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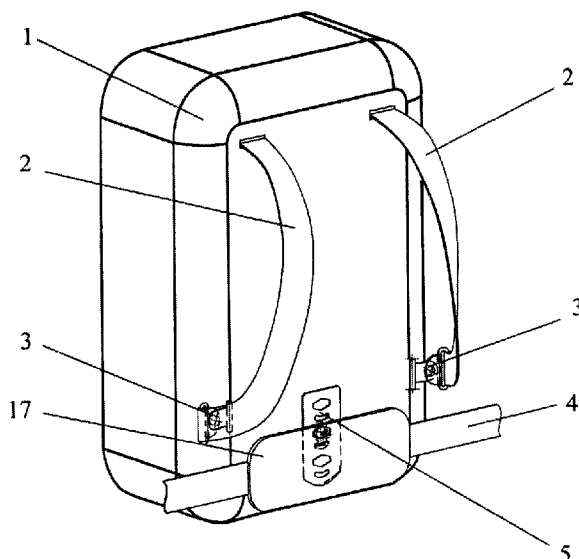


FIG. 1

(57) Abstract: The present invention relates to harness systems for transportation of heavy objects on the back. A belt harness system comprises a rigid frame or housing (1) for a breathing apparatus. Shoulder straps (2) and a waist belt (4) are attached to the housing by corresponding swiveling devices (3, 5) providing the harness adjusting convenience and increasing its reliability.



BELT HARNESS SYSTEM

The invention relates to the field of technology and a belt harness system for transportation behind the back of heavy objects having a rigid frame or housing, in particular breathing apparatus.

The belt harness system consisting of so-called shoulder straps and a waist belt is used for the transportation heavy objects having a rigid frame or housing behind a back in difficult conditions that allow to make the inclination and rotation of the body of the user.

The belt harness system is an essential component of the breathing apparatus that determines not only the convenience of wearing a relatively heavy device but also the safety and functioning reliability of an important component of the respiratory circuit – the hose respiratory system.

In the breathing apparatus of the prior art, the fitting the parameters of the harness system to the parameters of the user body of various constitution and body height is carried out by changing the length of the waist belt and shoulder straps, as well as sometimes the height of the supporting element - the frame. In the case when user has a short stature and the length of the shoulder straps decreases, the upper edge of the frame of the device rises above the shoulders of the user and limits the possibility of head lag back. In the case, when the user is tall, as the length of the shoulder straps increases, the upper edge of the frame of the apparatus falls below the shoulders of the user, causing a risk of tension and kinking of the breathing hoses.

The popular German self-contained breathing apparatus Dräger PSS® BG 4 plus is known (material from Dräger Safety AG & Co. KgaA <https://www.draeger.com/Products/Content/pss-bg4-plus-pi-9044832-us-en.pdf>; 2009 wherein the harness system thereof comprises shoulder straps and a waist belt attached rigidly to the lower part of the frame of the apparatus. The lower ends of the shoulder straps are also attached to the waist belt which is pin-connected by a damping bed with the frame of the apparatus in the middle part and is attached to the body of the main and auxiliary bearing straps to the sides.

The PSS-100 breathing apparatus is known from the material of “Dräger” (<https://www.noel122.at/atemschutz/pa-94.pdf>; (“Pressluftatmer - Grundgeräte der

Baureihen Drägerman PSS®100D”); Gebrauchsanweisung 3337449: 3rd Auflage: Oktober 2002)) in which the belt is fixed to the frame by an axle and is able to move freely in the horizontal plane. This allows the firefighter to lean to the sides.

The respiratory Harness system DRÄGER PSS® 7000 (<https://www.draeger.com/Products/Content/pss-7000-pi-9046671-de-de.pdf>; “Pressluftatmer *Dräger PSS 7000*”, https://www.noe122.at/atenschutz/as_2101_-pss-7000.pdf; “PSS® 7000 Serie” Gebrauchsanweisung, Auflage 11 – März 2013) contains comfortable shoulder straps and belt pads that are highly durable and hold the apparatus on the user body due to the pebbly surface. The apparatus has a slidable and rotating unit of the waist belt, as well as an unit of a three-stage height adjustment located in the upper part of the housing which is associated with the above inconvenience.

The ability to make lateral inclinations due to the horizontal movement of the point of attachment of the waist belt relative to the housing of the apparatus described in the last two breathing apparatus leads to an unpleasant for users shift of the center of mass relative to the sagittal plane of the user's body.

