March 30, 1943. R. L. SLATER 2,314,955

RESPIRATOR

Filed July 2, 1941 5 Sheets-Sheet 1

Fig. 1.

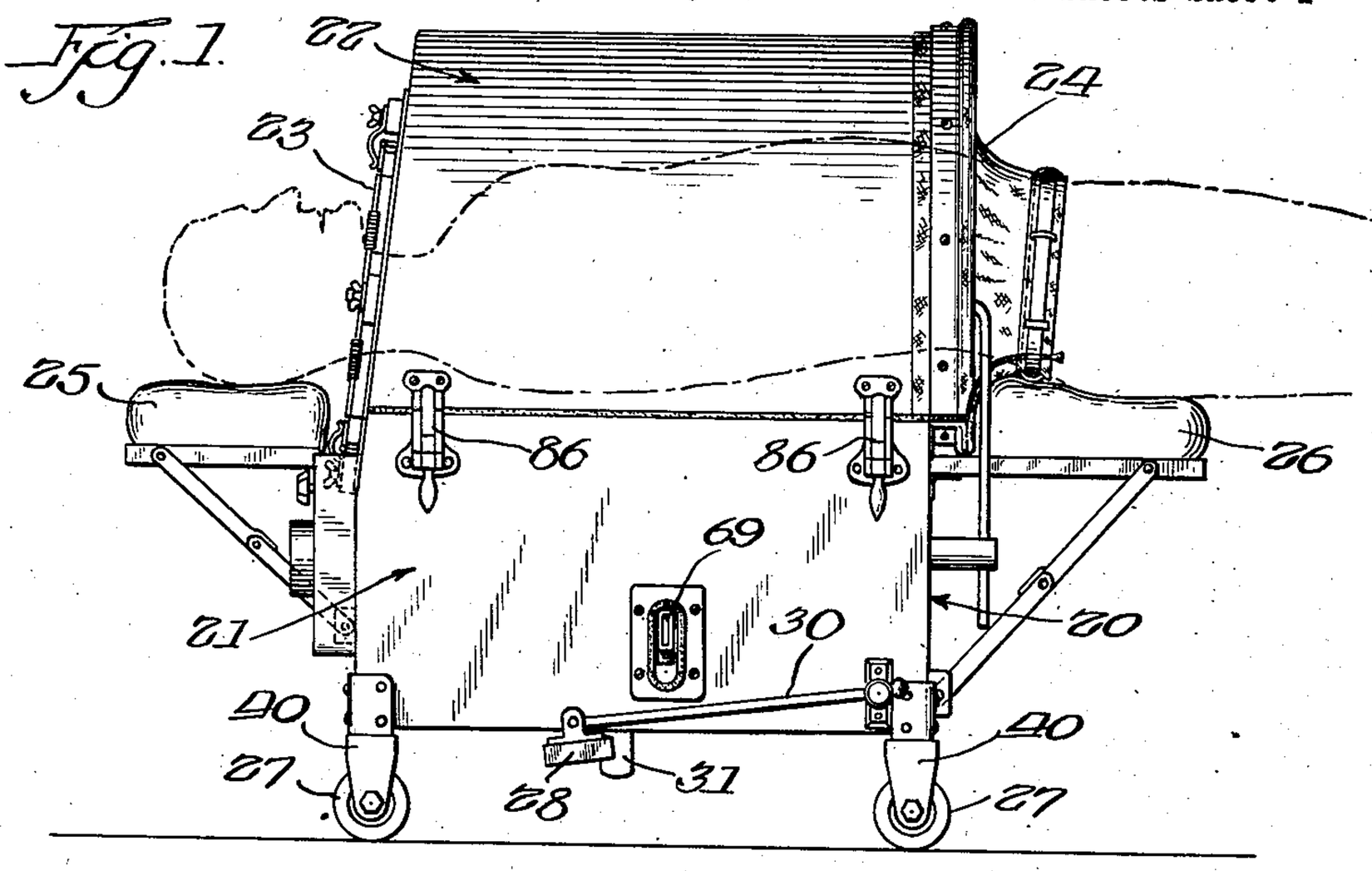
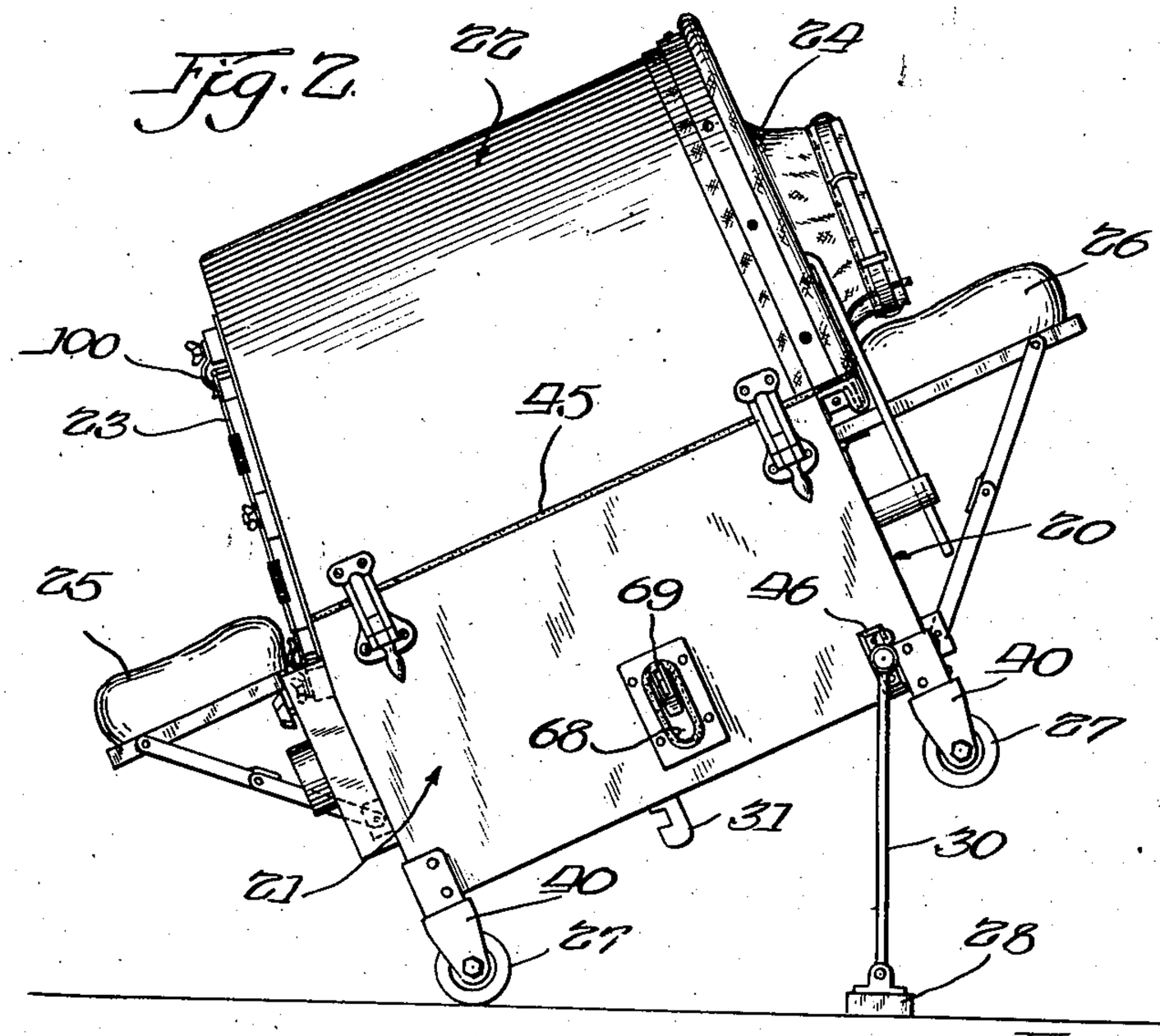


