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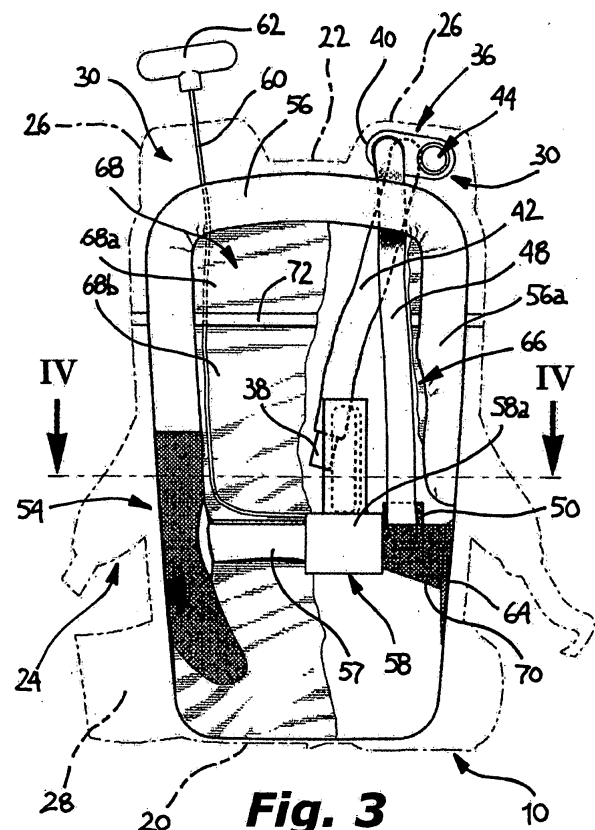
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(54) **BACKPACK WITH SAFETY SYSTEM TO BE ACTIVATED IN THE CASE OF AN AVALANCHE**

(57) A backpack provided with a safety system operable in case of an avalanche comprises a body (12) having a back wall (14), a casing (16) adapted to delimit a storage volume for storing objects, and a harness (24) including a pair of shoulder straps (26) at least a first one of which has an inner cavity (30) connected to the storage volume of the backpack (10). The backpack (10) is provided with an emergency breathing device (36) including a service pipe (42) that extends into the inner cavity (30) of the first shoulder strap (26), and which is connected to a valve unit (40) to selectively allow the user to discharge carbon dioxide into a zone (46) spaced from the intake zone (44), through a discharge pipe (48). The backpack (10) comprises an airbag device (54) which includes an inflatable cushion (56) and an inflation unit (58) operable via a control cable (60), which are arranged within the storage volume of the backpack (10), the control cable (60) extending into the inner cavity of a second shoulder strap (26).



Description

[0001] The present invention refers in general to safety systems operable in the case of an avalanche, to allow a victim of an avalanche to lengthen as much as possible the survival time below the avalanche snow mass, waiting for help.

[0002] It is known, for example from the patent application EP-2 620 181 in the name of the same Applicant, an emergency breathing device allowing a user to breathe below a mass of snow. In summary, this device comprises a mouthpiece connected to a valve unit by a service pipe, to allow the user to selectively inhale air from a suction zone, and to discharge exhaled carbon dioxide into a discharge zone spaced from the suction zone, through a discharge pipe.

[0003] It is also known from EP-1 790 386 to incorporate a similar emergency breathing device in a backpack, by associating such a device with the casing of the backpack. In this case, the service pipe of this device extends at least partially in the inner cavity of a shoulder strap of the backpack harness, while the discharge pipe is arranged inside the body of the backpack, one end of such a discharge pipe, opposite to the valve unit, being connected to a discharge opening formed in the casing.

[0004] In particular, the present invention relates to a backpack of the type defined above, having the features mentioned in the preamble of appended claim 1.

[0005] Also, backpacks are known to be used by hikers in mountain areas where a risk of avalanches exists, which incorporate a so-called air-bag device. This known device includes one or more inflatable cushions and a respective inflation unit that can be operated by the user to cause the cushions thereof to be inflated in a few seconds, in order to assist floating of the user above the snow mass of the avalanche.