The patent document of the prior art US 2003140392 A1 (IPC: A62B 9/04; publ. 2003.07.31) discloses the harness system including the attachment node of a supporting plate of the waist belt to the bearing frame for breathing gas tanks. It contains an elastic molded element mounted in the recess in the bearing frame and attached to the supporting plate by a connecting screw. The elastic molded element resiliently responds to mechanical stresses allowing the user to do the inclination and rotation of the body only within narrowly limited ranges.

The task of the invention is to develop a belt harness system of the breathing apparatus that provides ease of adjustment and use of the harness system through the applying swiveling devices, as well as increases the reliability of the breathing apparatus.

This task is solved by the fact that, according to the present invention, the waist belt in the belt harness system to transport a self-contained breathing apparatus having a rigid frame or housing containing shoulder straps attached to the upper part of the housing and to the lower part of the housing, as well as a waist belt attached to the lower part of the housing by means of a belt swiveling devices configured to allow rotating the waist belt relative to the housing as well as moving the height along of the housing.

In the preferred embodiment of the invention, the belt swiveling device is made detachable and consists of a T-shaped locking element fixed on the waist belt - wherein the T-shaped locking element is formed by a rack and at least two radial shoulders perpendicular to the rack - and at least two shifted height along locking mortices – wherein the said locking mortices are made in the apparatus housing as holes with radial grooves which consistent with the radial shoulders of the T-shaped locking element and oriented relative to the radial shoulders of the T-shaped locking element at right angles in the folded state of the belt swiveling device.

In the preferred embodiment of the invention, three locking mortices are made in the housing of the apparatus.

In a preferred embodiment of the invention, the T-shaped locking element is mounted on a supporting plate fixed on the waist belt wherein the belt swiveling device comprises a limiter of the rotation angle of the T-shaped locking element in both directions relative to the medium position in the range of +/- 30 degrees, which includes a limiting lug on the supporting plate and an arcuate limiting groove made in the housing of the breathing apparatus near the locking mortice.

In another preferred embodiment of the invention, the lower ends of the shoulder straps are attached to the lower part of the apparatus housing by means of a triple swiveling device containing the bearing plate fixed to the housing to which the first platelike hinge is attached by means of an axis with the possibility of rotation. The second hinge is mounted on the first hinge by means of a pin with the possibility of rotation wherein the second hinge is made in the form of a folded twice plate in the bend place of which the first shoulder of the elongated ring is inserted. While the second shoulder is consistent with the width of the lower part of the shoulder strap.

The features and advantages of the invention are explained in more detail below by way of example of the housing breathing apparatus with reference to the figures. The figures show:

FIG. 1 shows a general view of the breathing apparatus with the harness system according to the invention;

FIG. 2 shows the belt swiveling device of the harness system;

FIG. 3 shows the swiveling device of the lower unit of the mounting of shoulder strap of the harness system.

Fig. 1 presents the breathing apparatus containing the housing 1 and the shoulder straps 2 attached to the upper part of the housing 1 stationary, and to the

sides of the lower part of the housing using two triple swiveling devices 3 (Fig. 3), and epoxy waist belt 4 attached to the lower part the housing 1 of the apparatus by means of the belt swiveling device 5 (Fig. 2) made with the possibility of rotation relative to the housing of the apparatus, as well as moving the height along the housing.

In the preferred embodiment of the invention, the swiveling device 5 of the waist belt 4 is made detachable.

The detachable section of the swiveling device contains a plastic supporting plate 6 mounted on the waist belt 4, on which is placed the T-shaped locking element 7 having the rack 8 and the radial shoulders 9, 10 perpendicular to the rack 8 made at the free end thereof.

The stationary part of the swiveling device is made in the housing 1 of the apparatus with the reinforcing metal cover bar 11 locking mortice 12 in the form of hole with radial grooves 13, 14, the shape and dimensions of which are consistent with the shape and size of the shoulders 9, 10 of the T-shaped locking element 7 (Fig. 2). In the folded working condition of the swiveling device, the shoulder 9, 10 of the T-shaped locking element 7 is oriented relative to the radial grooves 13, 14 at right angles ensuring the reliable connection of the parts of the swiveling device.

