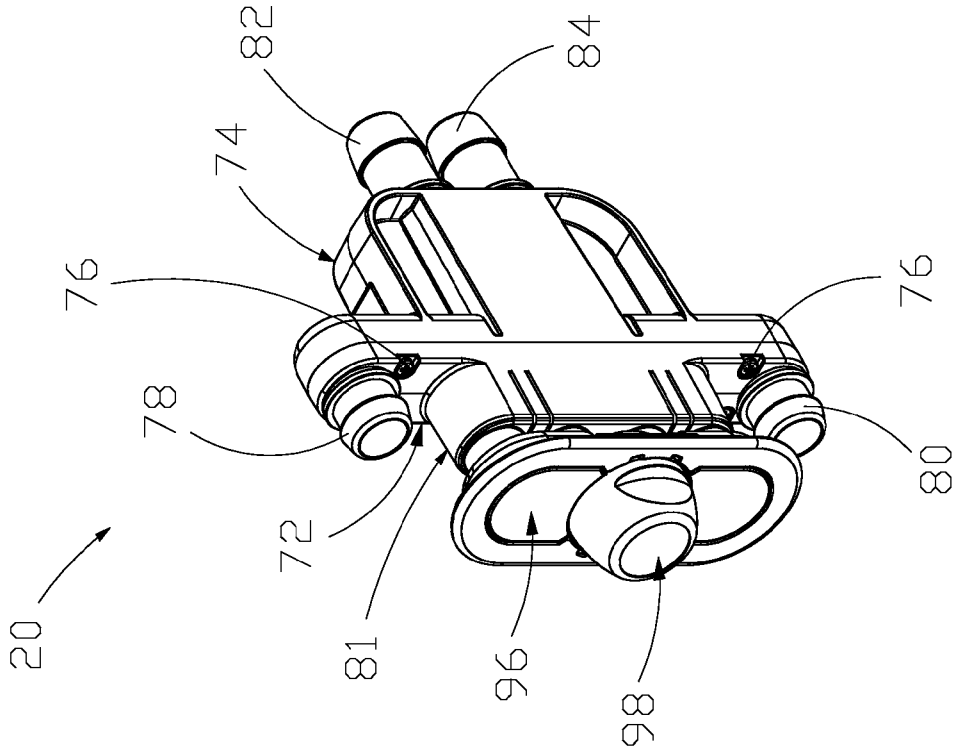
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Fig. 4

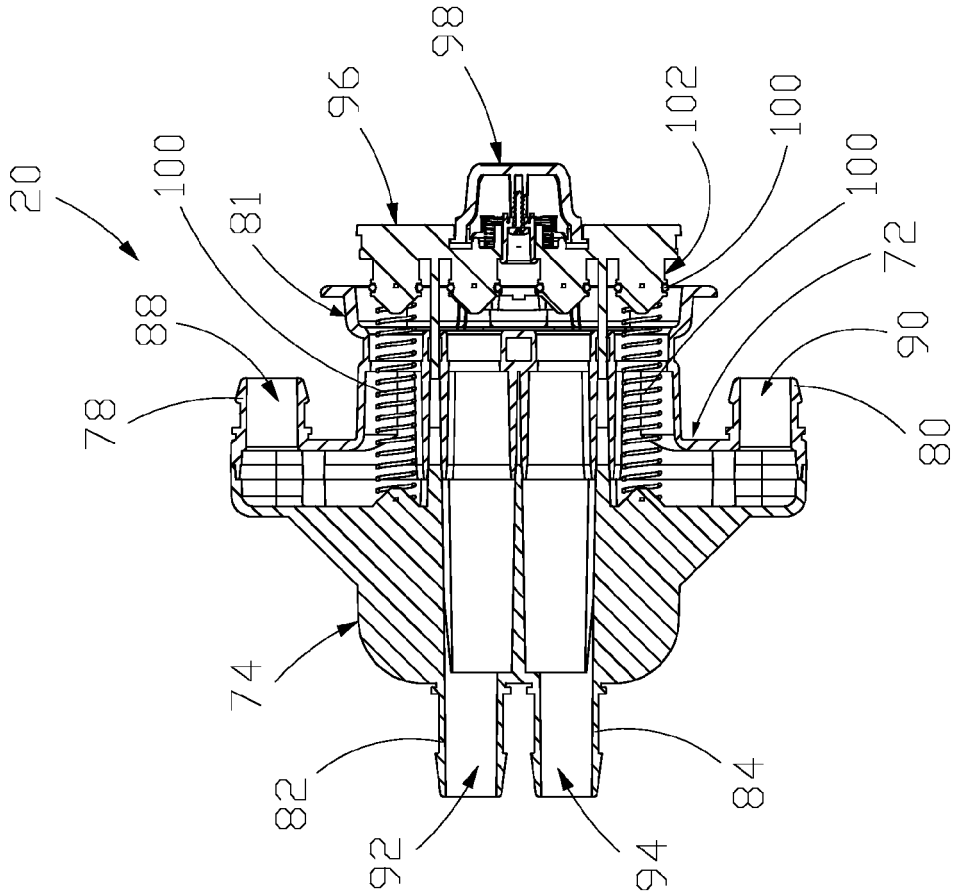
