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(54) PARACHUTE HARNESS RELEASE MECHANISM

(71) We, FROST ENGINEERING DEVELOPMENT CORPORATION, having a place of business at 3900 South Kalamath, Englewood, Colorado 80110, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a parachute and survival kit harness and more specifically to a harness with provision for releasing all or portions of the seat and aircraft-mounted restraints and adjunct equipment engaged with the harness in order to free the harness and wearer from such restraints in the event of an emergency during take-off or landing, or after ejection and parachute landing. The harness is adapted for association with conventional equipment, particularly the integrated torso harness garment worn by the crew members of naval carrier aircraft.

An aircraft crewman, particularly in high speed military aircraft, conventionally wears a parachute harness such as a torso restraint garment harness which embodies coupling devices for securing the harness to parachute canopy risers, shoulder restraint straps and survival kit lap belt straps. In addition, the harness provides attachment for an oxygen mask hose and terminal for connection into the oxygen system of the aircraft via the crewman's survival kit. It is desirable, under certain conditions, such as after ejection and parachute landing, or in the event of a ground emergency during landing or take-off procedures, that the crewman be able to rapidly disengage all or portions of the restaint devices and a survival kit (oxygen) system from his harness, and in some circumstances an emergency breathing supply is also necessary. Various systems and devices have been proposed and utilised to accomplish some of these purposes. See, for example, the disconnect coupling and system shown in U.S. Pat. No. 3,872,556, issued March 25, 1975, to Richard H. Frost for "Gas Operated Quick Disconnect Couplings". Note also U.S. Pat. No. 3,785,597, issued January 15, 1974 to John A. Gaylord for "Parachute Harness Release"; U.S. Pat. No. 3,767,143, issued October 23, 1973, to John A. Gaylord for "Quick Release Harness"; and U.S. Pat. No. 3,658,281, issued April 25, 1972, to John A. Gaylord for "single Release for Parachute Harness".

The present invention is adapted for use with quick disconnect couplings such as shown in U.S. Pat. No. 3,872,556, issued March 25, 1975, to Richard H. Frost for "gas Operated Quick Disconnect Coupling", or other suitable gas operated quick disconnect couplings known in the art. The Frost coupling embodies certain highly desirable features, and to the extent necessary for a greater understanding of that coupling, reference should be made to that Frost patent.

The principal object of the present invention is to provide an improved parachute harness with a release mechanism which mounts directly on the harness, and when actuated selectively releases the harness from parachute canopy risers or alternatively releases the harness from the parachute canopy risers, the survival kit straps and the oxygen system.

Another object of the present invention is to provide a parachute harness with a release mechanism which, upon diconnection from the oxygen system, provides a short term air supply to the harness wearer.

According to the present invention there is a parachute and survival kit harness comprising releasable buckles for connection with parachute riser and shoulder harness straps adapted to be releasably attached to an aircraft seat, releasable buckles for connection with survival kit lap belts, and a single restraint-free multipositional control means

mounted on said harness for selectively releasing said releasable buckles and having a first operational position selectable for releasing only the parachute riser and shoulder harness strap buckles and a second operational position selectable for releasing all of the harness mounted buckles simultaneously.

In the drawings:

FIG. 1 is a diagram illustrating a garment type harness in accordance with the present invention.

FIG. 2 is a detailed elevation view of a parachute harness embodying the present invention;

FIG. 3 is an isometric illustration of an actuating control device forming a part of the parachute harness release mechanism.

FIG. 4 is a plan view of the control device shown in FIG. 3.

FIG. 5 is an elevation view of the control device shown in FIG. 4.

FIG. 6 is a section view taken substantially in the plane of line 6-6 on FIG. 4.

FIG. 7 is a section view taken substantially in the plane of line 7-7 on FIG. 4.

FIG. 8 is a section view taken substantially in the plane of line 8-8 on FIG. 4.

FIG. 9 is a section view taken substantially in the plane of line 9-9 on FIG. 5.

FIG. 10 is an end elevation view of the control device shown in FIG. 5.

FIG. 11 is a section view taken substantially in the plane of line 11-11 on FIG. 5.

FIG. 12 is a section view taken substantially in the plane of line 12-12 on FIG. 5.

Fig. 13 is an exploded isometric illustration of the control device shown in FIG. 3.

FIG. 14 is an isometric view of the opposite side of the cam body and cam ring shown in FIG. 13.

FIG. 15 is an enlarged elevation view of the pressure indicator-vent valve in the no pressure position.

FIG. 16 is a section view taken substantially in the plane of line 16-16 on FIG. 15.

FIG. 17 is a view similar to FIG. 15 but with the indicator-vent valve in the pressure position.

Shown in the drawings and described below in detail, the present invention contemplates a parachute harness such as a torso restraint garment or vest harness having releasable buckles for connection with parachute riser and shoulder restraint straps, releasable lap buckles for connection with survival kit and lap belts, and which frequently supports an oxygen mask pressure regulator and hose assembly connectable through a releasable coupling to the oxygen supply conduit from the main aircraft supply and survival kit emergency supply. The harness release mechanism is mounted directly on the harness or vest and includes a control valve carrying a source of compressed air. This source may comprise one or two cylinders containing compressed air under a pressure of about 3000 psi, but hereinafter is described in the singular sense. The cylinder includes a pierceable seal and is mounted on the control valve in a position for supplying high pressure air to the system upon piercing of the seal. The valve body carries a control handle normally positioned in parallel juxtaposed relation to the cylinder and secured by a releasable latch. A first compressed air chamber in the body is in direct communication with the pierceable seal on the cylinder as well as with the releasable parachute riser shoulder restraint strap quick disconnect buckles through a conduit connected to a high pressure fitting on the control valve. The compressed air seal is punctured by a lance which is actuated by a cam controlled by the valve handle. When the air bottle seal is pierced, compressed air at high pressure is directed through the valve body to the releasable buckles.