[0006] The possibility to incorporate both an emergency breathing device and an air-bag device in a same backpack is not be considered seriously up till now in view of the difficulty of arranging both these devices in the reduced volume defined by a backpack, considering that both these devices require a free space to allow them be reliable in use. Also, a backpack provided with both these devices might be complex to be operated, entailing therefore an increase of the reaction times needed for its operation by the user. Moreover, the fact that both these devices are provided in a backpack, without using particular measures, should significantly reduce its function of transporting objects, including the safety tools, such as shovels or probes, which are imposed by the rules to those who want to access to areas affected by the risk of avalanches. In particular, the possibility of preparing a backpack including both an emergency breathing device and an air-bag device has been set aside up to now owing to technical prejudices caused by the practical difficulty of manufacturing such a backpack that proves to be really reliable in use.

[0007] Anyway, the present invention, arises from the

idea that a backpack equipped with both an emergency breathing device and an air-bag device, should constitute an equipment that would be able to considerably improve safety of hikers who access to the zones affected by the risk of avalanches.

[0008] Therefore, the object of the invention is to propose a backpack provided with an emergency breathing device and with an air-bag device, in which both these devices are conceived and arranged so as to take up a minimum space, so as to allow the backpack to have a relatively wide volume available for storing objects, and to allow a fully reliable and safe use of both these devices, and that allows in the same time to keep this two devices separated with each other and operable in a simple and immediate manner.

[0009] This object is achieved by virtue of the characteristics defined in the appended claims.

[0010] In particular, by virtue of the fact that the backpack comprises an air-bag device including an inflatable cushion and an inflation unit both arranged within said storage volume of the backpack, the inflation unit being operable manually by the user by means of a control cable that extends at least partially in the inner cavity of a second shoulder strap, which cavity is accessible from the outside of the backpack through a closable opening of said second shoulder strap, it is possible to make the operation of the emergency breathing device and the air-bag device contained in a same backpack, comfortable, quick and effective, without prejudice their reliability in operation.

[0011] According to a preferred feature of the invention, the inflation unit for inflating the air-bag device is connected to an intake opening for sucking air from the outside of the backpack, which air intake opening is formed in the casing of the body in a position separate from the discharge opening, but close to it.

[0012] In this manner, simplicity and production cost effectiveness of the backpack are increased.

[0013] According to another preferred feature of the invention, the air intake opening is formed in a side wall of the casing, the discharge opening being formed in a position adjacent to the back wall, close to the air intake opening.

[0014] This enables to provide a discharge opening of the emergency breathing device which is arranged at a zone at least partially sheltered by the wearer's body, so as to promote the operational reliability of such a breathing device.

[0015] According to yet another preferred feature, the inflatable cushion, in the inactive configuration of the air-bag device, is wound according to a generally tubular configuration at a peripheral zone of the back wall, so as it has a lateral branch that extends at least partially along a side zone of the body of the backpack, the discharge pipe of the emergency breathing device being arranged in a position substantially parallel and close to said lateral branch of the inflatable cushion.

[0016] In this manner the overall operating space of

the two devices is reduced, which allows a storage volume to be available inside the backpack for storing relatively large objects, without interfering with the operation of these devices.

[0017] Further characteristics and advantages of the invention will become more apparent from the following detailed description, which has been provided purely by way of non-limiting example, and is referred to the accompanying drawings that show a preferred embodiment, in which:

- Figure 1 is a schematic perspective view of a backpack according to the invention,
- Figure 2 is another schematic perspective view of the backpack of Figure 1,
- Figure 3 is a schematic partially broken and rear elevational view showing an emergency breathing device and an air-bag device incorporated in the backpack of the invention, and
- Figure 4 is a top elevational view sectioned along line IV-IV of Figure 3.

[0018] With reference to the Figures, a backpack according to the invention is indicated in its whole by reference numeral 10.