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Fig. 7

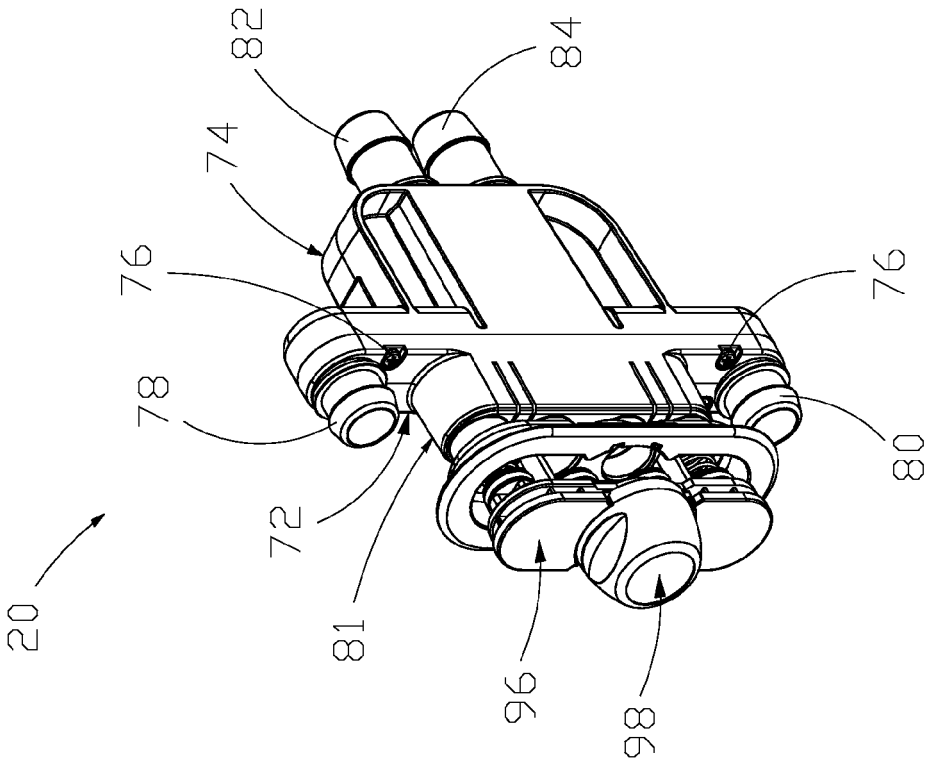