The control valve further includes a second chamber which communicates with the first chamber through a slide valve, and further communicates with the releasable buckles connecting the survival kit lap belts as well as with the oxygen hose connector. Upon rotation of the control cam in a second direction, the air cylinder seal is pierced and compressed air flows into the first chamber to actuate the parachute riser strap release buckles, and through the slide valve into the second chamber to actuate the releasable survival kit lap belt buckles as well as the oxygen hose disconnecting means. At the same time, a portion of the high pressure air flow through a pressure reducer and into the oxygen pressure regulator and mask hose leading to the crewman's oxygen mask in order to supply breathable air to the crewman's mask. A check valve in the oxygen hose prevents the air from escaping through the disconnect coupling.

An indicator vent valve is provided on the control valve to indicate when the system is pressurized and to facilitate the release of pressure from the system when it is desired to permit the various buckles and the oxygen mask hose to be manually reconnected.

The control system provides a dual-mode operation. In the first mode, when the control handle is swung upwardly, high pressure compressed air is supplied only to the disconnect buckles coupling the parachute riser and shoulder restraint straps to the harness. In this mode, the oxygen hose and survival kit connectors remain engaged. The purpose of this mode is primarily to release the crewman from his parachute after a parachute descent. The second mode provided by the control system embodying the present invention is primarily utilized when the crewman desires to escape from the aircraft in the

event of an emergency during take-off or landing procedures. This mode releases the crewman completely from all aircraft associated restraints, namely the shoulder and parachute riser restraints as well as the survival kit restraints and the oxygen hose coupling. In the event of an underwater, fire or smoke emergency, it is desirable that the crewman retain his mask and accordingly, the second mode provides a short term breathable air supply to the mask. This enables the crewman to scramble from an aircraft with his mask and harness intact and with a breathable air supply. The present invention thus adds a substantial and important safety feature to the crewman's equipment.

In FIG. 1 is shown a parachute harness in the form of a torso restraint harness garment such as a leotard type vest 21 with a release mechanism 20. The garment or vest 21 carries shoulder buckles 22 adapted to be secured to parachute canopy riser and shoulder restraint straps 24. The garment also carries lap belt buckles 25 adapted to be secured to survival kit straps 26. An oxygen hose 28, which extends from the survival kit emergency oxygen system, is connected by a coupling 29 to an oxygen mask hose 30 which is secured to the vest 21 or similar over-garment and extends to the crewman's oxygen mask.

Each of the buckles 22, 25, which is desirably the type of releasable coupling described and claim in U.S. Pat. No. 3,872,556, includes a gas operable quick release element that is engaged with a manually releasable coupling 31, 32 respectively. In addition, a gas powered releasable coupling 34 forms a part of the oxygen hose coupling 29 for rapid powered separation of the oxygen hose 28 from the harness mounted hose 30. Upon actuation of the quick disconnect elements, the harness is released from all aircraft-associated restraints leaving the crewman free of such impediments. A clean release of all restraints is essential in a preflight or post-flight emergency such as may occur during take-off and landing operations. Also of importance to the safety of the crewman is the retention of the vest or harness, with the concomitant advantage residing in the protection afforded by the associated oxygen mask. In the event of a fire, the mask further protects the crewman against smoke and hot gases, and the combination of the mask and this system's provision of an emergency air supply is sufficient to enable the crewman to traverse the fire zone. The concomitant capability for escape from deeply submerged cockpits is even more vital for crewmen in naval carrier aircraft, since emergencies that involve ditching are more probable than fire.

The control device of the parachute harness release mechanism 20, as shown schematically in FIG. 1, is formed by a body 35 to which a pair of compressed air cylinders 36 are secured in parallel in the compressed air circuit. An actuating lever 38 is pivotally mounted relative to the body and serves to actuate a cam 39 and associated lance and valve mechanisms for selectively releasing compressed air into the system. The lever 38 is initially held in a closed position by a safety latch 40 which must first be depressed in order to release the lever 38. Upon depression of the latch 40, the lever 38 pops up to an angle of about 20°, to its operative position, where it may be readily grasped and swung into operative position. When the lever 38 has been released and swung outwardly to its operative position at about 90° to its operative position to the device, it may be either pivoted upwardly in order to direct high pressure compressed air into conduits 41 to the buckles 22, or swung downwardly in order to direct compressed air from the cylinders 36, not only into the conduits 41 to the buckles 22, but also into conduits 42 which lead to the buckles 25 and a conduit 44 leading to an oxygen hose manifold 45. From the oxygen hose manifold compressed air at high pressure is directed through a second conduit 46 to the oxygen hose releasable coupling 34 and, additionally, air is directed through a pressure reducer 48 and thence into a manifold 49 for supplying breathable air through a pressure regulator and hose 50 to the wearer's oxygen mask for a period of 30 to 60 seconds. It will be noted that upon actuation of the mechanism to release the various releasable couplings the crewman and his harness are freed from all restraints or connection with the aircraft associated with the release mechanism. He is thus free to escape from the aircraft in the event of an emergency, and is supplied with breathable air from a period long enough to free himself from the cockpit or cabin and reach safety through an intervening hazardous environment, perhaps from 50 feet beneath the sea surface, or through a lake of blazing jet fuel.

A torso restraint garment carrying a release mechanism 20 and embodying the present invention is shown in more detail in FIG. 2. The torso restraint garment or vest 21 is a body fitting, sleeveless and legless leotard style garment with a front zipper 51. The various belts and straps terminating in the buckles 22, 25 are sewn into and form an integral part of the vest. An oxygen mask hose 30 is conventionally attached to the vest or an over-garment and leads to an oxygen mask (not shown) at the other end through a flexible hose 50.