Fig. 2.



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RESPIRATOR

Filed July 2, 1941 5 Sheets-Sheet 2

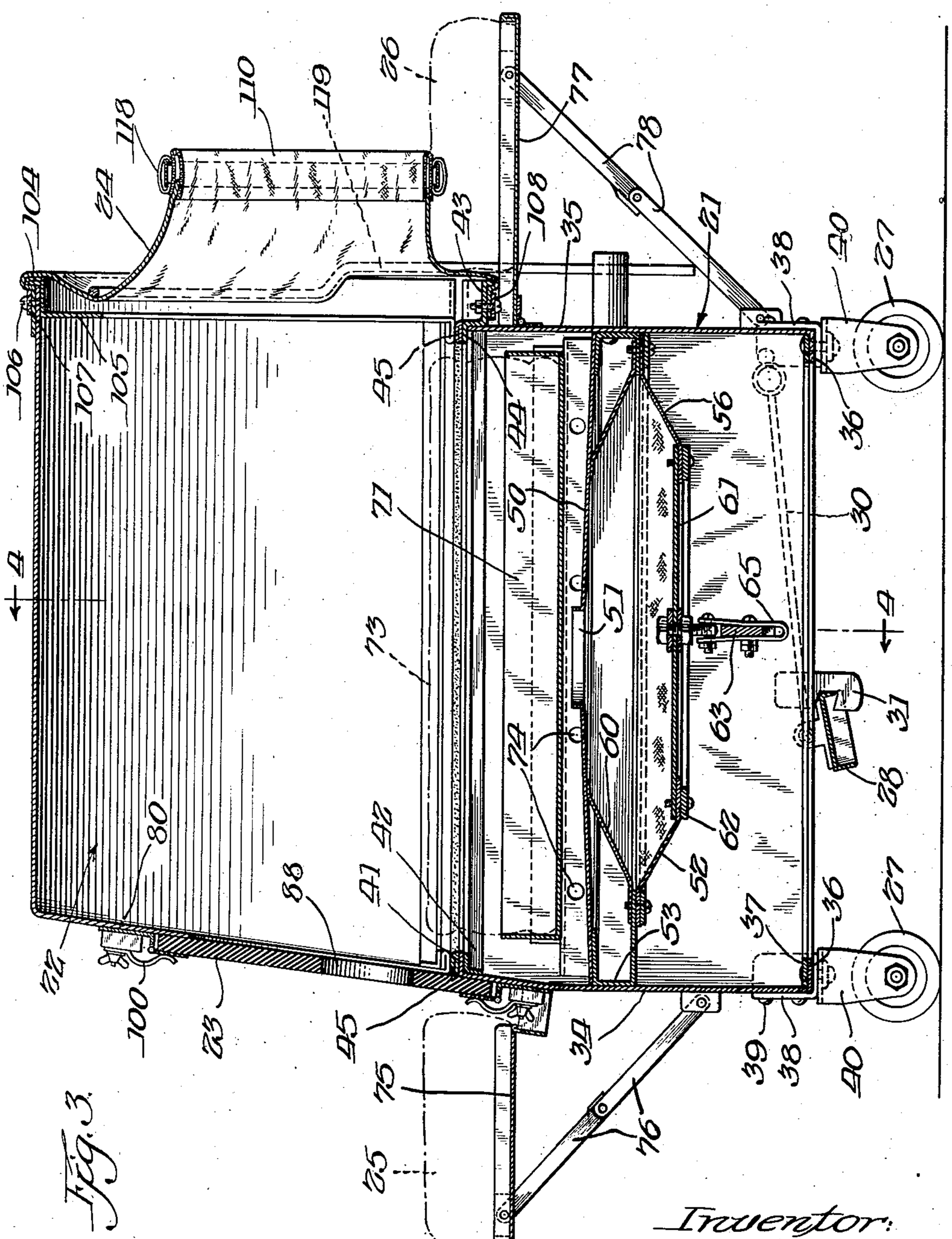

Fig. 3.

