

Sept. 23, 1947.

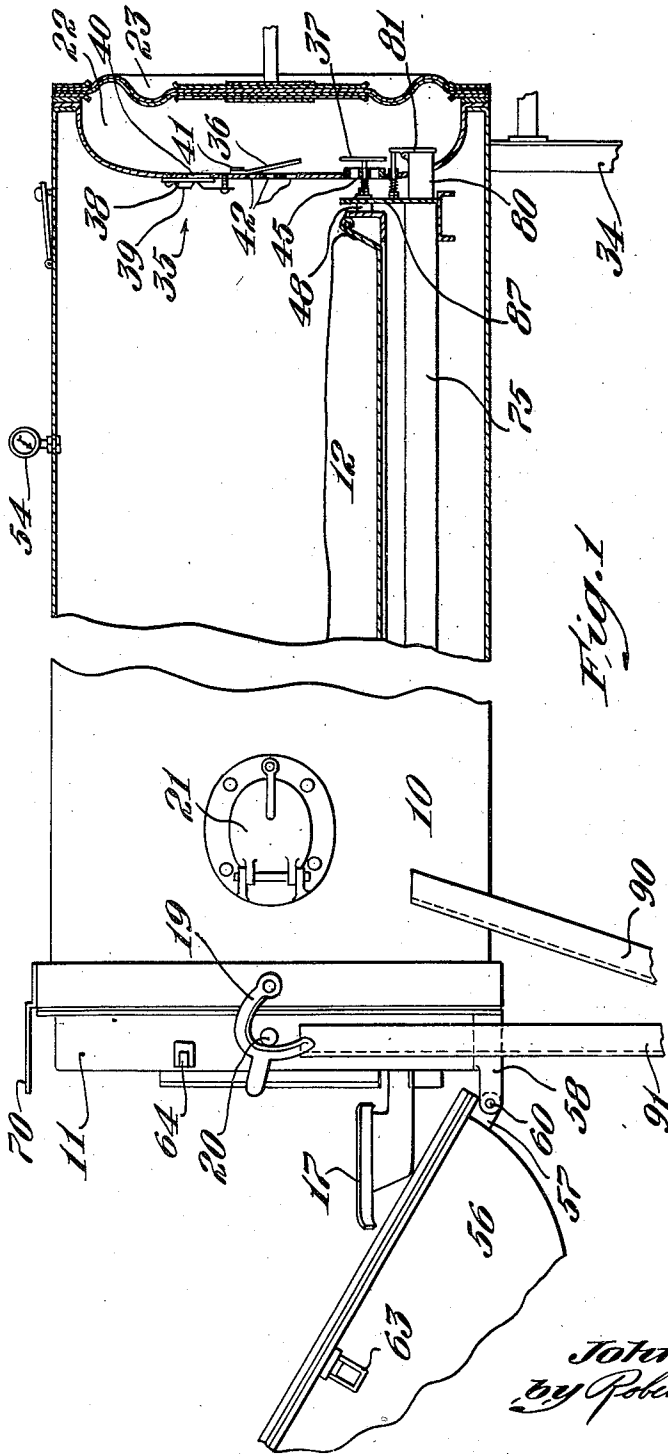
J. H. EMERSON

2,427,665

ARTIFICIAL RESPIRATOR WITH AN AUXILIARY UNIT FOR TEMPORARY USE

Filed June 10, 1946

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

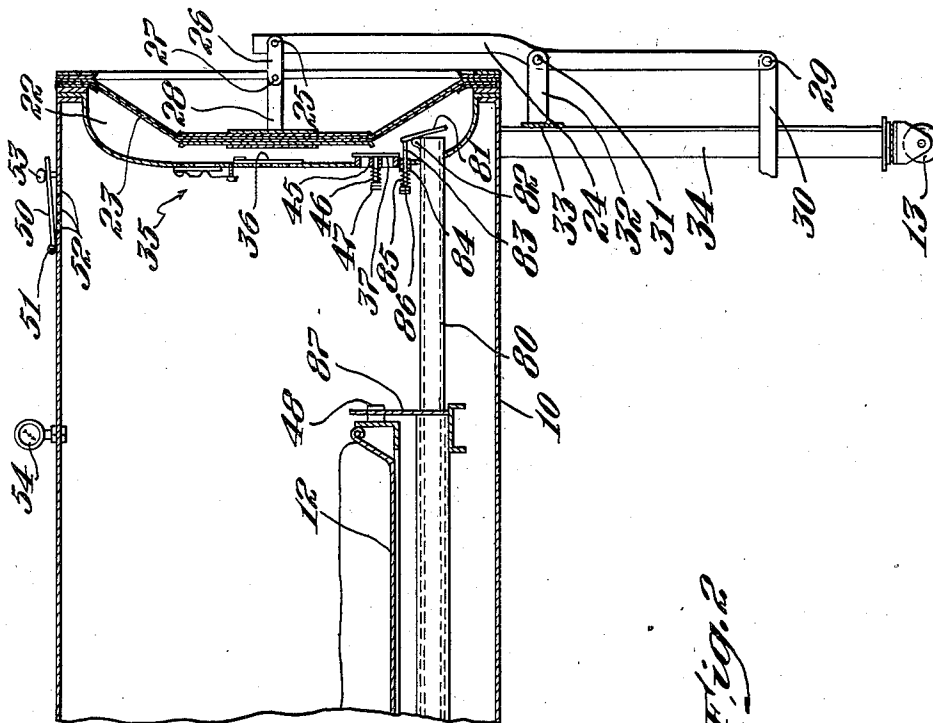
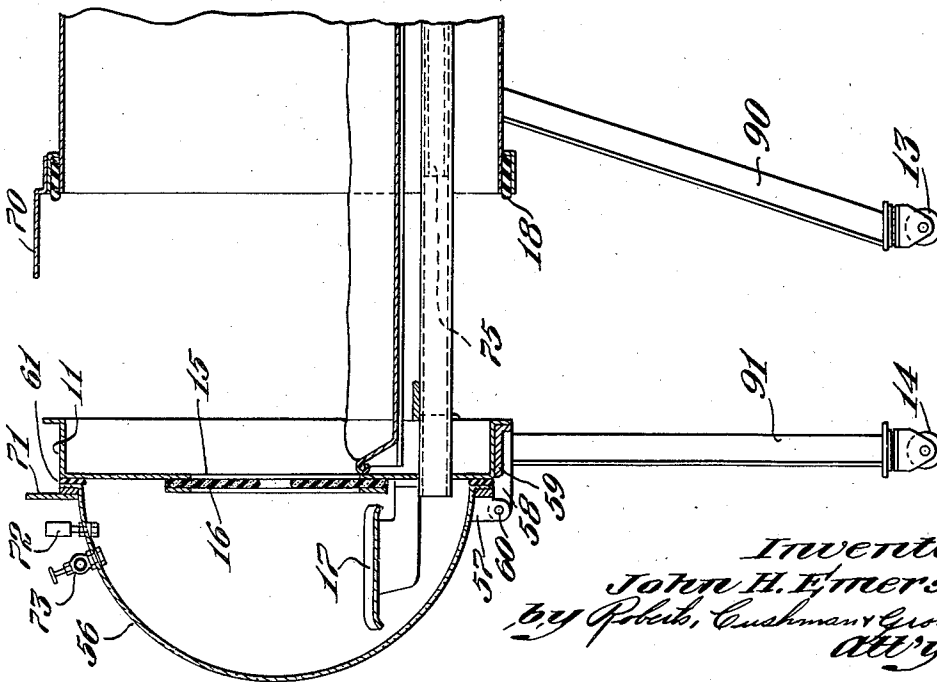


Fig. 2



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UNITED STATES PATENT OFFICE

2,427,665

ARTIFICIAL RESPIRATOR WITH AN AUXILIARY UNIT FOR TEMPORARY USE

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Application June 10, 1946, Serial No. 675,706

12 Claims. (Cl. 128—30)

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This invention relates to artificial respirators for inducing breathing in persons suffering from infantile paralysis, drowning, suffocation, etc., and more particularly to an auxiliary unit for temporary use during periods when the patient is withdrawn from the casing of the primary respiration unit.

This invention is an improvement upon a well-known type of prior art artificial respirator which comprises a substantially horizontal air-tight casing having a removable end wall section to which is attached the end of a slideable bed. The removable wall section is provided with an opening through which the patient's head may be passed as he reclines on the bed. When the removable wall section is in place against the end of the casing, the casing encloses the body of the patient reclining on the bed, leaving at least his nose and mouth exposed to the atmosphere. Alternate negative and atmospheric or positive pressures are created within the casing in time with the normal respiration periods of the patient. Each negative pressure period causes the patient's chest and lungs to expand and air is automatically drawn into his lungs through his nose and mouth, thereby causing an inhalation. Each atmospheric or positive pressure period causes the patient's chest to collapse whereby the gases contained in his lungs are expelled through his nose and mouth, thus causing an exhalation.