In FIG. 2 the upper end of the oxygen hose 30 is provided with an assembly comprising a high-pressure manifold 45 series with a pressure reducer 48, and a low-pressure manifold

49 in series with a conventional ball-type check valve and the oxygen pressure regulator. The lower end of the hose 30 has a gas-operated quick-releasable coupling 34 and each of the buckles 22 and 25 are likewise provided with a gas releasable coupling. The control device of the releasable mechanism 20 is attached to the vest by a mounting plate 52 and the control conduits 41, 42 are connected by weaving them through the vest to the various buckles. The control device is generally contoured in such a configuration as to lie flat against the wearer's waist and remain out of the way to prevent inadvertent operation and yet be readily accessible when needed.

The control device for the release mechanism is shown in detail in FIGS. 3 to 14 inclusive. The control device there shown, indicated generally at 55, comprises a valve, a gas supply and an actuating mechanism for the valve. The valve is formed by a valve body 56 having a first chamber 58 defined therein and opening into a port 59 in which is secured a first high pressure conduit fitting 60. The chamber 58 further opens into a check valve passage 61 leading to a lance bore which in turn opens into an interiorly threaded counterbore 64 adapted to receive the sealed, threaded end 65 of an elongate compressed air cylinder 36. The cylinder end 65 is threaded into the counterbore 64 and seats against an O-ring seal 66 which in turn surrounds a puncturable seal 68 in the end of the cylinder 36. In the configuration shown, a pair of compressed air cylinders 36 is utilized, with the foregoing passage and seal structure being provided in duplicate. Each cylinder 36 contains compressed air at a pressure of about 3000 psi.

A cam actuated lance mechanism, which is described in more detail below, is positioned in the lance bore 62 for piercing the seal 68 in the end of the compressed air cylinder 36 when the system is actuated, thereby supplying compressed air to the first chamber 58. To prevent a back flow of air, a ball check valve 69 is provided in the check valve passage 61, with the ball being held against an annular seat 70 defined in the passage 61 by a coil spring 71.

The first high pressure fitting 60 in communication with the first chamber 58 is in turn connected to the conduits 41 leading to the gas operable quick release elements forming a part of the buckles 22 engaging the parachute risers and shoulder restraint straps 24. The introduction of compressed air into the first chamber 58 serves to disconnect the gas operable quick release element of the buckle devices 22 and thereby release the parachute riser and shoulder restraint straps from the harness.

For releasing the remaining quick release elements and couplings, the valve body 56 is provided with a second chamber 53 opening into a threaded port 54 into which is mounted a second high pressure fitting 57. Secured in turn to the high pressure fitting 57 are the conduits 42 leading to the survival kit lap belt quick release elements of the buckles 25 and the conduit 44 leading to the oxygen hose releasable coupling 34.

For controlling communication between the first compressed air chamber 58 and the second compressed air chamber 53, there is provided a cam controlled slide valve 72. This valve is formed by a passage 74 communicating between the first and second chambers 58 and 53 respectively, and defining a valve chamber wall 75 against which a valve poppet 76 is sealingly engaged. The poppet 76 includes a valve stem 78 the outer end of which defines a cam follower 79. The slide valve passage 74 opens into the outer surface of the valve body as the lance bores 62 and in close juxtaposition therewith. The slide valve 72 is held in the seated or closed position, to prevent communication between the first and second chambers 58, 53 respectively, by the cam 39. When the cam 39 is rotated by swinging the handle 38 downwardly, into the second mode position, the slide valve 72 is released and opened by the pressure in the first chamber, thereby permitting compressed air to flow from the first chamber 58 into the second chamber 53 and thence outwardly through the high pressure fitting 57 into the various conduits 42, 44 to the buckles 25 and via the manifold 45 and conduit 46 to the hose release couplings 34 respectively, to release the same and free the harness from the associated restraints formed by the survival kit straps 26 and oxygen hose 28.

For piercing the sealed end of the inserted cylinder 36 a sharpened lance 80 is slidingly and sealingly mounted in the lance port. The lance includes a sharply pointed end 81 for piercing the seal 68 at the inserted end of the cylinder 36, and an elongate follower end 82 for engagement by the cam 39. The lance is biased outwardly of the lance passage by a coil spring 84 and is slidingly sealed therein by an appropriate O-ring 85. As indicated above, when two cylinders 36 are utilized, the lance mechanism is provided in duplicate.

The cam 39, upon rotation in either direction from its neutral position, in response to swinging the lever 38 either up or down, drives the lance or lances 80 inwardly to pierce the seal or seals 68 on the cylinder or cylinders 36 and thereby release high pressure compressed air into the lance bore or bores 62. From the lance bore 62, the compressed air flows past the ball valve 69 and into the first chamber 58. From the first chamber 58, compressed air is directed through the high pressure fitting 60 into the

conduits 41 leading to the gas operable quick release elements of the buckles 22 to release the parachute risers from the harness vest. When the lever 38 is swung downwardly to rotate the cam in the second mode, the lances are likewise actuated to pierce the seals 68 on the bottles 36 and release compressed air at high pressure into the first chamber 58. In this mode, however, the cam also releases the slide valve 72 thereby permitting the high pressure compressed air from the first chamber 58 to flow into the second chamber 53 and thence into the remaining conduits 42, 44 to effect a release of the lap belt connectors and oxygen hose coupling.