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RESPIRATOR

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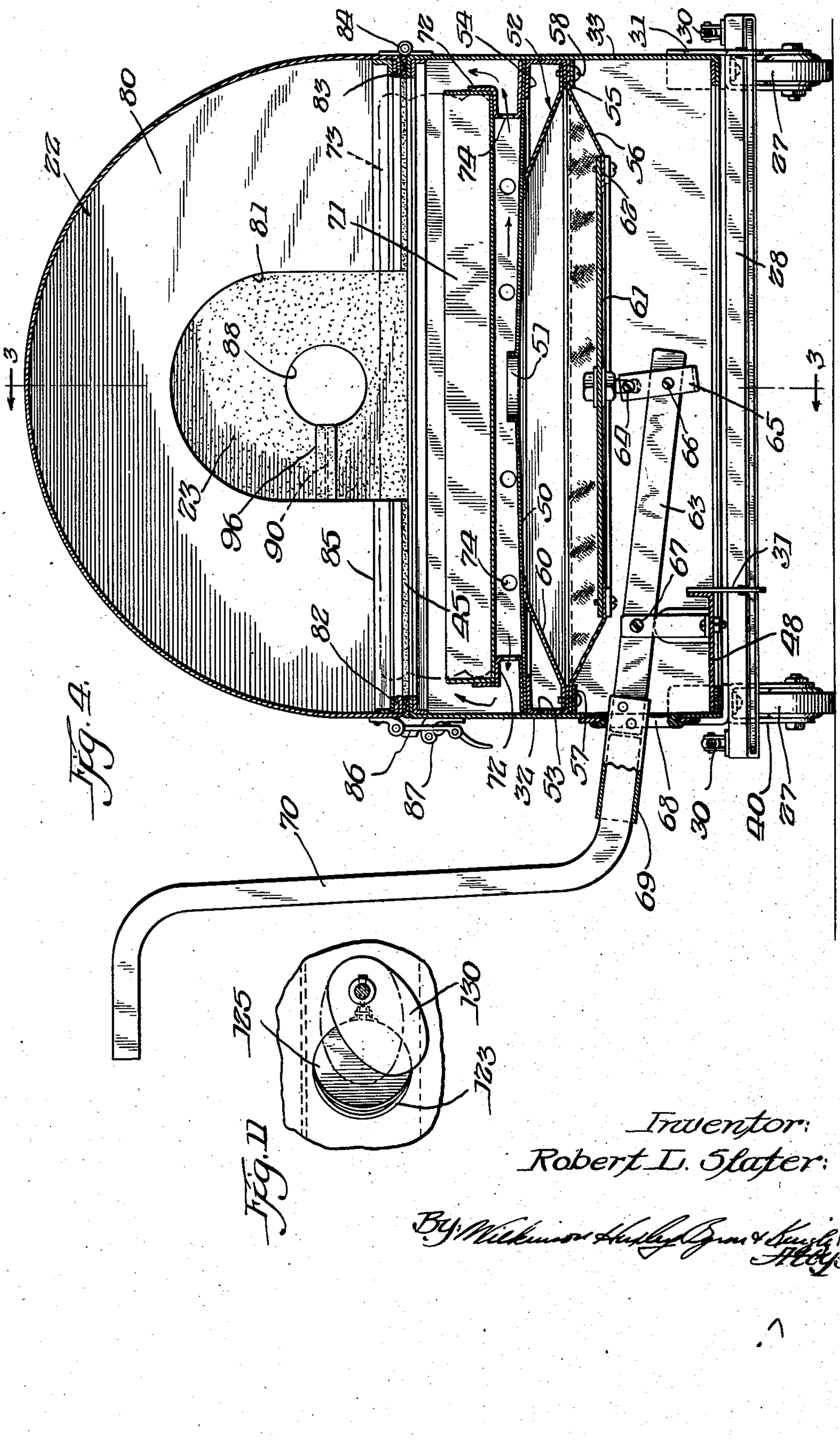

Fig. 4.

Fig. 11

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RESPIRATOR

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Fig. 5.

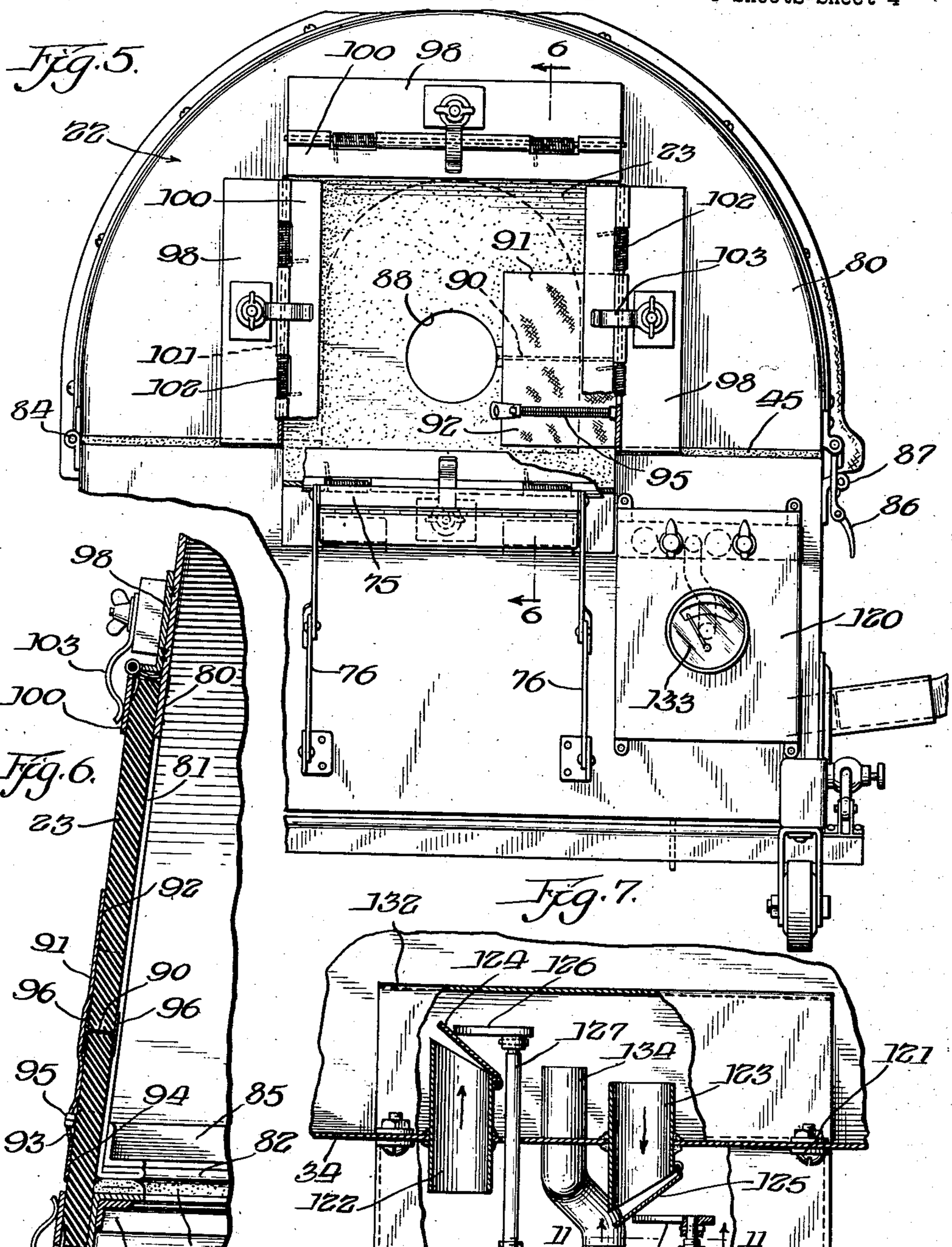

Fig. 6.

Fig. 7.

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RESPIRATOR

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Fig. 8.