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Fig. 6

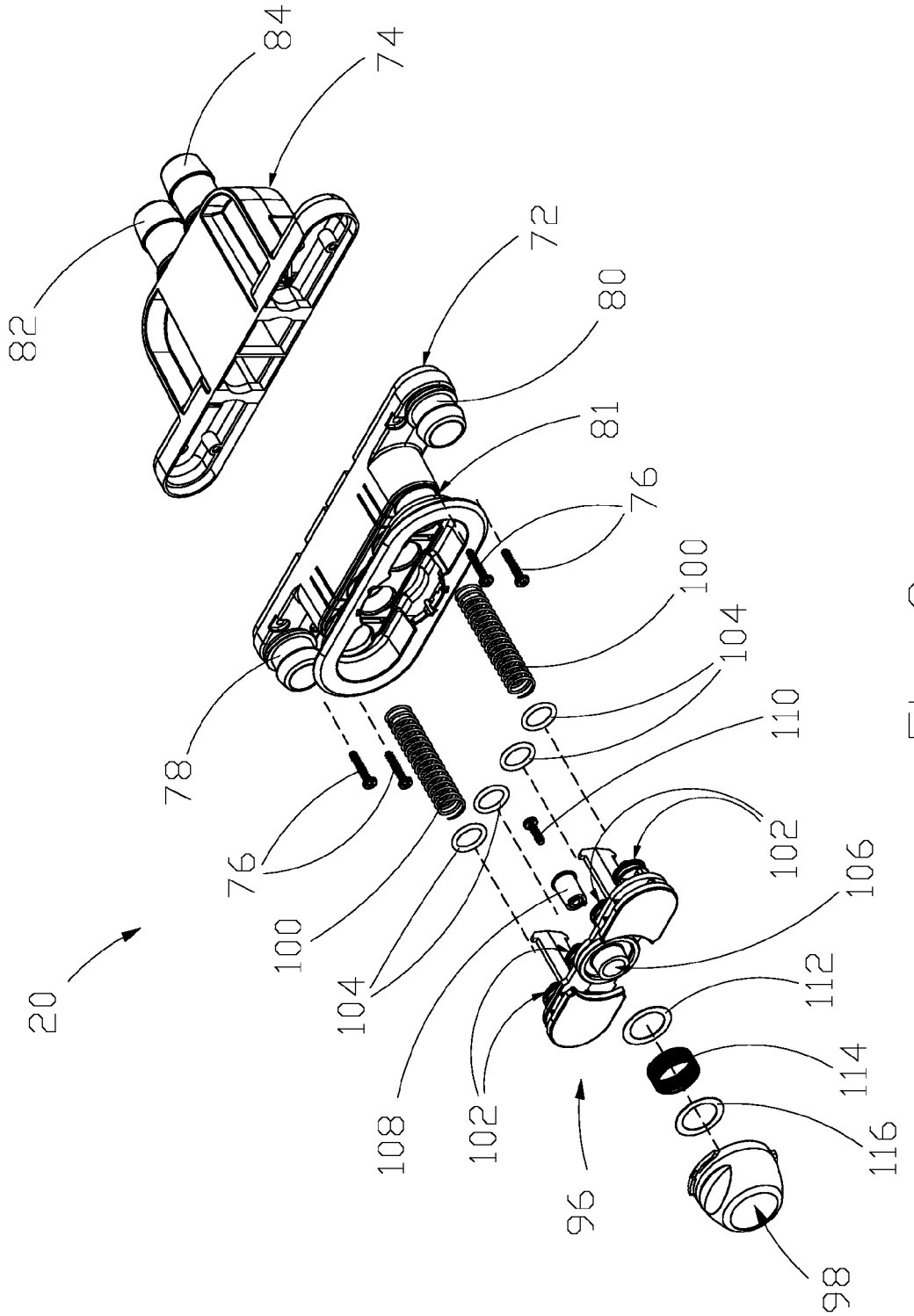
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