The cam 39 is formed by a cam housing 86 secured to a hollow sleeve shaft 88 which is journaled in a corresponding bore 89 in the valve body 56. The cam housing 86 is positioned against the body and overlies the lance bores 62 and the slide valve passage 74 opening into the face 90 of the body on which the cam housing 86 is mounted. The cam housing 86 and shaft 88 rotate by movement of the lever 38. For actuating the lances 80 in response to rotation of the cam, the cam housing includes an annular groove 91 in which is mounted a generally annular shaped strip cam 92 having on its face raised cam ridges 94 and corresponding depressions or valleys 95. As the cam housing 86 is rotated, the ridges 94 bear against the projecting elongate end 82 of the lance 80 to drive the lance forceably inwardly to pierce the seal 68 on the compressed air cylinder 36. When the cam is in its neutral position, the elongate end of the lance rests in the depression or valley 95 on the cam ring 92.

When the cam housing is mounted against the valve body, the inner face 96 of the cam housing, at a point radially inwardly of the cam ring 92, engages the slide valve 72 and holds the same in sealed position between the first chamber 58 and the second chamber 53. To release the slide valve 72, the cam housing further defines on its inner face a recess or depression 98 which when the cam is rotated into its second mode position allows the slide valve to project outwardly into the cam and hence open the passage 74 between the first chamber 58 and second chamber 53.

The actuating lever 38 includes an L-shaped arm 93 pivotally mounted through a slot 97 in the shaft 88 by pin 99 for swinging movement within a slot 100 defined in the cam housing 86. A corresponding slot 101 is cut in the surface of the body 56 into which the arm 93 is positioned when the cam is in its neutral configuration and the lever 38 lies in closed or inactive position along the air cylinders 36. The lever 38 and associated lever arm 93 form a generally L-shaped handle which when swung fully outwardly is received within the outer end of the shaft and cam housing enabling the cam to be rotated. When nested against the valve body and air cylinders, the lever effectively locks the cam and prevents rotation of the cam and inadvertent actuation of the system.

In order to enable the user to grasp the lever, and yet prevent accidental operation, the latch 40 holds the lever in its closed position with the cam in neutral. To this end, the latch 40 is pivotally mounted on the valve body 56 and is provided with an interfering edge 105 which abuts a similarly disposed edge 106 on the lever 38. The latch is biased to an upward locking position by a latch biasing spring 108 and plunger 109 acting between the valve body and the underside of the latch 40. By pressing downwardly on the latch against the valve body, the interfering surfaces 105, 106 are disengaged allowing the lever 38 to swing upwardly. For biasing the lever upwardly into position where it may be grasped by the user, a spring biased plunger 104 is mounted axially in the cam shaft 88 and is provided with a chamfered head 110 which bears against the depending arm 93 of the lever and acts to raise the lever 38 to a position at an angle of about 20° from the compressed air cylinders where it may be readily grasped for use. The springs 111 are preferably of the Belleville type to provide a strong spring force with limited movement. Once released, the lever is further swung outwardly to a point where the lever 38 extends generally at right angles to the assembly and the depending arm 93 is positioned within the cam shaft and housing. During this movement the plunger serves to provide resistance to the lever and as a detent to hold the lever in its outward position. With the lever fully extended, the cam may be rotated into the first mode or second mode position to effect the desired releasing operation as shown in FIG. 3 in dotted lines by swinging the lever either up or down.

For purposes of indicating when the system is under pressure, or to signal a leakage from one of the compressed air cylinders, there is provided a gas pressure indicator 112 mounted in an indicator passage 114 in the valve or control body 56. The indicator passage 114 is in communication with the first pressure chamber 58 and the indicator reacts in response to an increase in pressure in that chamber by projecting outwardly from the valve body thereby giving a visible indication that there is pressure in the system. The pressure indicator further serves as a vent valve. Upon depressing the indicator, air pressure within the system is exhausted to the atmosphere. If desired, the various quick release elements of the buckles may then be manually reengaged. Referring to FIGS. 15 to 17, the indicator-vent valve is formed by a valve body 115 threadably mounted in the indicator passage 114. The valve body 115 is

generally sleeve shaped and defines a central axial bore 116 which slidably receives a valve stem 118. At its upper or outer end, the valve stem 118 is secured to an indicator button cap 119 which is telescopingly received in a counterbore 120 forming an extension of the indicator passage 114. The button cap 119 is provided with an annular groove 121 receiving an O-ring seal 122 which sealingly engages the side wall of the counterbore 120 when the button cap 119 and stem 118 are pushed downward, into the indicator bore. A light coil spring 124 surrounds the stem 188 and acts between the valve body 115 and in button cap 199 to provide an upward twist bias on the latter. The strength of the spring is such, however, that the friction between the seal 122 and the wall of the counterbore 120 holds the button inwardly against the force of the spring until a positive pressure is exerted in the system.

In order that system pressure will force the button outwardly to give an indication of system pressure, the valve stem 118 is provided with an axial bore 125 which opens into a central chamber 126 in the button cap. The valve stem 118 is sealed within the axial bore 115 in the valve body 115 by an O-ring 128 surrounding the valve stem and supported in an annular groove 129 in the bottom end of the valve sleeve or body 115. Air pressure in the system forces the cap outwardly of the counterbore.

In order to prevent loss of air pressure when the system is pressurized to actuate the various quick release elements, the valve stem is provided with an enlarged flange seat 130 on its lower end defining a frustoconical sealing surface 131 which sealingly engages the O-ring 128 on the valve body 115 when the valve stem and button cap have been raised under the force of pressure in the system.

To provide a vent for the system, the button cap is provided with a transverse passage 132 communicating with the central stem bore 125. The transverse passage 132 opens below the cap seal 122 initially to prevent the escape of air so that the button cap pops out of the control valve. By pushing on the button cap, however, the stem seal is opened allowing pressure in the system to vent through the stem bore 125 and transverse passage 132 to the atmosphere.