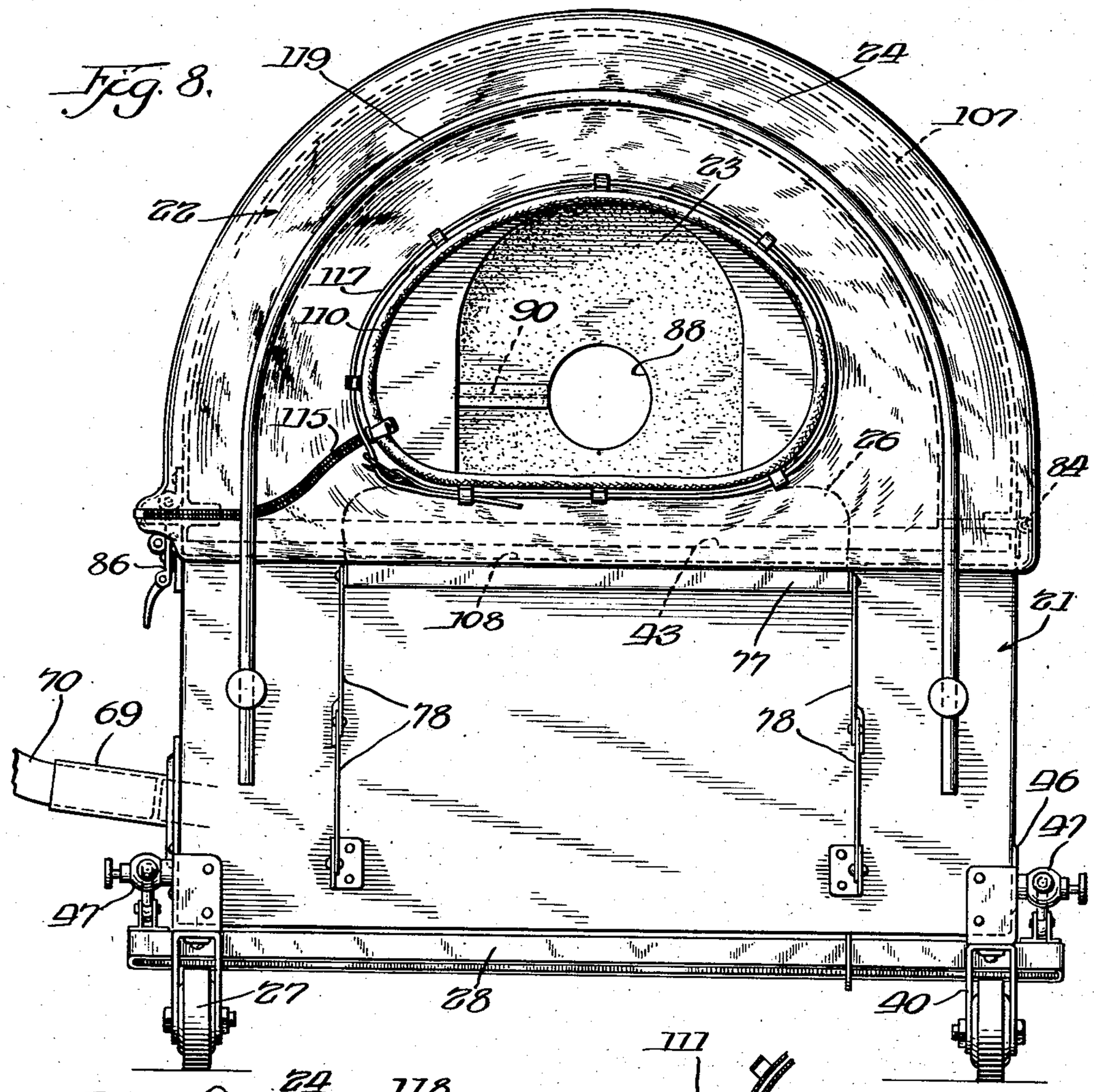


Fig. 9.

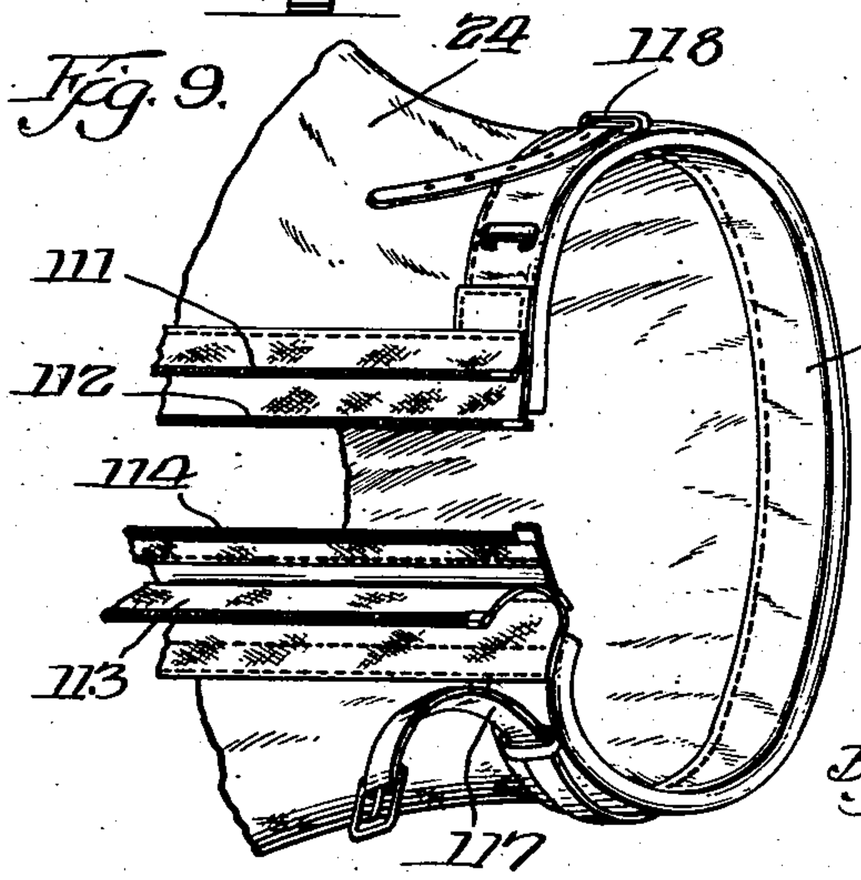
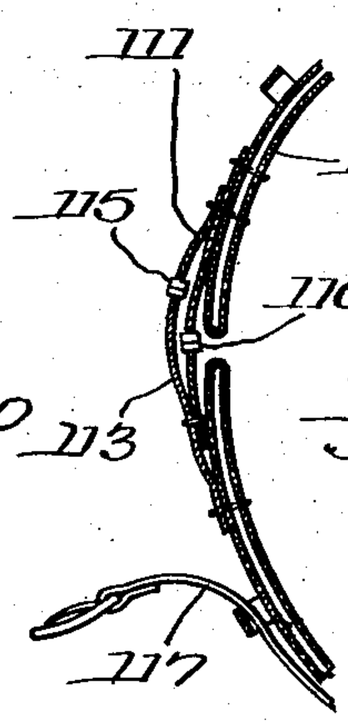


Fig. 10.



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UNITED STATES PATENT OFFICE

2,314,955

RESPIRATOR

Robert L. Slater, Chicago, Ill.

Application July 2, 1941, Serial No. 400,727

13 Claims. (Cl. 128—30)

The invention relates to respirators and has more particularly reference to a light weight, portable apparatus for treating patients requiring artificial respiration.

The primary object of the invention is to provide a portable respirator which will induce breathing by rhythmic changes of the air pressure within the respirator chamber; to provide a respirator which will be relatively light in weight, embodying relatively few parts, and one that can be economically manufactured as most of the parts are metal stampings.