Fig. 8

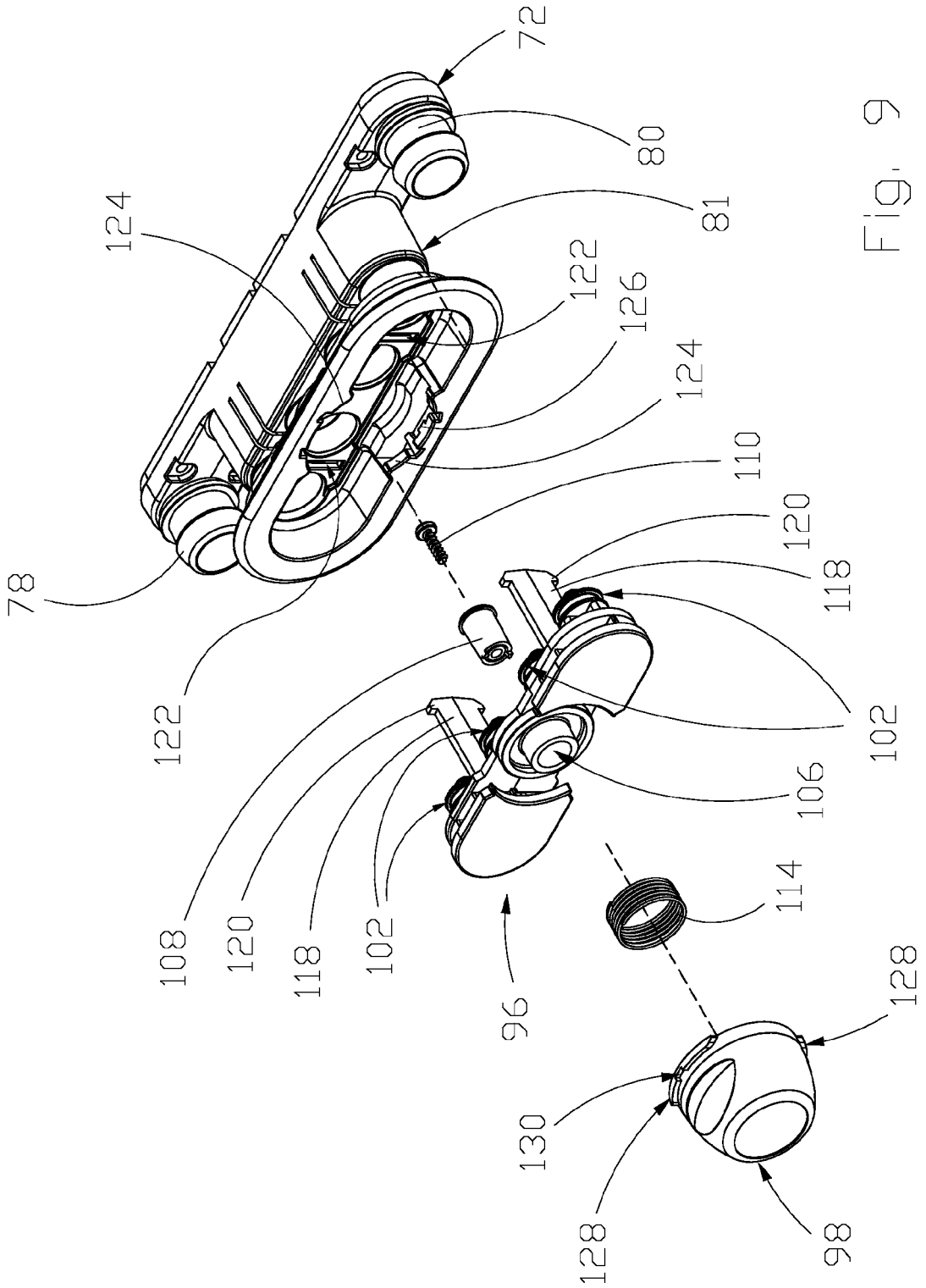
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Fig. 9