To reset the indicator and vent valve, a mechanic having knowledge of the valve configuration must push the button cap inwardly until the cap seal 122 sealingly engages the side wall of the counterbore 120. To prevent inadvertent or unintentional resetting, a tongue 134 extends upwardly from the valve sleeve body 115 and must engage in a notch 135 in the button cap. The spring 124 rotates the cap slightly so that the tongue and notch are out of alignment. The mechanic resetting the indicator must utilize a screw drive in a slot 136 in the button cap to rotate the cap sufficiently against the force of the spring to allow the tongue 134 to slip into the notch 135 so that the button cap can be fully seated in the counterbore.

WHAT WE CLAIMS IS:—

1. A parachute and survival kit harness comprising releasable buckles for connection with parachute riser and shoulder harness straps adapted to be releasably attached to an aircraft seat, releasable buckles for connection with survival kit lap belts and a single restraint-free multipositional control means mounted on said harness for selectively releasing said releasable buckles and having a first operational position selectable for releasing only the parachute riser and shoulder harness strap buckles and a second operational position selectable for releasing all of the harness mounted buckles simultaneously.

2. A parachute and survival kit harness as defined in claim 1 including an oxygen mask having a hose terminating in a releasable coupling for connection with an oxygen supply conduit, said control means comprising means operative on selection of said second operational position to release said oxygen mask hose releasable coupling and to supply air to said oxygen mask.

3. A parachute and survival kit harness as defined in claim 2 wherein the control means comprises a control valve for controllably releasing air from a source of compressed air and having said first and second operational positions for selectively supplying said air to said releasable buckles, releasable coupling and said oxygen mask hose, first conduits connecting said control valve to the releasable parachute riser and shoulder harness strap buckles for supplying compressed air to release said buckles when said control valve is positioned in its first or second position, second conduits connecting said control valve to the releasable survival kit lap belt buckles and the releasable oxygen supply coupling for supplying compressed air to release said buckles and coupling when said control valve is positioned in its second position, and a pressure reducing device communicating with said second conduits for supplying low pressure air to the oxygen mask hose when compressed air is supplied to said first and second conduits to release all buckles and the oxygen hose coupling from the parachute harness.

4. A parachute and survival kit harness according to claim 3, wherein the control valve comprises a valve body, a first compressed air chamber in said body and connected by said first conduits to said parachute riser and shoulder harness strap buckles, at least one lance slidably and sealingly mounted in said body for piercing a seal of

the compressed air source to release said compressed air into said first chamber, a control cam rotatably mounted on said body and pivotally engaged with a control handle, said cam upon rotation in either direction from a neutral position engaging and sliding said lance into piercing engagement with said air source seal for releasing said compressed air into said first chamber, a second compressed air chamber in said body and connected by said second conduits to said survival kit lap belt buckles, a normally open valve between said first and second chambers, and said cam engaging and holding said valve in the closed position when said cam is in the neutral and the first operational position and releasing said valve to open communications between said first and second chambers when said cam is in the second operational position.

5. A harness as defined in claim 4, wherein the control valve has a latch releasably engaging said lever for releasing said lever into operative position and for preventing inadvertent operation thereof, and a spring biasing said lever towards it operative position against the holding action of said latch.

6. A harness as defined in claim 3 and including a check valve for preventing escape of air through the disconnected oxygen hose.

7. A harness as defined in claim 3 and including means for discharging compressed air from the system after actuation to facilitate manual reconnection of the releasable buckles and oxygen hose coupling.

8. A harness as defined in claim 4 and including an indicator for indicating air leakage from said compressed air source.

9. A harness as defined in claim 8 wherein said compressed air source comprises a sealed cylindrical bottle containing air at a pressure of about 3000 psi.

10. A harness as defined in claim 8 where said source of compressed air comprises a pair of sealed cylindrical bottles in parallel in the compressed air circuit.

11. A harness as defined in claim 10 wherein said control valve is adapted to operate a pair of cam operated simultaneously actuated lances to pierce said bottles.

12. A parachute and survival kit harness substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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1581888 COMPLETE SPECIFICATION