Another object of the invention resides in the provision of a respirator embodying a hinged cover to facilitate the placing within and removal of the patient from the respirator chamber and wherein the ends of the chamber will be closed by diaphragms of novel construction for coacting with the cover in the opening and closing of the same.

Another object is to provide a neck collar for the present respirator of soft sponge rubber with improved means for opening the same for application to or removal from the neck of the patient and which may be readily secured to the respirator by novel hinged clamps that are spring energized to maintain them open unless locked in closed position.

Another object is to provide a respirator which will confine within the respirator chamber only the chest and abdomen of the patient and which will thereby have the important advantage of cleanliness as all body functions can be taken care of outside the apparatus.

Another object is to provide improved diaphragm means for sealing the rear of the respirator chamber around the hips of the patient; to provide a flexible diaphragm which will render possible the opening and closing of the cover by embodying a zipper closure, and a diaphragm which will fit tightly around the hips of the patient when in operative association to prevent the leakage of air.

Another object is to provide a bellows assembly for the respirator device of the invention that will be compact and simple in construction, and which will have a volumetric capacity well in excess of that required for producing normal respiration.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation as will be more fully described and particularly pointed out in the specification, drawings and claims appended hereto.

In the drawings which illustrate an embodiment of the invention and wherein like reference characters are used to designate like parts—

Figure 1 is a side elevational view of the respirator of the invention showing the location of a patient within the respirator chamber with the neck collar and rear flexible diaphragm being shown in proper position on the patient;

Figure 2 is a side elevational view of the respirator shown in Figure 1, illustrating the adjustable standard whereby the apparatus may be supported in tilting position with the head of the patient inclined downwardly;

Figure 3 is a vertical sectional view taken longitudinally through the present respirator showing the improved closure means for the respective ends of the respirator chamber and also illustrating the construction of the bellows assembly;

Figure 4 is a vertical sectional view taken transversely through the respirator shown in Figure 3, substantially along line 4—4 thereof and looking in the direction of the arrows;

Figure 5 is a front elevational view showing in particular the hinged clamps for releasably retaining the neck collar in place;

Figure 6 is a detail sectional view taken vertically through the neck collar and clamping means therefor, substantially along line 6—6 of Figure 5;

Figure 7 is a fragmentary plan view with parts being shown in section to better illustrate the construction of the air inlet and exhaust valves and regulating means therefor;

Figure 8 is a rear elevational view of the respirator of the invention illustrating the constructional features of the rear flexible diaphragm for encircling the hips of the patient;

Figure 9 is a fragmentary view in perspective showing the open end of the rear flexible diaphragm and the zipper closure for making possible the opening of the cover to the respirator chamber;

Figure 10 is a detail sectional view showing the zipper closure for the rear flexible diaphragm in closed position; and

Figure 11 is a sectional view taken substantially along line 11—11 of Figure 7 more particularly illustrating the regulating means for the air exhaust valve.

Referring to the drawings, particularly Figure 1, which illustrates the application of the present apparatus to a patient for the purpose of inducing artificial respiration, it will be observed that the present respirator indicated in its entirety by numeral 20 includes a base structure 21 to

which the cover 22 is pivoted and releasably fastened in closed position. The base structure houses the bellows assembly, as will be more particularly understood as the description proceeds, whereas the cover 22 forms the major portion of the respirator chamber. Said chamber is closed at the head end by a neck collar 23 and at the rear end by a flexible diaphragm 24 having encircling relation with the hips of the patient. Only the chest and abdomen of the patient is therefore confined within the respirator chamber which has the important advantage of cleanliness as all body functions may be taken care of outside the apparatus. The head rest 25 is pivotally connected with the front wall of the base structure and a rear cushion 26 for supporting the buttocks of the patient has pivotal connection in a similar manner to the rear wall of the base structure. In Figure 1 the respirator is shown in horizontal position with all four rollers 27 having contact with the floor. Figure 2 illustrates an inclined position of the apparatus which is resorted to in certain types of artificial respiration as drowning and in advance stages of paralysis to facilitate draining of the throat. The tilting is rendered possible by a foot member 28 extending transversely beneath the base structure and having pivotal connection at its respective ends with rods 30. When not in use, as in Figure 1, the foot member 28 is supported in an inoperative position by the depending hooks 31 which fit within a slot formed in the foot member 28 for the purpose as illustrated in Figure 4.

As best shown in Figures 3 and 4, the base structure includes spaced parallel side walls 32 and 33, a front end wall 34 and a rear wall 35. The four walls at their lower end are each bent inwardly to form flanges 36 reinforced by metal strips 37 and which are additionally reinforced at the corners by brackets 38 suitably secured as by the rivets 39 to the said walls. The brackets provide supporting means for the swivel casters 40 journalling the rollers 27. Three of the walls of the base structure, namely, the side walls 32 and 33 and the front wall 34, are also flanged inwardly at their upper end to form a supporting ledge 41 and which ledge is reinforced throughout its extent by the angle piece 42. Wall 35 carries an additional part which extends along the upper edge thereof for the purpose of providing, in conjunction with the cover, suitable fastening means for the rear diaphragm 24. This additional part is clearly shown in section in Figure 3 and includes the transversely extending member 43 providing the inwardly directed flange 44 which is disposed in substantially the same plane as the ledge 41. Said supporting ledge and flange 44, which is substantially a continuation thereof, retains in position a sealing strip 45 that may be formed of any soft flexible material and which defines the opening between the base structure and the cover of the respirator. When the cover is in closed position the same will have contact with the sealing strip 45 around all four edges thereof so as to effectively seal the interior of the cover from the atmosphere and prevent leakage of air at these points.

The side walls are provided with plates 46, as best shown in Figures 3 and 8, which are located relatively close to the rear corner brackets 38. These plates each provide a rotatable and adjustable connection 47 adapted to receive the rods 30 of the foot attachment which permits pivoting of the rods and adjustment of the same as to length. Two hooks 31 are provided, each depending from the base structure, as best shown in Figure 4. The left hand hook depends vertically downward from a plate bracket 48, whereas, the right hand hook member is secured to and depends from the side wall 33.