Patients suffering from infantile paralysis remain confined in such an artificial respirator for periods ranging from a week to many months. In the treatment of such patients many physicians find it desirable to apply hot packs to certain portions of the patient's body. During such hot-pack treatments and such prolonged treatments, access to the patient's body is required and for conveniently affording such access it is necessary to slide the bed out of the casing far enough for the attendant to apply the packs, rub or massage the patient, administer urinals, bed pans, and the like. To slide the bed out of the casing it is necessary to break the seal between the moveable end wall of the casing and the adjacent end of the casing so that the patient's chest is no longer subject to the periodic variation of pressure and artificial respiration ceases.

In an effort to solve this temporary lack of artificial respiration, several years ago a respirator was equipped with an auxiliary casing mounted outside of the moveable wall section, the auxiliary casing being moveable to a position in which it cooperated with the moveable end wall section of the casing to form an enclosure for the patient's

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head. The auxiliary casing remained open while the main respirator casing was in use and was closed when the patient was slid out of the casing for such temporary treatments. The machine was provided with means for alternately producing positive pressure which was connected to the interior of the auxiliary casing by a flexible hose which ran from the positive pressure means to the floor and thence to the auxiliary casing to provide a sufficient length for complete removal of the bed from the main casing. This arrangement functioned to force air into the patient's lungs through his nose and mouth in time with normal respiration periods.

This prior art auxiliary unit did not meet with acceptance because the hose became entangled with the attendant's feet and with the casters of the slideable unit and the main respirator unit; because it was necessary to manipulate controls to start and stop the means for producing positive pressure; and because it was possible in the use of the respirator to close the auxiliary head enclosure when the bed was entirely within the casing, thereby creating the possibility of asphyxiating the patient by using the main respirator unit with the head enclosure closed with no communication between the patient's nose and mouth and the atmosphere.

It is the object of this invention to provide an auxiliary respirator unit combined with said well-known prior art artificial respirator which is simple and economical in construction and which will function to provide artificial respiration during periods when the patient is removed from the main respirator casing.

A further object is to provide such a respirator with extensible means for affording communication between the interior of the auxiliary respirator casing and the means for producing positive pressure which extensible means is supported above the floor at all times and is located out of the attendant's way, thus eliminating one of the objections to the prior art device.

A further object is to produce such a respirator embodying a valve, the operation of which is controlled by the slideable unit or bed so that communication between the positive pressure means and the interior of the head enclosure is automatically opened when the bed is slid outwardly of the casing and such communication is automatically closed when the bed is returned to the casing.

A further object is to provide a single unit for creating alternate variations in pressure within the main casing and the auxiliary head enclosure,

together with valves, the operation of which is controlled by the slideable unit so that communication between the pressure-varying unit and the main casing is provided when the slideable unit is closed and communication between the pressure-varying unit and the auxiliary head enclosure when the slideable unit is open.

A further object is to provide means associated with the main casing and with the slideable unit which prevent closing the auxiliary head enclosure when the slideable unit is closed.

According to this invention I provide a plurality of telescoping members to form extensible means for providing communication between the means for producing positive pressure and the interior of the head enclosure, one of said telescoping members being connected to the slideable bed unit and another being connected to the means for producing positive pressure, whereby when the bed is slid out of the casing the former telescoping member moves in unison with the bed so that the extensible means is automatically extended, and when the bed is slid into the casing said telescoping member is automatically returned to its original position. This permits mounting this means above the floor so that it remains out of the way at all times. In a preferred embodiment the extensible means is located in the interior of the main respirator casing between the bottom of the bed and the bottom of the casing, but it may be mounted between the bottom of the casing and the floor or at any other locations without or within the casing. The scope of the invention is not limited to telescoping means but is broad enough to cover any extensible means supported above the floor and extensible by outward movement of the slideable bed unit.

According to this invention I provide a valve associated with said extensible means and operable by said slideable bed unit whereby upon sliding the bed out of the casing communication between the positive pressure means and the interior of the head enclosure is automatically opened and upon returning the bed to the interior of the casing such communication is automatically closed thereby eliminating the necessity for manually operating controls when periodic positive pressure is desired in the head enclosure.

According to this invention I provide a single unit for creating alternate variations in pressure within the main casing and the auxiliary head enclosure, this unit being located at the end opposite to the moveable end wall section, together with two valves, one controlling communication between the pressure-varying unit and the main casing and the other controlling communication between the pressure-varying unit and the auxiliary head enclosure. I also provide means associated with said valves and with the slideable unit so that communication between the pressure-varying unit and the main casing is provided only when the slideable unit is closed, and communication between the pressure-varying unit and the auxiliary head enclosure is provided only when the slideable unit is open.