In the preferred embodiment of the swiveling device, at least two, preferably three, the shifted height along locking mortices 12 are made in the apparatus housing. They help to perform the adjustment of the position of the waist belt 4 of the harness system with the user height without changing the position of the upper part of the apparatus housing 1 and therefore the breathing tubes relative to the shoulders or head of the user.

In the preferred embodiment, the swiveling device has a limiter of the rotation angle of the T-shaped locking element in both directions relative to the medium position in the range of ± 30 degrees. It consists of the limiting lug 15 on the supporting plate 6 and the arcuate limiting groove 16 in the housing 1 of the breathing apparatus.

In a preferred embodiment, a flexible shock absorber pad 17 is mounted on the side of the supporting plate 6 facing the back of the user.

During the operation of the harness system, after the required locking mortice 12 is selected to establish the required height of the attachment of the waist belt 4 on the housing 1, the supporting plate 6 of the waist belt 4 rotated about the axis of the rack 8 is brought to it, so that the shoulders 9, 10 of the T-shaped locking element 7

entered into the grooves 13, 14 of the locking slot 12 concertedly, and the supporting plate 6 is turned with the overcoming of the elastic force of the limiting lug 15 to the entry of the limiting lug 15 in the limiting groove 16.

When the user performs turns and/or lateral inclinations of the shoulders relative to the pelvis on which the waist belt 4 is fixed, the locking element 7 rotates in the locking mortice 12 in a certain range of the rotation angles facilitating the accomplishment of such actions. When the extreme values of the range of rotation angles are reached the limiting lug 15 abuts against one or the other edge of the limiting groove 16, thereby preventing the possibility of spontaneous disconnection of the swiveling device during intense motor activity of the user.

To disconnect the belt swiveling device 5, it is necessary to straighten out the limiting lug 15 with the simultaneous turning the supporting plate 6 around the axis of the rack 8 to remove it from the coupling engagement with the limiting groove 16, and then remove the locking element 7 and the locking mortice 12 from the coupling engagement.

The advantage of the belt swiveling device of the invention is to improve the ergonomics and increase the reliability of the breathing apparatus due to adjustability of the height of the attachment place of the waist belt 4 in the lower part of the housing 1 of the breathing apparatus, resulting in the fitting the parameters of the harness system to the physical parameters of the user is performed without the changing the position of the flexible hoses relative to shoulders and the head of the user. This eliminates unwanted tension and/or overbending of the hoses in the case if the user is tall or excessive raise of the housing of the apparatus relative to the shoulders and the head when the user is short of stature. Also, the advantage is in the convenience for the user during performing the works that requires rotations and/or lateral inclinations of the shoulders of the user relative to his pelvis, on which the waist belt 4 is fixed.

Since, due to the change in height of the attachment point of the waist belt 4 to the lower part of the housing 1 as well as the motor activity of the user, the angles at which the lower parts of the shoulder straps 2 are oriented relative to the body 1 are changed, the lower ends thereof are attached to the sides of the housing 1 of the breathing apparatus using triple swiveling devices 3 (Fig. 3) in order to avoid warps and bends of the shoulder straps 2.

The triply shoulder swiveling device 3 comprises the bearing plate 18 fixed

stationary to the housing 1 to which the first platelike hinge 20 is attached rotatable via the axis 19. The second hinge 22 is mounted on the hinge 20 with the pin 21 with the possibility to rotate in the form of the folded twice plate. The first shoulder of the elongated ring 23 is freely inserted into the bending point of the hinge 22. The second shoulder of the ring 23 parallel to it encompasses the lower end of the shoulder strap 2.

Through the use of shoulder swiveling devices 3 during the operation of the harness system, it is provided the optimal orientation of the lower parts of the shoulder straps 2 relative to the housing 1 without warps and bends.

According to the invention, the technical solutions greatly improve the ergonomics of the breathing apparatus and increase its operational reliability.