The base structure is divided internally by means of a metal diaphragm member 50 having the central opening 51 and which diaphragm member forms the upper stationary part of the bellows assembly indicated in its entirety by numeral 52. Diaphragm 50 is suitably supported within the base structure by the channel bracket 53, the same providing an upper ledge 54 on which the member 50 is directly supported and also a lower ledge 55 which is used to suitably fasten the movable diaphragm 56 of the bellows assembly as by means of the ring 57 and bolts 58. An internal partition 60 extends upwardly from the lower ledge 55, being also suitably secured thereto by bolts 58 and said internal partition at its opposite end connects with the diaphragm 50. The structure thus described, in connection with the rigid center piece 61, suitably secured around the periphery thereof as at 62 to the movable diaphragm 56, completes the bellows assembly. It will be understood that diaphragm 56 may be formed of any suitable flexible material and by movement of the same in a vertical direction upwardly and downwardly air will alternately be forced from the bellows assembly and drawn into said assembly through opening 51. The actuating means for the bellows assembly may consist of any conventional source of power with mechanism for moving the rigid center piece 61 up and down. For purposes of illustration a manually actuated lever 63 is disclosed, having connection with the rigid center piece at 64 by means of a link 65 pivotally connecting at 66 with the end of the lever located within the base structure. Said end has a fulcrum connection at 67 and projects outwardly through a rubber covered opening 68 located in the side wall 32. An adapter 69 is fitted to this projecting end of the lever so as to receive a handle part 70 which projects upwardly and provides a handle in convenient reach of the operator.

The air from opening 51 of the bellows assembly is caused to travel laterally since a mattress container 71 is positioned directly over the said opening. Said container, which is of rectangular shape in plan and having upstanding marginal flanges, is suitably supported by brackets 72 and horizontally positioned within the upper portion of the base structure. A mattress or the like, indicated by numeral 73, and shown in dotted lines in the drawings, Figures 3 and 4, is positioned within the container.

In order that the air pressure within the respirator chamber may be alternately changed from pressure to vacuum by the action of the bellows, the brackets 72 are provided with a plurality of openings 74 which allow the air to travel to and fro from the bellows upwardly to the respirator chamber. In other words, the openings 74 provide the necessary communication between opening 51 of the bellows assembly and the peripheral channel extending around the mattress 73 which leads to the respirator chamber. For inducing artificial respiration relatively slight changes in the air pressure is required and the bellows member is preferably operated at a speed so that said changes take place at the rate of normal breathing. When the pressure within the respirator chamber falls slightly below atmospheric the chest of the

cured to this rear end of the cover. The screws 106, employed for securing the member to said cover, also confine between the cover and a ring 107 the terminal end of the rear diaphragm for a portion of the entire circumference thereof. The remainder is secured in a similar manner to member 43, similar to member 105 except that the latter, as previously described, is secured to the base structure. It will be observed that ring 107 extends from the hinges on one side of the respirator around the cover to the handles on the opposite side, as shown in Figure 8. The metal strip 108 which secures the rear diaphragm to member 43 is separate and apart from the cover but likewise extends from the hinges to the clamps so as to complete the circumferential securement of the said diaphragm 24 to the respirator. The opening in the respirator for receiving the buttocks of the patient is formed of elastic material such as the elastic band 110, shown in Figure 10. Said elastic band is suitably secured to the diaphragm so as to form a continuation thereof and said band as well as the diaphragm is slotted so that said rear diaphragm may be separated along a radial line to make possible the opening of the cover 22. The slot extends from the opening formed by the elastic band 110 to the circumference of the diaphragm and which is in alignment with the separation between the cover and the base structure. The rear diaphragm in open position is clearly shown in Figure 9, wherein it will be observed that the upper portion is provided with double fastening means 111 and 112. The lower portion is likewise provided with double fastening means such as 113 and 114. The said fastening means have coaction in pairs to form an exterior zipper closure 115 and an interior zipper closure 116, respectively. For example, the fastening means 111 and 113 are joined by the zipper 115. This double closure is provided to form a more effective seal for preventing leakage of air from the respirator chamber. Although the elastic band 110 will have a relatively close fit around the patient, it may be drawn even tighter if desired by the belt 117 which fits around said elastic band and is held in place thereon by loops 118. Before opening the cover of the present respirator it will be clearly understood that it is necessary first of all to open the rear diaphragm by releasing the fastening means comprising the zipper closures 115 and 116 and to also release the belt 117. The next operation requires that the clamps 103 be released in order that the neck collar may be detached from the cover of the respirator. Thereafter the handles 86 are actuated to unlock the cover, whereupon the same can be swung back upon the hinges 84 and the patient can then be removed. When it is desired to place a patient within the respirator the operations above described are just reversed. The rod 119, suitably supported by means extending from the rear wall 35 and substantially arcuate in form, is designed to limit the movement of the rear diaphragm 24 particularly in an outward direction during operation of the respirator.

Operation of the bellows assemblies will alternately increase the air pressure within the respirator chamber and then produce a slight vacuum within the chamber. The degree of pressure and vacuum may be adjusted in accordance with the present invention by regulating means applied to the exhaust and inlet valves, respectively, and which regulating means are under the control of an operator.

This structure is clearly shown in Figure 7. The casing 120 within which the air valves are located is suitably fastened by bolts 121 to the front wall 34 of the base structure. It will be observed that the inlet conduit 122 and the exhaust conduit 123 pass through said wall and that an air-tight connection is provided therewith. A pivoted valve 124 is associated with the inlet conduit 122 on the inner end of the same, whereas, a pivoted valve 125 is associated with the exhaust conduit 123 on the outer end of the same. During the creation of a reduced pressure within the respirator chamber air will tend to flow into the chamber through the inlet conduit 122 and this action will cause valve 124 to open. The extent of opening is controlled by cam 126 fixed to the actuating rod 127 and having the knob 128 suitably fastened to the portion of said rod projecting outwardly of the casing 120. When a pressure is created within the respirator chamber the action of the air is reversed and the same tends to flow from the chamber through the exhaust conduit 123. Flow in this direction will cause the valve 125 to open and the extent of opening is controlled by cam member 130 suitably actuated by knob 131. When valve 125 is open the valve 124 automatically closes and when air tends to flow into the chamber valve 125 will automatically close and valve 124 will open. As shown in Figure 11, the cams 126 and 130 are elliptical in shape and the degree of opening of the valves depends on the positioning of the cams. In fact, the cams are so designed that the valves can be held closed or allowed to completely open, in which case the conduits would be fully operative for conducting air to the chamber and exhausting the same therefrom. The casing 120 is closed on three sides but the bottom is open so that the conduits have communication with the atmosphere. The end of the conduits within the respirator chamber is protected by an interior guard 132 which is open at its respective ends and in this manner communication is maintained with the respirator chamber. The construction, however, sufficiently shields valve mechanism 124 and 125 to prevent damage thereto either by the operator located on the outside of the respirator or by the patient within. The air pressure gauge 133 is positioned centrally of casing 120 and serves to indicate the degree of pressure and vacuum within the respirator so that the operator may independently adjust the valves to produce the desired pressure changes for the particular patient undergoing treatment. The gauge is in communication with the respirator chamber by the conduit 134 which passes through the front wall 34, having an air-tight connection therewith, and terminates within the interior guard 132.

The invention is not to be limited to or by details of construction of the particular embodiment thereof illustrated by the drawings as various other forms of the device will of course be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

What is claimed is:

1. In a respirator, in combination, a base structure including spaced side walls, a front wall and a rear wall, a bellows assembly positioned within the base structure and supported by said walls, a cover substantially semi-circular in transverse cross section having a hinged connection along one longitudinal side thereof with one side wall

patient rises and air enters the lungs. The air pressure within the chamber then returns to normal or slightly above atmospheric and the patient breathes air out of his lungs. A surprisingly slight change of pressure is required to duplicate normal breathing.