According to this invention I provide means on the head end of the casing and on the auxiliary casing which prevent the closure of the auxiliary casing when the bed is completely within the main casing thereby insuring communication between the patient's nose and mouth and the atmosphere when the main casing is being utilized for artificial respiration.

Other objects relate to the construction and mode of operation and will be apparent from a consideration of the following description and accompanying drawings which exemplify one embodiment of my invention chosen for the purposes of illustration.

In the drawings

Fig. 1 is a side elevation of a respirator embodying my invention, parts being broken away and shown in section, the auxiliary head enclosure being illustrated in open position and the slideable unit shown in closed position; and

Fig. 2 is a vertical longitudinal section of the respirator shown in Fig. 1 but with the auxiliary head enclosure shown in closed position and the slideable unit shown in open position.

The respirator illustrated comprises the casing 10 and the removable end wall 11 to which the head end of the bed 12 is attached. The casing 10 is supported by four casters 13 which roll along the floor, these casters being secured to a pair of legs 90 which support the head end of the casing and a pair of legs 34 which support the foot end of the casing. The removable wall section 11 and the bed 12 are supported by the two casters 14 which roll along the floor, the casters being secured to a pair of legs 91. The foot end of the bed is slideably supported on the casing wall by means (not shown).

An opening 15 is provided in the end wall 11 large enough to permit the passage of the head of the patient therethrough. A seal is provided between the edge of this opening and the patient's neck by a sponge rubber collar 16 which is clamped against the removable end wall 11 by any suitable clamping means (not shown). A headrest 17 is supported by the end wall 11 and is conveniently located for use by the patient when reclining upon the bed 12. A gasket 18 is provided adjacent to the open end of the casing 10 whereby a substantially air-tight seal is formed between the end wall 11 and the end of the casing 10 when the end wall is clamped in closed position by the clamps 19 engaging the lugs 20 (see Fig. 1).

A porthole 21 is provided in the side of the casing wall 10 permitting access of an attendant to the patient's body when the casing is closed.

The means for producing alternate positive and negative pressure consists of the fixed end wall 22 and the flexible leather diaphragm 23. This diaphragm is operated by an operating arm 24 which has its upper end pivotally secured at 25 to the link 26, the other end of which is pivotally secured at 27 to the rigid diaphragm extension 28. The lower end of the operating arm 24 is pivotally secured at 29 to the connecting rod 30, and the operating arm is pivotally secured intermediate its ends at 31 to the rigid arm 32 which is secured to a cross bar 33 supported between the two legs 34.

The connecting rod 30 is reciprocated back and forth horizontally by an electric motor (not shown). Such reciprocation causes reciprocation of the operating arm 24 above the pivot 31, thereby causing the diaphragm 23 to be moved in and out of the cavity formed by the end wall 22. When the diaphragm is moved into this cavity (see Fig. 2) it creates positive pressure therein, and when the diaphragm is returned to the outer position (see Fig. 1) it creates negative pressure therein.

The end wall 22 is provided with three valves 35, 36, and 37. The valve 35 consists of a flexible strip 38 hinged to move away from the end

wall 22 toward the interior of the casing 10 and resiliently maintained in closed position by a phosphor bronze spring member 39. This valve 35 is a positive pressure safety valve which normally closes the opening 40 but which moves to open position against the pressure of the spring 39 when excessive positive pressure is built up by the diaphragm 23.

The valve 36 consists of a strip of leather or other flexible material secured to the end wall 22 at 41 and this valve serves to close the perforations 42 during positive pressure periods and to open communication through said perforations during negative pressure periods.

The valve 37 serves to close communication between the pressure-varying unit and the interior of the casing 10 when the bed 12 has been slid outwardly of the casing 10, as shown in Fig. 2. This valve is supported by the cross member 45 which is secured to the end wall 22 and which is provided with a passage adapted to slideably receive the stem of valve 37. The coil spring 46 has one end seated upon the cross member 45 and the other end seated upon the enlarged head portion 47 of the valve stem. When the bed is completely within the casing 10 the lug 48 provided on the foot end of the bed engages the enlarged head 47 of the valve stem and moves the valve 37 to the open position shown in Fig. 1, compressing the spring 46. This opens communication between the pressure-producing means and the interior of the casing. When the bed 12 is slid outwardly of the casing the spring 46 moves the valve 37 to the closed position shown in Fig. 2, wherein communication with the interior of the casing is closed. Thus when the valve 37 is in the closed position shown in Fig. 2, positive pressure cannot be transmitted to the interior of the main casing unless the degree of positive pressure reaches such intensity that the safety valve 35 is opened. However, no substantial negative pressure can be built up by the pressure-producing means when the valve 37 is in closed position, because during the outward stroke of the diaphragm 23 the flap valve 36 will be moved inwardly thereby affording communication with atmospheric pressure which is then present within the respirator casing due to the fact that the end of the casing is open.