[0019] The backpack 10 comprises essentially a body 12, typically of textile and/or plastic material, including a back wall 14 intended to rest, in use, on the back of a user. A casing 16 is connected to the back wall 14 so as to delimit a storage volume for storing objects, which casing comprises, in general, a pair of side walls or zones 18, a bottom wall or zone 20 and a top wall or zone 22.

[0020] A harness 24 is fixed on the back wall 14, which includes, in a manner known per se, a series of mostly conventional retaining members, such as a pair of shoulder straps 26 and a waist belt 28, of the adjustable type, as well as other buckles and straps, the purpose of which is to allow the backpack 10 to be firmly connected to the wearer's body. Of course, especially in view of using the backpack 10 in the case of an avalanche, all the various members of its harness 24 require a proper tightening.

[0021] Both the shoulder straps 26 have a hollow structure so as to define an inner cavity 30 connected to the storage volume of the backpack 10 at the back wall 14. The cavity of both the shoulder straps 26 can be reached from the outside of the backpack 10 through a respective opening 32, which extends longitudinally for a subitive portion of the respective shoulder strap 26, closure means of this opening being provided, preferably in the form of a zipper.

[0022] The backpack 10 is provided with an emergency breathing device adapted to allow a user to breathe below a mass of snow, which is indicated 36 as a whole, conveniently of the type described in the patent application EP-2 620 181 which is incorporated herein by reference.

[0023] In short, the device 36 comprises a mouthpiece 38, intended to receive a terminal member (not shown) of plastic material such as silicone, which can be inserted

into the user's mouth in view of its use. This mouthpiece 38 is connected to a valve assembly 40, by means of a flexible service pipe 42, which essentially comprises a pair of non-return valves functionally mounted in an opposite manner one with respect to the other. These valves allow the user to selectively inhale fresh air from an intake zone 44, for example adjacent to the valve unit 40, and to discharge the exhaled air, rich in carbon dioxide, at a discharge zone 46 spaced from the intake zone 44, through a flexible and extensible discharge pipe 48 associated with the casing 16.

[0024] In particular, the pipe 48 is arranged inside the body 12 of the backpack 10, and has one end opposite to the valve unit 40 which is connected to a discharge opening 50 formed in the casing 16 close to its lower portion, such as its bottom wall or zone 20.

[0025] In the inactive condition of the device 36, the service pipe 42 is usually received in the inner cavity 30 of the respective shoulder strap 26, for example of the right shoulder strap of the backpack 10, and, in view of the use of the device 36, it can be easily drawn out from such a shoulder strap 26 through its opening 32.

[0026] The backpack 10 also comprises an air-bag device 54 that includes, in a manner generally known per se, an inflatable cushion 56 and a respective inflation unit 58. The cushion 56 and the unit 58 are both arranged in the storage volume of the backpack 10, which is arranged between the rear wall 16 and the casing 14 of the backpack 10.

[0027] In the active and inflated condition of the cushion 56, it is intended to assume an arcuate configuration, substantially shaped as an overturned U, which surrounds the upper part of the backpack 10, in a position adjacent to the side and top walls or zones 18 and 22 of the casing 16.

[0028] In the inactive or deflated condition of the cushion 56, it is wound according to a generally tubular configuration inside the casing 16, so as to assume an arcuate shape that extends along part of the perimeter of the back wall 14, close to a zipper of the known automatically opening type, indicated 55 in Figures 1 and 2, which is arranged at the side and top walls or zones 18 and 22 of the casing 16. In this configuration, the cushion 56 forms a transverse upper branch as well as two parallel side branches one of which is indicated in Figures 3 and 4 by the reference numeral 56a. An elongated recess indicated 66 is defined between this side branch 56a of the cushion 56 and the back wall 14, in which a prevailing part of the discharge pipe 48 of the emergency breathing device 36 is arranged.

[0029] In this manner, the exhaust pipe 48 of the emergency breathing device 36 extends substantially parallel and close to the side branch 56a of the inflatable cushion 56, so as to occupy a normally unusable space within the storage volume of the backpack 10, enabling to significantly reduce the space needed for installation of the devices 36 and 54 inside the backpack 10.