The head rest **25** is supported by the pivoted table **75** from the front wall **34** of the base structure. The toggle links **76** have connection with the table at its outer end and, with the front wall of the base structure, serve to support the table in horizontal position when the links are in alignment. The rear cushion support **26** for the hips or buttocks of the patient is likewise horizontally positioned by a table **77** having pivotal connection with the rear wall **35**. The links **78** connect the end of the table with the bottom portion of the rear wall of the base structure and when said links are aligned the table and rear support is located horizontally as disclosed in the drawings. Since the present respirator is portable it is preferably that the same make as compact a unit as possible during transportation. For this purpose the tables are constructed so that they can be collapsed by actuation of the supporting links therefor and in collapsed position it will be understood that the tables depend from their pivots and are located relatively close to the respective walls of the base structure.

As previously described, the cover **22** forms approximately the entire respirator chamber and accordingly, to provide the necessary space the cover is arcuate in form or more particularly semi-circular in cross section. Within this chamber the chest and abdomen of the patient are located for inducing breathing by rhythmic changes of air pressure. The cover **22** is shown as consisting principally of a single sheet of metal having an inwardly directed flange **80** providing the front wall of the cover and which, as shown in Figure 4, is formed with a U-shaped opening **81** extending to the base of the cover. Along the longitudinal sides of the cover at the base thereof the metal is also flanged inwardly and then bent upon itself to provide the portions **82** and **83**, the former being located along the side of the cover having the handles fixed thereto, and the portion **83** being located adjacent the side having the hinges **84**. Said portions and thus the base perimeter of the cover are suitably reinforced by the angle piece **85**. The portions are located over and are adapted to have contact with the sealing strip **45**, which, as previously described, is suitably supported by inturned ledges and flanges provided by the base structure. With the cover in closed position, as shown in the drawings, the sealing strip **45** is confined between the parts just described so as to maintain an air-tight joint. The handles **86** are pivotally fastened to the cover and said handles are designed to have locking relation with the latch members **87** secured to the base structure. When the handles are released the cover may be swung open with the pivoting taking place on the hinges **84**. To permit this action of the cover the neck collar **23** and the rear diaphragm **24** are each provided with zipper closures, the construction of which will now be described.

The neck collar **23**, Figure 5, is preferably formed of soft sponge rubber substantially square in shape having an opening **88** of an average size to accommodate the neck of the patient. To facilitate application of the collar the same is severed as at **90**, the separation extending from the opening **88** radially to the right hand edge as shown in said figure. When the respirator is in operation it is of course necessary to seal the slot formed by the separable edges **90** so as to prevent leakage of air from the respirator chamber. This is accomplished as shown in Figure 6 by a canvass or other flexible cloth covering **91** glued or otherwise secured as at **92** to the upper portion of the neck collar and having overlapping relation with the separable edges **90**. A second cloth covering **93** is glued or otherwise secured as at **94** to the lower portion of the neck collar and by the provision of fastening means **95** on the adjacent edges of cloth covering **91** and **92** the same may be releasably closed in overlapping relation with slot **90**. The upper and lower edges of the neck collar forming said slot are retained in proper alignment with each other by means of guiding strips **96**, a strip being located on each side of the neck collar and being preferably secured to the lower portion. The upstanding sections of the strips thus form a guide channel within which is releasably located the upper portion of the neck collar. With the parts in the position as described the flexible cloth covering has overlapping relation therewith and an effective and secure seal is provided. The flexible cloth coverings may be readily separated by the fastening means **95** in the form of a zipper and the neck collar can then be separated at **90** so as to permit location of the collar around the neck of the patient or removal therefrom.

The neck collar is completely detachable from the front wall **80** of the cover. Therefore before a patient is placed within the respirator the neck collar is located on the patient and the flexible cloth covering is closed by zipper **95** as above described to prevent the escape of air through the separable edges formed by the slot **90**. It will be understood, of course, that the circular opening **88** is substantially closed by the neck of the patient. When the cover is closed it is only necessary, therefore, to clamp the neck collar to the cover. For this purpose four clamps are provided adapted to have coaction with the four sides respectively of said collar. Each clamp includes a base portion **98** fixed to the wall **80** of the cover and a hinge portion **100** pivotally secured to **98** by the rod **101**. Said rod provides retaining means for the coil springs **102** which are so designed as to apply spring tension to the hinge portions **100** in order to maintain the portions in open position. Therefore the portions automatically assume an open position when the clamps **103** are released. It will be clearly understood that with the hinge portions in open position a substantially square area is provided on wall **80** for receiving the neck collar **23** and when in position thereon the opening **81** in the cover will be closed thereby. To releasably secure the neck collar to the cover it is only necessary to actuate clamps **103** whereby the hinge portions **100** will be caused to close against the neck collar and securely fasten the same in place. The construction of the hinge portions, which are spring energized to maintain them in open position, and the clamps therefor have the advantage of speed in placing a patient within the respirator and fastening of the collar in desired position.

The rear diaphragm **24** has also been designed to make possible the greatest amount of speed in placing a patient within the respirator and operation of the same to induce breathing. The outer periphery of the diaphragm **24** is located over an upstanding flange **104** provided by the substantially U-shaped member **105** which is se-

of the base structure, handle members on the opposite longitudinal side of the cover for releasably fastening the cover to the other side wall of the base structure, said cover having an opening at each end thereof, a diaphragm member for each said opening having associated relation with the cover respectively, a head rest supported by the front wall of the base structure and having an exterior position adjacent one of said diaphragms, and a rear support having connection with the rear wall of the base structure and exteriorly located adjacent the other diaphragm.

2. In a respirator, in combination, a base structure including spaced side walls, a front wall and a rear wall, a bellows assembly positioned within the base structure and supported by said walls, a cover substantially semi-circular in transverse cross section having a hinged connection along one longitudinal side thereof with one side wall of the base structure, handle members on the opposite longitudinal side of the cover for releasably fastening the cover to the other side wall of the base structure, said cover having an opening at each end thereof, a diaphragm member for each said opening, one of said diaphragm members having securement for a portion of its circumference to the cover and being secured for the remainder of its circumference to the base structure, the other diaphragm member having releasable securement to the cover and to the base structure, a head rest pivotally supported from the front wall of the base structure, and a rear support having pivotal connection with the rear wall of the base structure.