8 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

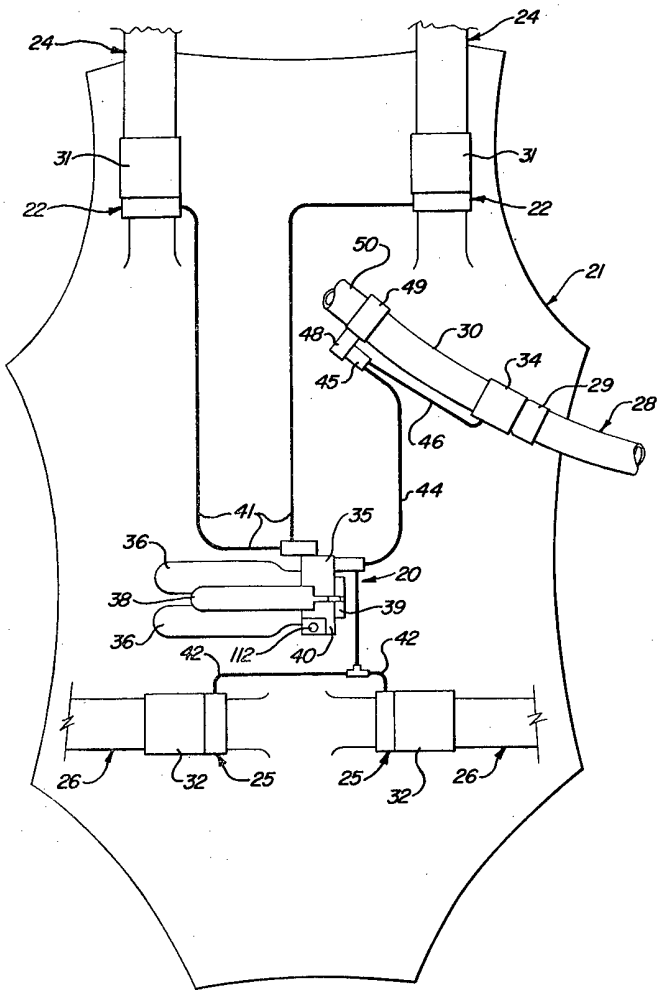

Fig_1

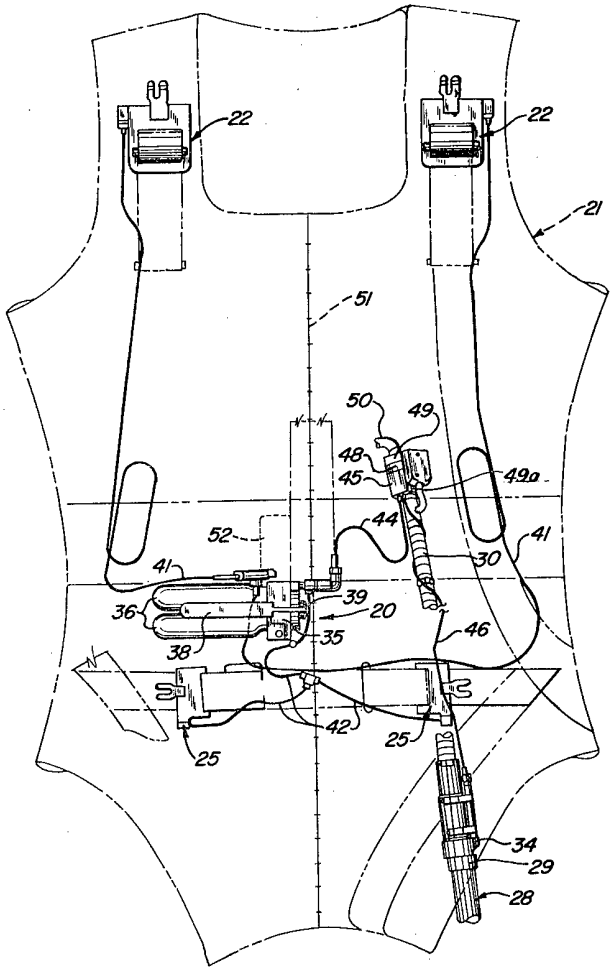
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Fig - 2

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Sheet 3

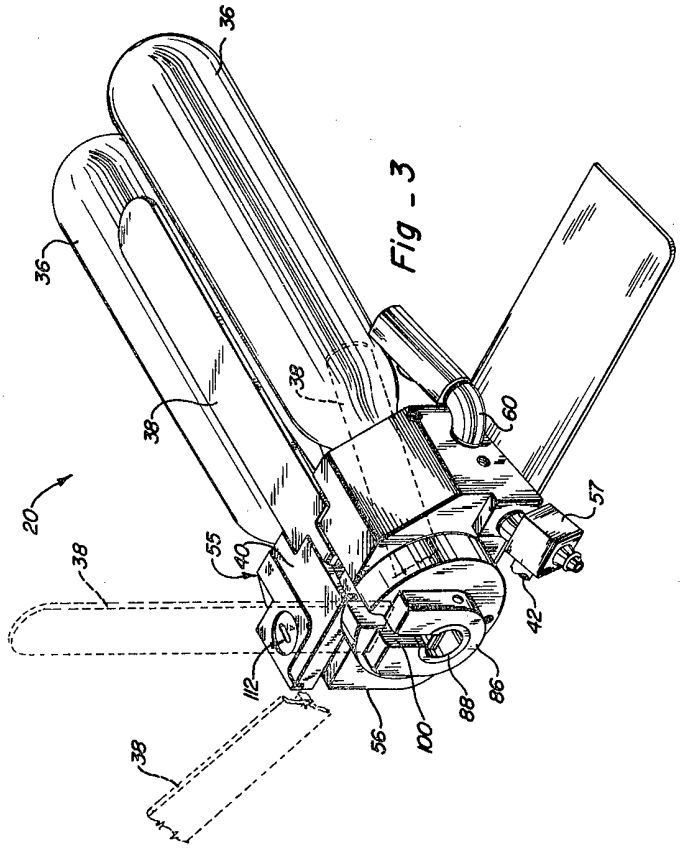

Fig - 3

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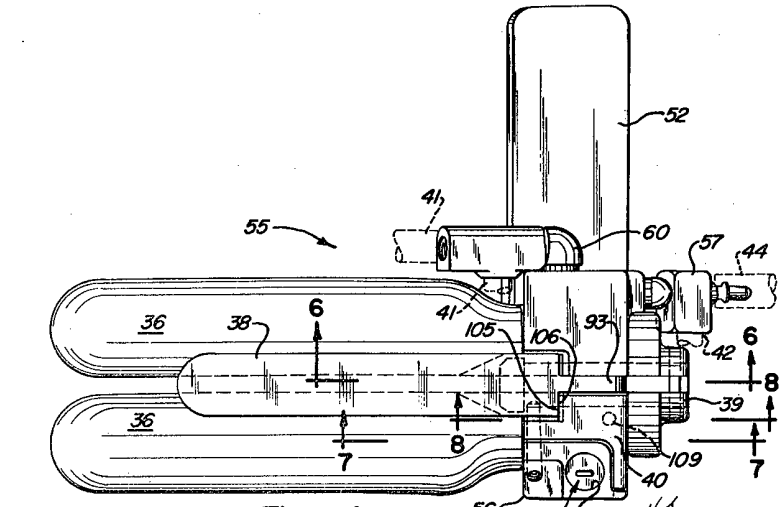