[0030] The inflation unit 58 for inflating the air-bag de-

vice 54 comprises a duct 57 arranged transversely with respect to the storage volume of the backpack 10, substantially close to its bottom wall or zone 20, along which a driving mechanism 58a is interposed. A pair of compressed gas cartridges are associated, in a manner known per se, to such a mechanism, which contain, for example, carbon dioxide (CO₂) and Argo (Ag), respectively, the respective nozzles of which face the inside of the duct 57. A portion of the duct 57 is connected to one end of the cushion 56, at one side of the mechanism 58a, while the other portion of the duct 57, at the opposite side of the mechanism 58a, has a general truncated cone shape having its wider end connected to the edge of an air intake opening 64 for sucking air from the outside of the backpack 10. Opening of the gas cartridges of the mechanism 58a causes an accelerated gas flow to be generated within the duct 57 which, by ejector effect, causes air to be sucked from the opening 64 through the truncated cone portion of the duct 57.

[0031] The driving mechanism 58a of the inflation unit 58 is adapted to be actuated manually by the user, as a result of application of a pulling force to a control cable 60, via a relative actuating handle 62, which extends in a zone substantially adjacent to the inner face of the back wall 14. The control cable 60 is slidably mounted within the inner cavity 30 of a second shoulder strap 26 of the backpack 10, for example the left shoulder strap, the handle 62 being usually contained in such an inner cavity 30 that can be closed by a respective zipper 32. If the user considers a risk of avalanches may exist, after the cavity of the respective shoulder strap 26 has been open by acting on the relative opening 32, he or she pulls out the handle 62 from the shoulder strap 26, so that it can be readily grasped and submitted to a traction.

[0032] The opening 64 is preferably formed in the casing 16 in a position separated from the discharge opening 50, but close to it, so as to make the manufacturing operations of such openings easier and faster.

[0033] Preferably, the air intake opening 64 is formed in a side wall 18 of the casing 16, while the discharge opening 50 is formed in a position adjacent to the back wall 14 or in a zone of the same back wall 14, approximately at half height of the backpack 10.

[0034] The air intake and exhaust openings 64 and 50 are conveniently provided with respective protective nets 64a and 50a, the protective net 64a of the air opening 64, which normally has a wider size, being associated with one or more stiffening crosspieces 64b.

[0035] The inflation unit 58 and the respective duct 57, as well as an end portion of at least one of the side branches of the inflatable cushion 56, are covered by a protective coating 70 which is also connected, inside the casing 16, to the peripheral edge of the air intake opening 64.

[0036] An inner wall 68 of the backpack 10 is provided between the back wall 14 and the air-bag device 54, which is substantially parallel to the back wall 14, in such a manner that the inner wall 68 and the casing 16 delimit, on opposite sides, the storage volume for storing objects

of the backpack 10. One or more transverse and/or longitudinal openings, that can be closed by closing means known per se such as Velcro®, are formed in the inner wall 68, so as to allow access to the zone of the backpack 10 adjacent to the back wall 14, where the discharge pipe 48 of the emergency breathing device 36 is located, from the inside of the casing 16.

[0037] In particular, the inner wall 68 has a transverse opening 72 which divides it into two upper and lower portions 68a and 68b, respectively. A portion of the cable 60 closer to its end connected to the driving mechanism 58a of the inflation unit 58, extends into the volume for storing objects, so as to be placed side by side to the lower portion 68b of the inner wall 68. The other portion of the cable 60, closer to the handle 62, slidably crosses a zone of the transverse opening 72, and it is interposed between the upper portion 68a of the inner wall 68 and the back wall 14 of the backpack 10, so as to reach the cavity 30 of the respective shoulder strap 26.