The valve 50 consists of a strip of resilient metal hinged to the casing wall at 51. An adjustment member 53 is screw threaded through an interiorly threaded perforation in the valve 50 so that the space between the valve 50 and the casing wall may be varied by turning the knob of the member 53. The amount of communication between the atmosphere and the interior of the casing 10 through the perforations 52 is thus controlled by adjustment of this knob. A pressure gauge 54 registers the degree of positive and negative pressures which are present within the interior of the casing 10. The amounts of such pressures may be controlled by means of the valve 50 so that the valve 50 in effect serves as a controlled leak valve by means of which the intensity of the pressures built up within the main casing are controlled.

The auxiliary head enclosure is formed by the semispherical shell 56 which is pivotally secured to the moveable end wall 11 by means of a pair of lugs 57 attached to the shell 56, a pair of arms 58 attached to the moveable end wall 11 by the cross bar 59. The pivot lugs 60 extend through registering perforations in the lugs 57 and the arms 58. A substantially air-tight seal is pro-

vided between the edge of the shell 56 and the face of the moveable wall section 11 by the rubber gasket 61 carried by the flange on the edge of the shell 56. The shell 56 is held in closed position by a pair of clamps 63 which are moveable to locked position about its lugs 64 as in the type of clamp commonly used on trunks, suitcases, and the like.

A stop member 70 is secured to the wall of the casing 10 and a cooperating stop member 71 is secured to the shell 56. These stop members are so positioned that they engage each other when the slideable bed unit is moved inwardly of the casing with the shell 56 in the closed position so that they cooperate to prevent closing the end wall 11 of the casing when the shell 56 is closed about the head of the patient or in the alternative closing of the shell 56 when the slideable bed is completely within the casing.

A pressure gauge 72 communicates with the interior of the auxiliary head enclosure and registers the amount of pressure therein. The valve 73 is similar in construction to the valve 50 and may be adjusted to control the maximum amount of positive pressure which may be created within the auxiliary head enclosure.

Communication is provided between the interior of the head enclosure 56 and the interior of the pressure-creating means by the telescoping pipes 75 and 80. The forward end of the pipe 75 is secured to the moveable end wall 11 and the rear end of the pipe 75 is secured to the foot end of the bed 12. The forward end of the pipe 80 slideably fits within the axial passage of the pipe 75 and the rear end of the pipe 80 passes through a perforation in the end wall 22 and is rigidly secured to said end wall.

The valve 81 is pivotally secured to the pipe 80 at 82 and is pivotally secured to the valve stem 83 which is slideably mounted in the axial passage of the sleeve 84 which passes through and is secured to the edges of a perforation in the end wall 22. The coil spring 85 has one end seated against the end of the sleeve 84 and the other end seated against the enlarged head 86 of the valve stem 83. The vertical bar 87 is secured to the end of the bed 12 and is so positioned that when the bed is slid completely into the casing 10 it engages the enlarged head 86 of the valve stem 83 and slides the valve stem from left to right looking at Fig. 2, thus causing the valve 81 to move in a clockwise direction about the pivot 82 and to close the end of the pipe 80 (as shown in Fig. 1). When the bed is slide outwardly of the casing the engagement between the bar 87 and the head 86 of the valve stem is released and the spring 85 causes the valve 81 to move in a counterclockwise direction about the pivot 82, thus opening communication between the interior of the pipe 80 and the pressure chamber formed by the end wall 22 and the diaphragm 23.

In operation the motor is run continuously while a patient is on the bed 12. The motor causes the diaphragm 23 to be reciprocated in accordance with the normal periods of inhalation and exhalation of the patient. When the end wall 11 is in the closed position shown in Fig. 1, alternate periods of negative and positive pressures are created within the casing 10. During each period of negative pressure the patient's lungs are expanded, causing air to enter the lungs through the patient's nose or mouth. During each period of positive pressure the patient's lungs are collapsed, causing the gases to pass out

from the patient's lungs through his nose and mouth. When the bed is slid outwardly of the casing by releasing the clamp 19 and pulling the moveable end wall 11 away from the end of the casing, the valve 37 is closed and the valve 81 is opened, thus opening communication between the means for creating pressure and the auxiliary head enclosure formed by the shell 56. The shell 56 is then moved to closed position and clamped in such position by the clamps 63. The diaphragm then creates alternate periods of positive pressure within the auxiliary head enclosure, forcing fresh air into the head enclosure during each positive pressure period.