Fig _ 4

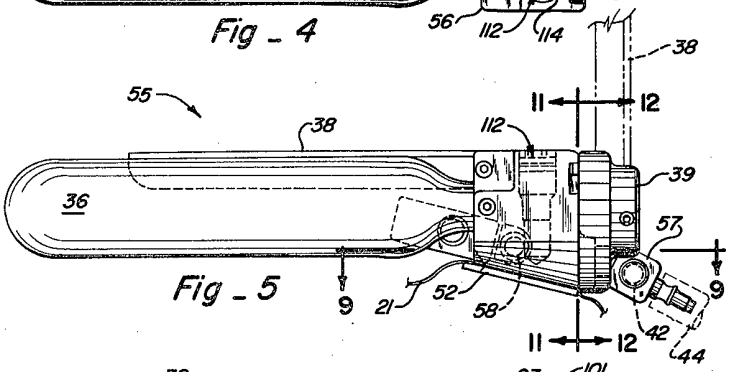

Fig _ 5

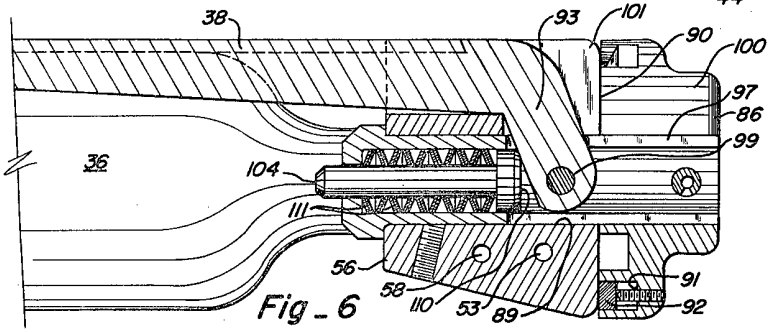

Fig _ 6

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8 SHEETS This drawing is a reproduction of the Original on a reduced scale