[0038] While the foregoing description and the accompanying figures are referred to an embodiment in which the emergency breathing device 36 is arranged in the right portion of the backpack 10, a part of such a device being received in the right shoulder strap 26 while the control cable 60 of the air-bag device 54 extends in the left shoulder strap 26, which configuration is more suitable for use by a right-handed user, the invention has the considerable advantage of allowing the backpack 10 to be modified in a simple and relatively quick manner to be used by a left-handed user. In this case, it is enough to move simply the emergency breathing device 36 into the left shoulder strap, and the control cable 60 of the airbag device 54 into the right shoulder strap 26.

[0039] Conveniently, the backpack 10 is provided with a passive reflector 74, for example of the known so-called Recco® type, for reflecting radio signals of a predetermined frequency, which is applied on the outside of the casing 16, preferably on a top face 20 thereof.

[0040] In use of the backpack 10, when the user considers a risk of avalanches may exist in the vicinity of its path, he opens the closable openings of both the shoulder straps 26 to extract from them the mouthpiece 38 of the service pipe 42 of the emergency breathing device 36, and the handle 62 of the control cable of the air-bag device 54, respectively, so that they can be readily used. Use of the emergency breathing device 36 involves insertion of the terminal member of the mouthpiece 38 into the user's mouth, for example by using the left hand, in such a manner to allow air to be inhaled via the valve assembly 40, and to exhale air rich in carbon dioxide through the discharge opening 50.

[0041] Actuation of the air-bag device 54 requires a pulling force of a sufficient strength to be applied on the handle 62 of the cable 60, for example by the user's right hand, in order to activate the driving mechanism 58a of the inflation unit 58, so as to open the nozzles of the relevant compressed gas cartridges. In this manner, the compressed gas fed into the duct 57 will draw, owing to

ejector effect, the air required to inflate the cushion 56, together with the compressed gas of cartridges, through the air intake opening 64 from the outside of the backpack 10.

Claims

1. Backpack provided with a safety system operable in the case of an avalanche, comprising a body (12) having a back wall (14) intended to rest, in use, on the back of a user, a casing (16) connected to the back wall (14) adapted to delimit a storage volume for storing objects, and a harness (24) fixed to the back wall (14) and including a pair of shoulder straps (26), at least a first shoulder strap (26) having an inner cavity (30) connected to said storage volume and adapted to be reached from the outside of the backpack (10) through a closable opening (32) of said first shoulder strap (26), the backpack (10) being provided with an emergency breathing device (36) to allow a user to breathe below a mass of snow, which device (36) comprises a mouthpiece (38) connected to a valve unit (40) by means of a service pipe (42) which extends at least in part in the inner cavity (30) of said first shoulder strap (26), so as to selectively allow the user to inhale air from an intake zone (44) and to discharge carbon dioxide into a discharge zone (46) spaced from said intake zone (44) through a discharge pipe (48), which discharge pipe (48) is arranged within the body (12) of the backpack (10) and has one end opposite to said valve unit (40), which is connected to a discharge opening (50) formed in the casing (16),
characterized in that it comprises an air-bag device (54) including an inflatable cushion (56) and an inflation unit (58) both arranged within said storage volume of the backpack (10), the inflation unit (58) being operable manually by the user by means of a control cable (60) that extends at least partially in the inner cavity (30) of a second shoulder strap (26), which cavity is accessible from the outside of the backpack (10) through a closable opening (32) of said second shoulder strap (26).
2. Backpack according to claim 1, **characterized in that** the inflation unit (58) for inflating air-bag device (54) is connected to an intake opening (64) for sucking air from the outside of the backpack (10), which air intake opening (64) is formed in the casing (16) of the body (12) in a position separate from said discharge opening (50), but close to it.
3. Backpack according to claim 2, **characterized in that** the said air intake opening (64) is formed in a side wall (18) of said casing (16), and **in that** said discharge opening (50) is formed in a position adjacent to the back wall (14), close to the air intake opening (64).
4. Backpack according to claim 3, **characterized in that** said air intake opening (64) and said discharge opening (50) are provided with respective protective nets (64a, 50a).
5. Backpack according to claim 4, **characterized in that** said protective net (64a) of the air intake opening (64) is associated with crosspiece stiffening means (64b).
6. Backpack according to any one of claims 2 to 5, **characterized in that** said inflatable cushion (56), in the inactive configuration of the air-bag device (54), is wound according to a general tubular configuration at a peripheral zone of the back wall (14), so as it has a lateral branch (56a) that extends at least partially along a side zone of the body (12) of the backpack (10), and **in that** the discharge pipe (48) of the emergency breathing device (36) is arranged in a position substantially parallel and close to said lateral branch (56a) of the inflatable cushion (56).
7. Backpack according to claim 6, **characterized in that** an elongate recess (66) is defined between said lateral branch (56a) of the inflatable cushion (56) and a portion of the back wall (14) adjacent to it, in which a prevailing portion of the discharge pipe (48) of the emergency breathing device (36) extends.
8. Backpack according to any one of claims 2 to 7, **characterized in that** it comprises an inner wall (68) interposed between the back wall (14) and the air-bag device (54), such an inner wall (68) and said casing (16) delimiting, on opposite sides, said storage volume for storing objects of the backpack (10).
9. Backpack according to claim 8, **characterized in that** said control cable (60) crosses an opening of said inner wall (68).
10. Backpack according to claim 8 or 9, **characterized in that** said inner wall (68) has a closable opening (72) to allow the emergency breathing device (36) to be accessed from the inside of the casing (16).
11. Backpack according to any one of claims 2 to 9, **characterized in that** the inflation unit (58) and a portion of the inflatable cushion (56) are covered by a protective coating (70) which is also connected, inside the casing (16), to the edge of said air intake opening (64).
12. Backpack according to any one of claims 1 to 11, **characterized in that** it comprises a passive reflector (74) for reflecting radio signals of a predetermined frequency, which is applied outside said casing (16),