REFERENCE NUMERALS

- 1 Housing
- 2 Shoulder strap
- 3 Triply swiveling device
- 4 Waist belt
- 5 Belt swiveling device
- 6 Supporting plate
- 7 T-shaped locking element
- 8 Rack
- 9 Radial shoulder
- 10 Radial shoulder
- 11 Reinforcing cover bar
- 12 Lockinge mortice
- 13 Radial groove
- 14 Radial groove
- 15 Limiting lug
- 16 Limiting groove
- 17 Shock absorber pad
- 18 Bearing plate
- 19 Axis
- 20 First hinge
- 21 Pin

22 Second hinge

23 Elongated ring

CLAIMS

1. A belt harness system for transporting behind the back of an insulating breathing apparatus having a rigid frame or housing which contains shoulder straps attached to the upper part of the housing and the lower part of the housing, as well as a waist belt attached to the lower part of the housing, characterized in that the waist belt is attached by means of a belt swiveling devices configured to allow rotating the waist belt relative to the housing as well as moving the height along of the housing.
2. The harness system according to claim 1, characterized in that the waist swiveling device is made detachable and consists of a T-shaped locking element fixed on the waist belt, wherein the T-shaped locking element is formed by a rack and at least two radial shoulders perpendicular to the rack, and at least two shifted height along locking mortices made in the apparatus housing in the form of holes with radial grooves that are consistent with the radial shoulders of the T-shaped locking element and oriented relative to the radial shoulders of the T-shaped locking element at right angles in the folded state of the belt swiveling device.
3. The harness system according to claim 1, characterized in that three locking mortices are made in the housing of the apparatus.
4. The harness system according to claim 1, characterized in that the T-shaped locking element is mounted on a supporting plate fixed on the waist belt.
5. The harness system according to the preceding claim, characterized in that the waist swiveling device includes a limiter of the rotation angle of the T-shaped locking element in both directions relative to the middle position within ± 30 degrees, including a limiting lug on the supporting plate and an arcuate limiting groove made in the housing of the breathing apparatus near the locking mortice.
6. The harness system according to the preceding claim, characterized in that the lower ends of the shoulder straps are attached to the lower part of the apparatus housing by the means of the triple swiveling device containing a bearing plate which is fixed stationaryly to the housing, to which the first platelike hinge is attached rotatably using an axis wherein a second hinge is

mounted on the hinge by the means of a pin with the possibility of rotation, made in the form of folded twice plate, into the bend place of which the first shoulder of the elongated ring is freely inserted wherein the second shoulder is consistent with the width of the lower part of the shoulder strap.

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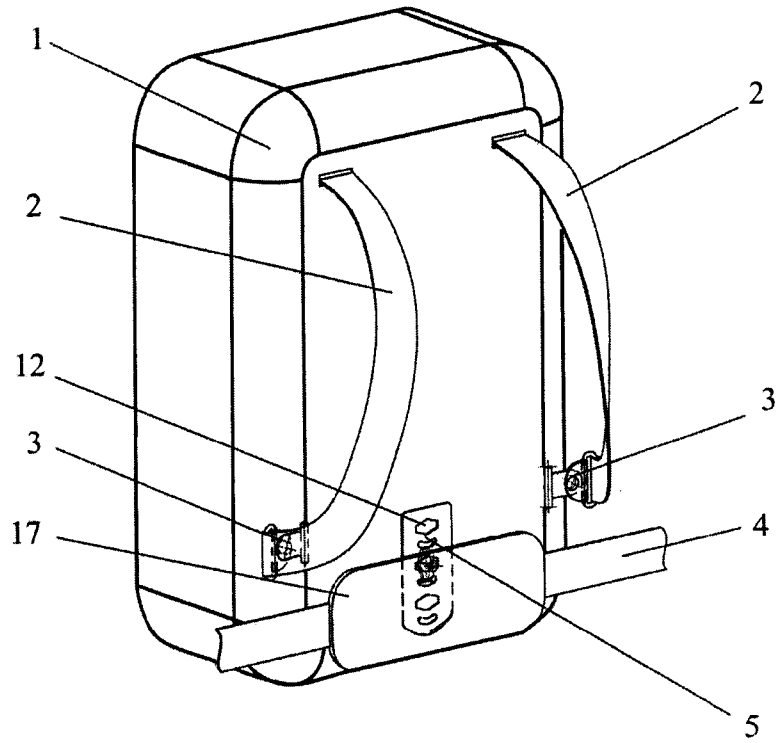