While I have disclosed the extensible communication between the pressure-varying means and the auxiliary head enclosure as located within the casing 10, it is obvious that pipes similar to the pipes 75 and 80 may be located outside of the casing 10. Furthermore a single accordion wall type tube may be substituted for the pipes 75 and 80, one end of this tube being secured to the end wall 11 and the other end to the end wall 22, the tube being so constructed that it extends when the slideable bed unit is slid outwardly of the casing and it automatically retracts when the unit is slid inwardly of the casing, the retraction being accomplished by the accordion like pleats in the wall of the tube. A tube of such construction is the well known type of tube provided between the canister and the face piece of a standard United States army gas mask.

It is also obvious that a separate positive pressure-producing unit may be provided and that the extensible communication may lead from such unit to the auxiliary head enclosure and that such unit need not be located in the end of the casing.

While I have shown and described one desirable embodiment of the invention, it is to be understood that this disclosure is for the purpose of illustration and that various changes in shape, proportion and arrangement of parts and substitution of equivalent elements may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. In an apparatus for producing artificial respiration comprising a casing to receive the major portion of the body of the patient, a bed which is slideable into and out of said casing, a casing wall section attached to and forming with said bed a slideable unit, said wall section including an opening through which the head of the patient may be passed, means for forming a seal between said opening and the patient's neck, means to produce periodic variations in pressure within said casing and an auxiliary casing mounted on said slideable unit and moveable to a position in which it cooperates with said moveable wall section to form an enclosure for the patient's head, the improvement comprising means to periodically produce positive pressure, extensible means providing communication between said means for producing positive pressure and the interior of said head enclosure and a connection between said extensible means and said slideable unit whereby the sliding of the bed outwardly of the casing automatically extends said extensible means and the sliding of the bed into the casing automatically retracts said extensible means.

2. In an apparatus for producing artificial respiration comprising a casing to receive the major portion of the body of the patient, a bed which

is slideable into and out of said casing, a casing wall section attached to and forming with said bed a slideable unit, said wall section including an opening through which the head of the patient may be passed, means for forming a seal between said opening and the patient's neck, means to produce periodic variations in pressure within said casing and an auxiliary casing mounted on said slideable unit and moveable to a position in which it cooperates with said moveable wall section to form an enclosure for the patient's head, the improvement comprising means to periodically produce positive pressure, extensible means comprising a plurality of telescoping members providing communication between said means for producing positive pressure and the interior of said head enclosure, a connection between one of said telescoping members and said slideable unit whereby the sliding of the bed outwardly of the casing automatically extends said extensible means and the sliding of the bed into the casing automatically retracts said extensible means.

3. In an apparatus for producing artificial respiration comprising a casing to receive the major portion of the body of the patient, a bed which is slideable into and out of said casing, a casing wall section attached to and forming with said bed a slideable unit, said wall section including an opening through which the head of the patient may be passed, means for forming a seal between said opening and the patient's neck, means to produce periodic variations in pressure within said casing and an auxiliary casing mounted on said slideable unit and moveable to a position in which it cooperates with said moveable wall section to form an enclosure for the patient's head, the improvement comprising extensible means providing communication between means to periodically produce positive pressure and the interior of said head enclosure, said extensible means comprising a plurality of telescoping conduits extending longitudinally of the respirator substantially parallel to the bed, one of said conduits being secured to said slideable unit and communicating with the interior of said head enclosure, and another of said conduits communicating with said means for producing positive pressure, whereby the sliding of the bed outwardly of the casing automatically moves said former conduit longitudinally of the casing, a portion thereof sliding within the adjacent conduit, and the sliding of the bed into the casing automatically retracts said former conduit to its original position.