preferably at a top face (20) thereof.

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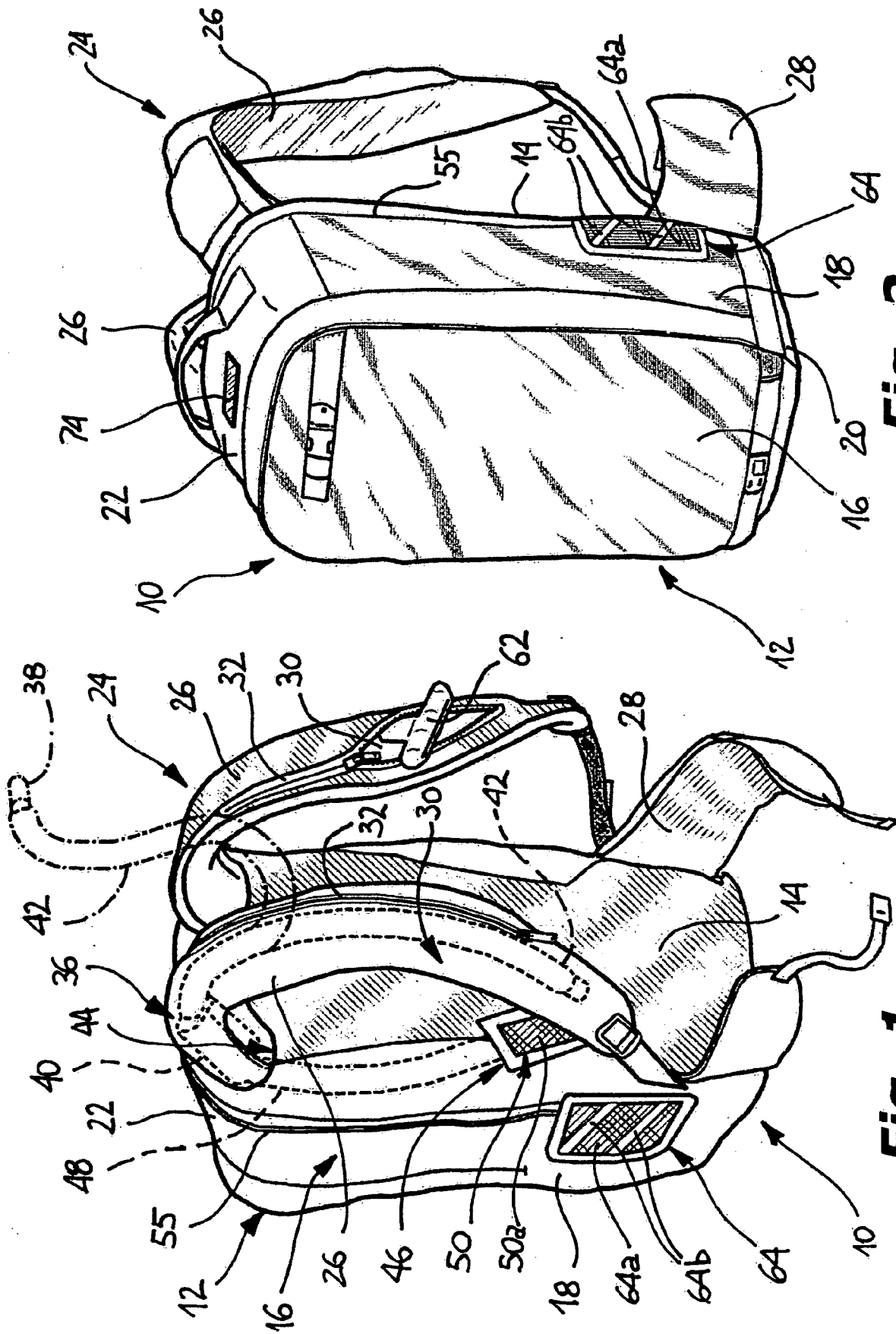