FIG. 1

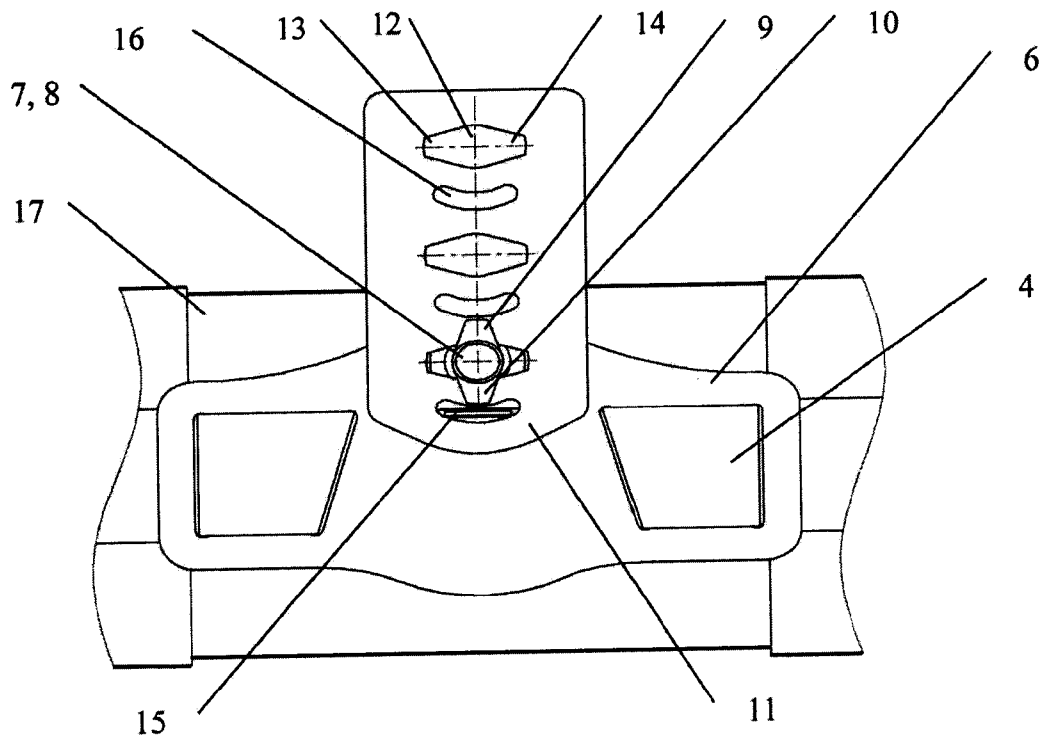


FIG. 2

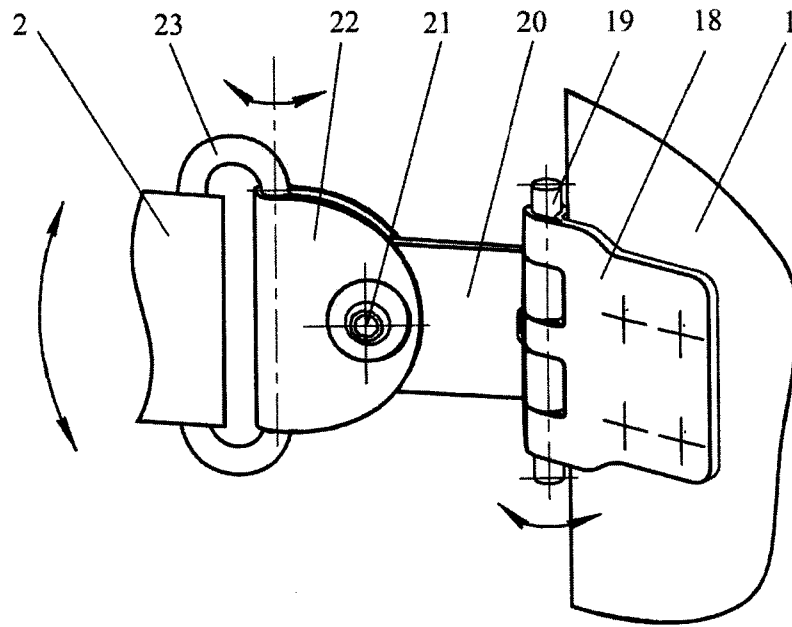
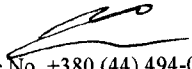


FIG. 3

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER		
A62B9/04, A45F3/04, A45F3/08		
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Minimum documentation searched (classification system followed by classification symbols)		
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CPC: A45F3/047		
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)		
EPOQUE Net		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
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X Y	US 2007090137 A1 (SANCHEONG CO. LTD [KR]) 26 April 2007 (2007-04-26) (the whole document)	1 2-5
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<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
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International application No.

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Information on patent family members

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