4. In an apparatus for producing artificial respiration comprising a casing to receive the major portion of the body of the patient, a bed which is slideable into and out of said casing, a casing wall section attached to and forming with said bed a slideable unit, said wall section including an opening through which the head of the patient may be passed, means for forming a seal between said opening and the patient's neck, means to produce periodic variations in pressure within said casing and an auxiliary casing mounted on said slideable unit and moveable to a position in which it cooperates with said moveable wall section to form an enclosure for the patient's head, the improvement comprising extensible means providing communication between means to periodically produce positive pressure and the interior of said head enclosure, said extensible means comprising a plurality of hollow telescoping conduits extending longitudi-

nally of the respirator within the casing and substantially parallel to the plane of sliding movement of the bed, one of said conduits being secured to said slideable unit and communicating with the interior of said head enclosure and another of said conduits communicating with said means for producing positive pressure.

5. In an apparatus for producing artificial respiration comprising a casing to receive the major portion of the body of the patient, a bed which is slideable into and out of said casing, a moveable casing wall section at one end of the casing, said wall section being attached to and forming with said bed a unit which is slideable longitudinally of the casing, said wall section including an opening through which the head of the patient may be passed, means for forming a seal between said opening and the patient's neck, a chamber in the end of the casing opposite to said moveable wall section, means for periodically creating positive and negative pressures in said chamber, means providing communication between said chamber and the interior of the casing and an auxiliary casing mounted on said slideable unit and moveable to a position in which it cooperates with said moveable wall section to form an enclosure for the patient's head, the improvement comprising a plurality of telescoping conduits extending longitudinally of the casing substantially parallel to the plane of sliding movement of the bed, one of said conduits being secured to said slideable unit and communicating with the interior of said head enclosure and another of said conduits being secured to a wall of said pressure chamber and communicating with the interior thereof.

6. In an apparatus for producing artificial respiration comprising a casing to receive the major portion of the body of the patient, a bed which is slideable into and out of said casing, a moveable casing wall section at one end of the casing, said wall section being attached to and forming with said bed a unit which is slideable longitudinally of the casing, said wall section including an opening through which the head of the patient may be passed, means for forming a seal between said opening and the patient's neck, a chamber in the end of the casing opposite to said moveable wall section, means for periodically creating positive and negative pressures in said chamber, means providing communication between said chamber and the interior of the casing and an auxiliary casing mounted on said slideable unit and moveable to a position in which it cooperates with said moveable wall section to form an enclosure for the patient's head, the improvement comprising an extensible conduit, one end of said conduit being secured to said slideable unit and communicating with the interior of said head enclosure and the other end of said conduit being secured to a wall of said pressure chamber and communicating with the interior thereof, a valve associated with said conduit and means associated with said slideable unit adapted to close said valve when said slideable unit is closed.

7. In an apparatus for producing artificial respiration comprising a casing to receive the major portion of the body of the patient, a bed which is slideable into and out of said casing, a moveable casing wall section at one end of the casing, said wall section being attached to and forming with said bed a unit which is slideable longitudinally of the casing, said wall section including an opening through which the head of

the patient may be passed, means for forming a seal between said opening and the patient's neck, a chamber in the end of the casing opposite to said moveable wall section, means for periodically creating positive and negative pressures in said chamber, means providing communication between said chamber and the interior of the casing and an auxiliary casing mounted on said slideable unit and moveable to a position in which it cooperates with said moveable wall section to form an enclosure for the patient's head, the improvement comprising an extensible conduit, one end of said conduit being secured to said slideable unit and communicating with the interior of said head enclosure and the other end of said conduit being secured to a wall of said pressure chamber and communicating with the interior thereof, a valve associated with said conduit, means associated with said slideable unit adapted to close said valve when said slideable unit is closed, a valve associated with said means providing communication between said pressure chamber and the interior of the casing and means associated with said slideable unit adapted to open said latter valve when said slideable unit is closed.

8. In an apparatus for producing artificial respiration comprising a casing to receive the major portion of the body of the patient, a bed which is slideable into and out of said casing, a casing wall section attached to and forming with said bed a slideable unit, said wall section including an opening through which the head of the patient may be passed, means for forming a seal between said opening and the patient's neck, means to produce periodic variations in pressure within said casing and an auxiliary casing mounted on said slideable unit and moveable to a position in which it cooperates with said moveable wall section to form an enclosure for the patient's head, the improvement comprising means to periodically produce positive pressure, extensible means providing communication between said means for producing positive pressure and the interior of said head enclosure, a connection between said extensible means and said slideable unit, a valve moveable to positions in which it opens and closes the communication between said means for producing positive pressure and said head enclosure, and means associated with said valve and said slideable unit whereby upon sliding of the bed outwardly of the casing said extensible means is automatically extended and said valve is automatically moved to a position wherein communication between the means for producing positive pressure and the head enclosure is opened and upon sliding the bed into the casing said extensible means is automatically retracted and said valve is automatically moved to a position wherein said communication is closed.