Sheet 5

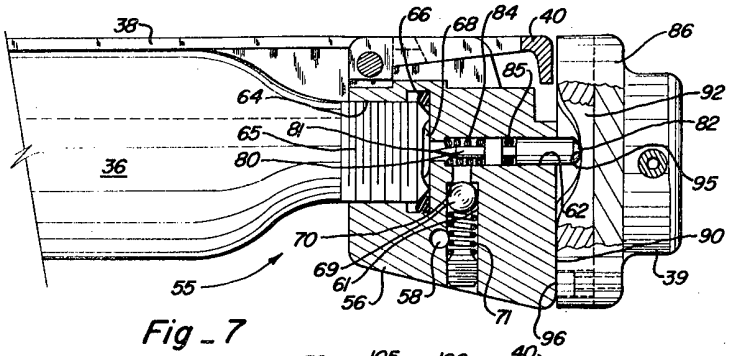

Fig_7

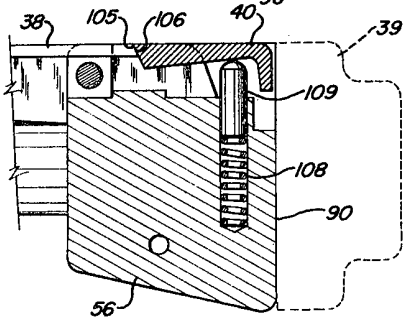

Fig_8

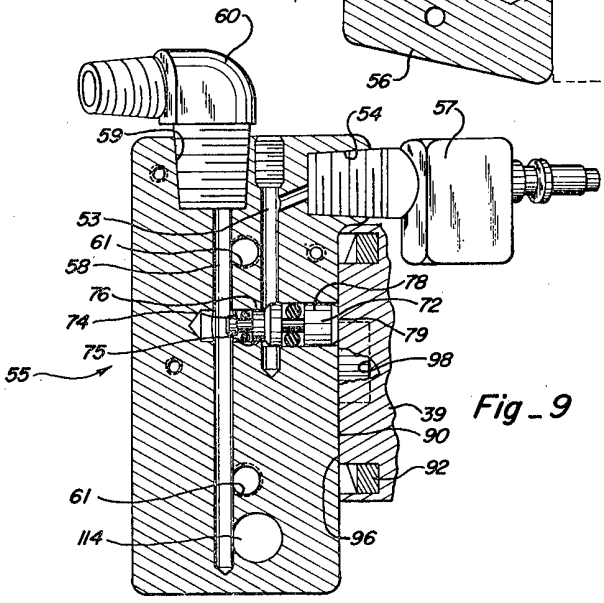

Fig_9

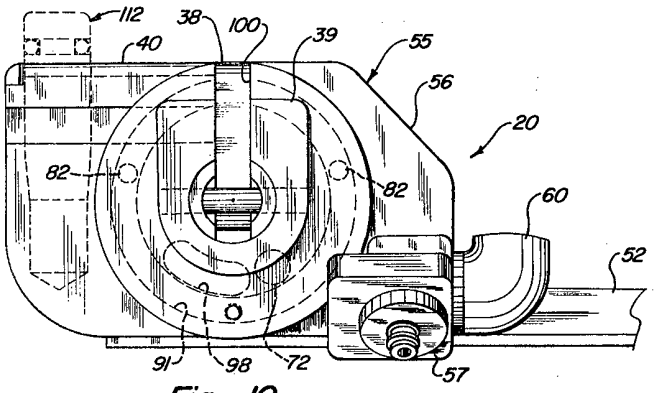

Fig _ 10

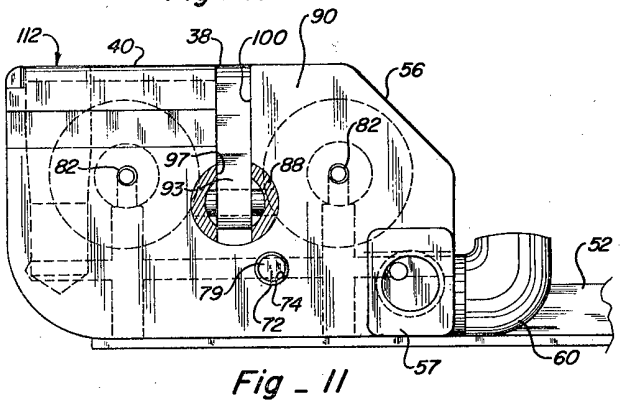

Fig _ 11

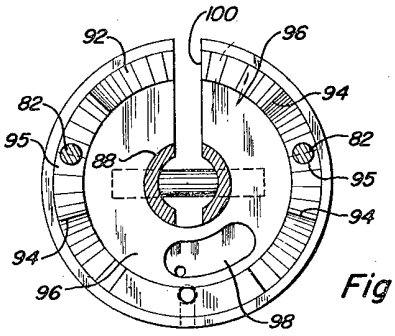

Fig _ 12

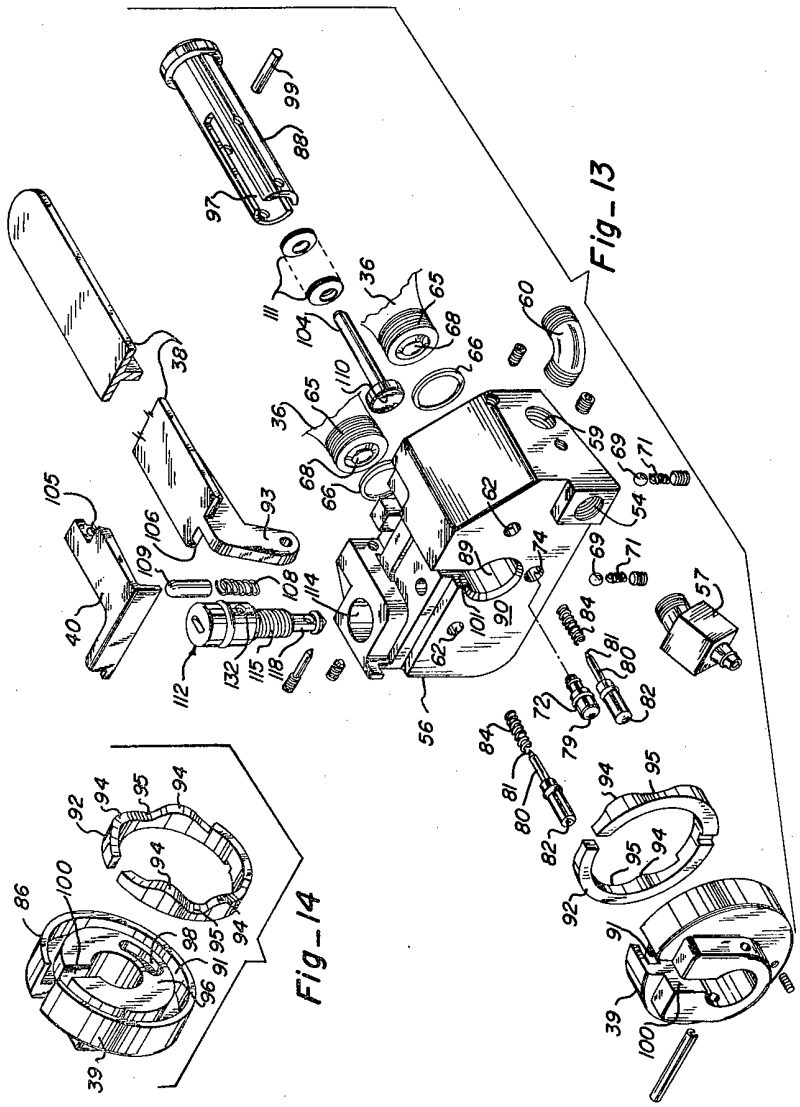
Fig_13
Fig_14

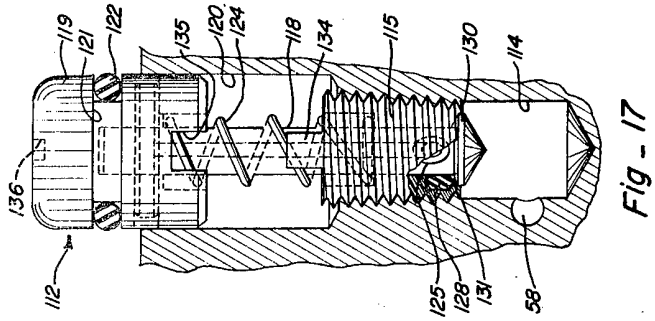

Fig - 17

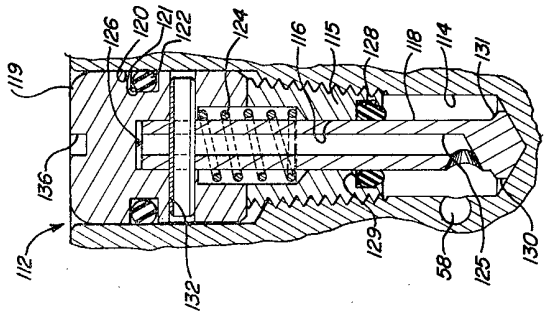

Fig - 16

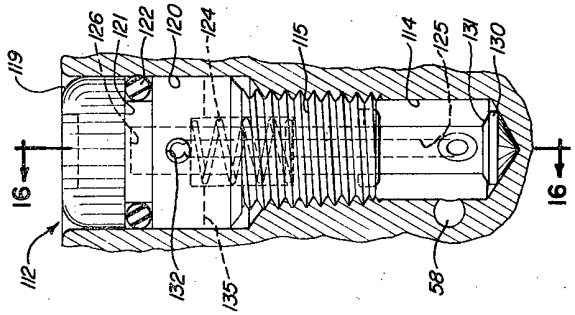

Fig - 15