3. In a respirator, in combination, a base structure, a bellows assembly positioned within the base structure and supported thereby, a cover substantially semi-circular in transverse cross section having a hinged connection along one longitudinal side thereof with the base structure and forming therewith a respirator chamber located above and in communication with the bellows assembly, said cover having an opening in the front end thereof and the rear of said cover also being open, a rear diaphragm member for said rear opening having securement for a portion of its circumference to the cover and being secured for the remainder of its circumference to the base structure, a diaphragm member for the front opening in the cover, and said rear diaphragm member being separable along a radial line extending to the circumference thereof and in substantial alignment with the separation between the cover and the base structure, whereby the cover may have pivotal movement into an open position on said hinged connection as an axis.

4. In a respirator, in combination, a base structure, a bellows assembly positioned within the base structure and supported thereby, a cover substantially semi-circular in transverse cross section having a hinged connection along one longitudinal side thereof with the base structure and forming therewith a respirator chamber located above and in communication with the bellows assembly, said cover having an opening in the front end thereof and the rear of said cover also being open, a rear diaphragm member for said rear opening having securement for a portion of its circumference to the cover and being secured for the remainder of its circumference to the base structure, a diaphragm member for the front opening in the cover, each said diaphragm member having an opening therein located substantially centrally of the member, each diaphragm member being separable along a radial line from the opening therein to its circumference, and fastening means on each diaphragm member for releasably joining the edges of the member formed by said radially extending separation therein.

5. In a respirator, in combination, a base structure, a bellows assembly positioned within the base structure and supported thereby, a cover substantially semi-circular in transverse cross section having a hinged connection along one longitudinal side thereof with the base structure and forming therewith a respirator chamber located above and in communication with the bellows assembly, said cover having an opening in the front end thereof and the rear of said cover also being open, a diaphragm member for the front opening in the cover, a rear diaphragm member for said rear opening having securement for a portion of its circumference to the cover and being secured for the remainder of its circumference to the base structure, and said rear diaphragm member having a central opening therein formed by an elastic band secured to the inner periphery of the member.

6. In a respirator, in combination, a base structure, a bellows assembly positioned within the base structure and supported thereby, a cover substantially semi-circular in transverse cross section having a hinged connection along one longitudinal side thereof with the base structure and forming therewith a respirator chamber located above and in communication with the bellows assembly, said cover having an opening in the front end thereof and the rear of said cover also being open, a diaphragm member for the front opening in the cover, a rear diaphragm member for said rear opening having securement for a portion of its circumference to the cover and being secured for the remainder of its circumference to the base structure, retaining means for the first mentioned diaphragm member pivotally connecting with the cover, and resilient means in associated relation with said retaining means yieldingly biasing the latter into an open position.

7. In a respirator, in combination, a base structure, a bellows assembly positioned within the base structure and supported thereby, a cover substantially semi-circular in transverse cross section having a hinged connection along one longitudinal side thereof with the base structure and forming therewith a respirator chamber located above and in communication with the bellows assembly, said cover having an opening in the front end thereof and the rear of said cover also being open, a diaphragm member for the front opening in the cover, a rear diaphragm member for said rear opening having securement for a portion of its circumference to the cover and being secured for the remainder of its circumference to the base structure, retaining means for the first mentioned diaphragm member pivotally connecting with the cover, coil springs in associated relation with the retaining means for yieldingly biasing the latter into an open position, and clamps for releasably holding the retaining means in closed position on the diaphragm member to secure the same to the cover.

8. In a respirator, in combination, a base structure, a bellows assembly positioned within the base structure and supported thereby, a cover substantially semi-circular in transverse cross section having a hinged connection along one longitudinal side thereof with the base structure and forming therewith a respirator chamber

located above and in communication with the bellows assembly, said cover having an opening in the front end thereof and the rear of said cover also being open, a diaphragm member for the front opening in the cover, a rear diaphragm member for said rear opening having securement for a portion of its circumference to the cover and being secured for the remainder of its circumference to the base structure, said rear diaphragm member having a central opening therein defined by an elastic band secured to the inner circumference of the member, retaining means for releasably securing the first mentioned diaphragm member to the cover including portions having pivotal connection therewith, and clamps for releasably holding the portions in closed position on said member.

9. In a respirator, in combination, a base structure including spaced parallel side walls, a front wall and a rear wall, a container within the base structure for supporting a mattress, a cover substantially semi-circular in cross section having a hinged connection along one longitudinal side thereof with one side wall of the base structure, said cover having an opening at each end thereof, a diaphragm member for each said opening having associated relation with the cover and base structure respectively, and a bellows assembly supported by the base structure below said container and including a stationary top wall and a movable bottom wall, said bellows assembly having communication with the space above the container defined by the said cover.

10. In a respirator, in combination, a base structure including spaced side walls, a front wall and a rear wall, a cover having a hinged connection with said base structure to form a respirator chamber with the open upper end thereof, a container located within the base structure and supported by the walls thereof, said container positioning within the base structure supporting means for the patient and which is located so that the upper surface thereof is on a plane approximately coinciding with the separation between the cover and base structure, a bellows assembly within the base structure below the container and in supported relation with the walls thereof, said assembly including a stationary top wall and a movable bottom wall, and said stationary top wall having an opening therein communicating with the respirator chamber.

11. In a respirator, in combination, a base structure including spaced side walls, a front wall and a rear wall, a cover having a hinged connection with said base structure to close the open top end thereof whereby to form a respirator chamber with the base structure, means within and secured to the base structure providing a support for a mattress adapted to accommodate the body of the patient, a head rest located exteriorly of the base structure and supported thereby in a horizontal plane substantially aligned with the said mattress supporting means, a bellows assembly within the base structure below the said mattress supporting means and substantially closing the open bottom end of said base structure, said assembly including a stationary top wall secured to the base structure and a movable bottom wall, means having connection with the bottom wall for moving said bottom wall, and said stationary top wall having an opening therein communicating with the respirator chamber.

12. In a respirator, in combination, a base structure including spaced side walls, a connecting front wall and a connecting rear wall, a bellows assembly positioned within the base structure and supported by said walls, said assembly including a stationary top wall and a movable bottom wall, a cover substantially semi-circular in transverse cross section having a hinged connection along one longitudinal side thereof with one side wall of the base structure and forming therewith a respirator chamber located above and in communication with the bellows assembly, said cover having an opening in the front end and the rear end of said cover also being open, a diaphragm member for the rear opening having associated relation with the cover at said end thereof, and a diaphragm member for the opening in the front end of the cover having releasable securement to the cover and also to the base structure.

13. In a respirator, in combination, a base structure including spaced side walls, a connecting front wall and a connecting rear wall, a bellows assembly supported by the base structure and closing the open bottom thereof, said assembly including a stationary top wall and a movable bottom wall, a cover for closing the open top of the base structure and having a hinged connection along one longitudinal side thereof with one side wall of the base structure, said cover forming a respirator chamber with the base structure located above and communicating with the bellows assembly through an opening in the top wall of the same, said cover having an opening at each end thereof, a diaphragm member for each said opening, one of said diaphragm members having securement for a portion of its circumference to the cover and being secured for the remainder of its circumference to the base structure, the other diaphragm member being releasably secured to the cover and base structure respectively.

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