9. In an apparatus for producing artificial respiration comprising a casing to receive the major portion of the body of the patient, a bed which is slideable into and out of said casing, a casing wall section attached to and forming with said bed a slideable unit, said wall section including an opening through which the head of the patient may be passed, means for forming a seal between said opening and the patient's neck, means to periodically produce variations in pressure, means affording communication between said means for producing pressure and the interior of said casing and an auxiliary casing mounted on said slideable unit and moveable to a position in which it cooperates with said moveable wall section to form an enclosure for the pa-

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tient's head, the improvement comprising means providing communication between said means for producing pressure and the interior of said head enclosure, a valve moveable to positions in which it opens and closes said communication between said means for producing pressure and the interior of the casing and means associated with said valve and said slideable unit whereby upon sliding the bed outwardly of the casing the valve is automatically moved to a position wherein communication between the interior of the casing and the pressure-producing means is closed, and upon sliding the bed into the casing said valve is automatically moved to a position wherein said communication is opened.

10. In an apparatus for producing artificial respiration comprising a casing to receive the major portion of the body of a patient, a bed which is slideable into and out of said casing, a casing wall section attached to and forming with said bed a slideable unit, said wall section including an opening through which the head of the patient may be passed, means for forming a seal between said opening and the patient's neck, means to periodically produce positive and negative pressures, means affording communication between said means for producing pressure and interior of said casing, and an auxiliary casing mounted on said slideable unit and moveable to a position in which it cooperates with said moveable wall section to form an enclosure for the patient's head, the improvement comprising extensible means providing communication between said means for producing pressure and the interior of said head enclosure, a valve moveable to positions in which it opens and closes the communication between said means for producing pressure and said head enclosure, means on said slideable unit engageable with said valve, a second valve moveable to positions in which it opens and closes said communication between said means for producing pressure and interior of the casing, and said slideable unit engageable with said second valve, whereby the sliding of said bed outwardly of the casing automatically extends said extensible means, opens said communication between the means for producing pressure and the head enclosure and closes said communication between the interior of the casing and said means for producing pressure, and the sliding of the bed into the casing automatically retracts said extensible means, closes said communication between said means for producing pressure and said head enclosure and opens said communication between the interior of the casing and said means for producing pressure.

11. In an apparatus for producing artificial respiration comprising a casing to receive the major portion of the body of a patient, a bed which is slideable into and out of said casing, a

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casing wall section attached to and forming a slideable unit with said bed, said wall section including an opening through which the head of the patient may be passed, means for forming a seal between said opening and the patient's neck, means to periodically produce variations in pressure within said casing, and an auxiliary casing mounted on said slideable unit and moveable to a position in which it cooperates with said moveable wall section to form an enclosure for the patient's head, the improvement comprising a stop member attached to the casing and a stop member attached to the auxiliary casing, said stop members being constructed and arranged by engagement with each other to prevent the closing of said auxiliary casing when said moveable wall section is in closed position.

12. In an apparatus for producing artificial respiration comprising a casing to receive the major portion of the body of the patient, a bed which is slidable into and out of said casing, a casing wall section attached to and forming with said bed a slidable unit, said wall section including an opening through which the head of the patient may be passed, means for forming a seal between said opening and the patient's neck, means to produce periodic variations in pressure within said casing and an auxiliary casing mounted on said slidable unit and movable to a position in which it cooperates with said movable wall section to form an enclosure for the patient's head, the improvement comprising means to periodically produce positive pressure, extensible means providing communication between said means for producing positive pressure and the interior of said head enclosure, a connection between said extensible means and said slidable unit whereby the sliding of the bed outwardly of the casing automatically extends said extensible means and the sliding of the bed into the casing automatically retracts said extensible means and a connection between said extensible means and the stationary portion of said main respirator casing, said connections and said slidable unit and main respirator casing being constructed and arranged to support said extensible means at all times above the floor of the room wherein the apparatus is in use.

JOHN H. EMERSON.

REFERENCES CITED

The following references are of record in the file of this patent:

Article appearing in "Science," Dec. 24, 1943, entitled "The Return of the Pulmotor as a 'Resuscitator': a Backstep toward the Death of Thousands," by Professor Yandell Henderson of Yale University. (Copy in Div. 55.)

Certificate of Correction

Patent No. 2,427,665.

September 23, 1947.

JOHN H. EMERSON

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Column 6, line 6, after the word "about" strike out "its"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 11th day of November, A. D. 1947.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.