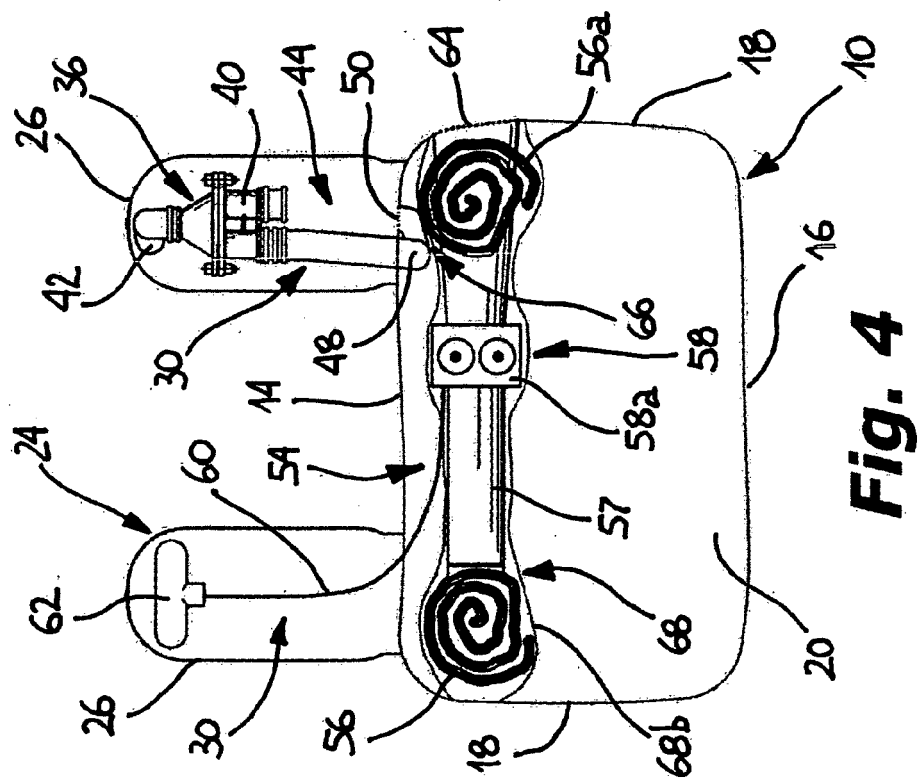
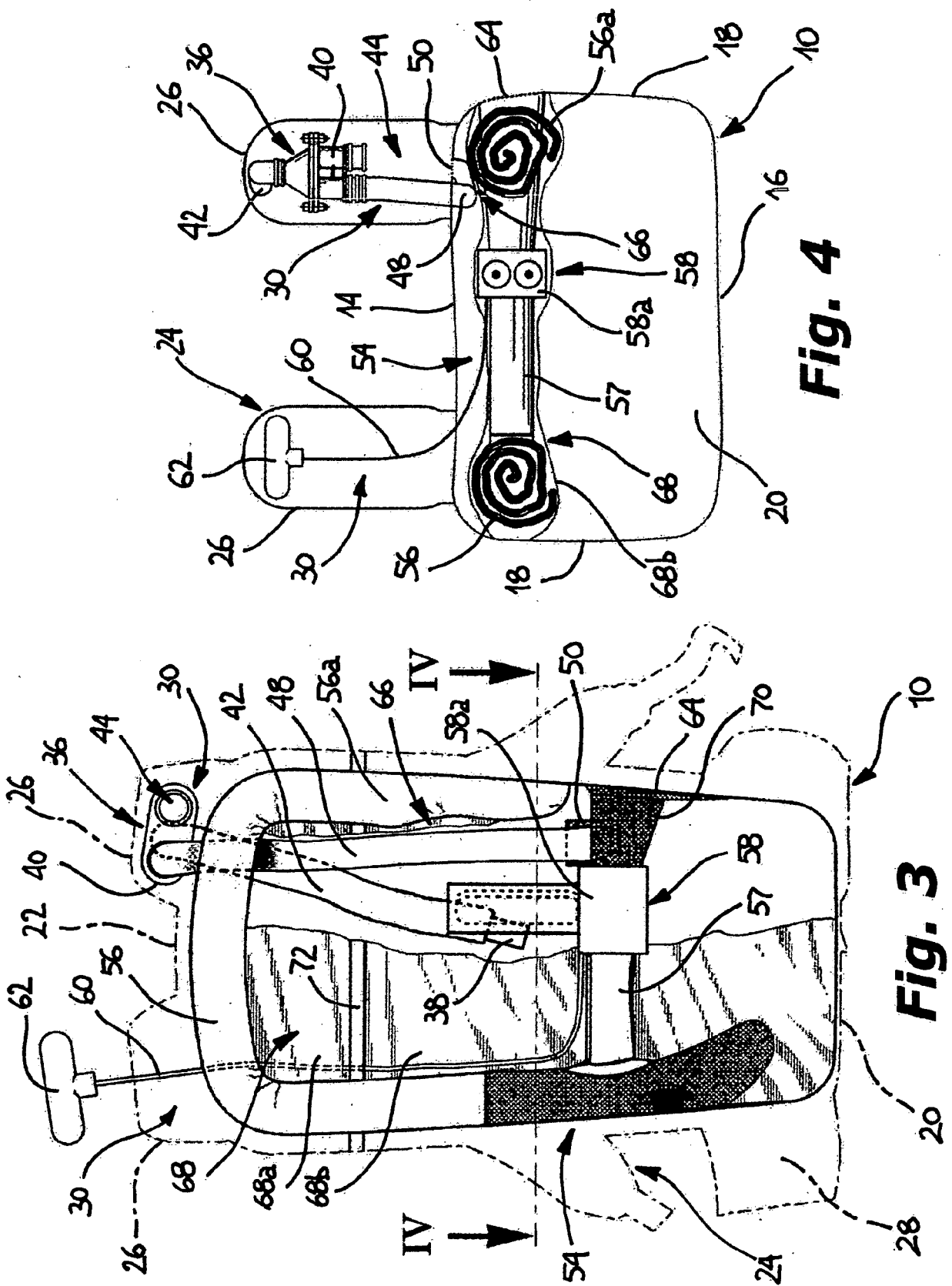


Fig. 2

Fig. 1





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Application Number
EP 15 00 3626

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