

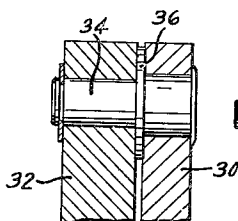
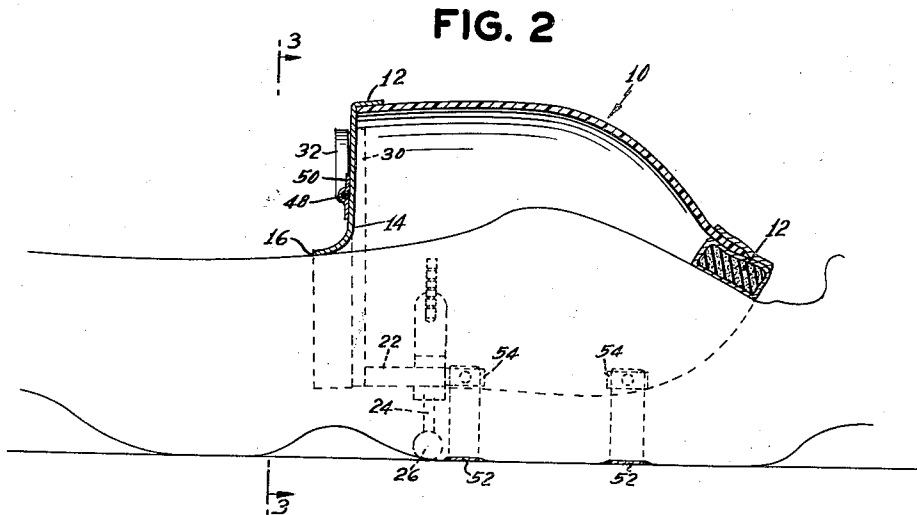
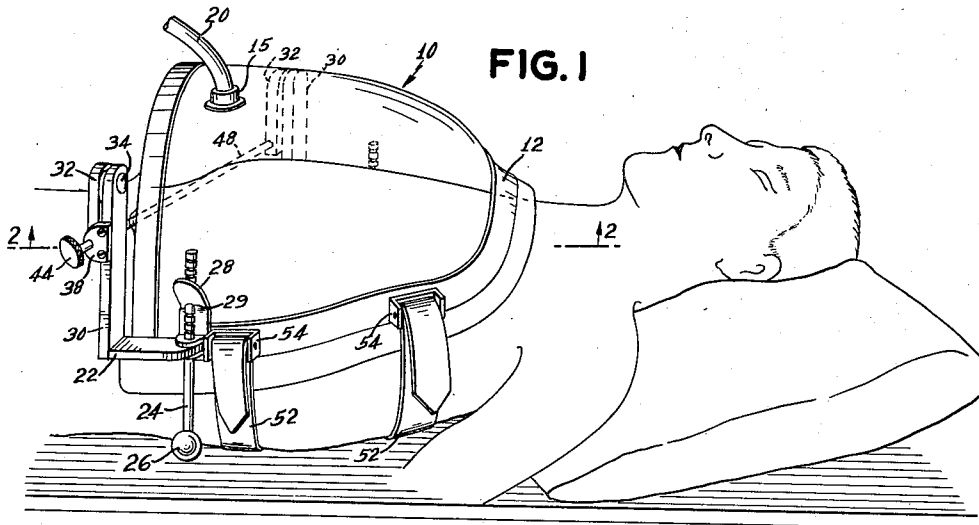
Aug. 21, 1956

N. G. KLING
ARTIFICIAL RESPIRATOR

2,759,474

Filed June 1, 1954

2 Sheets-Sheet 1



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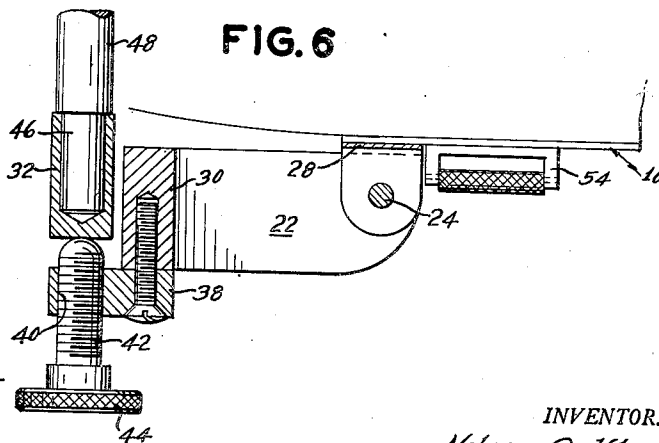
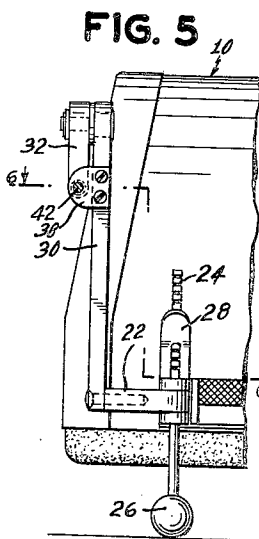
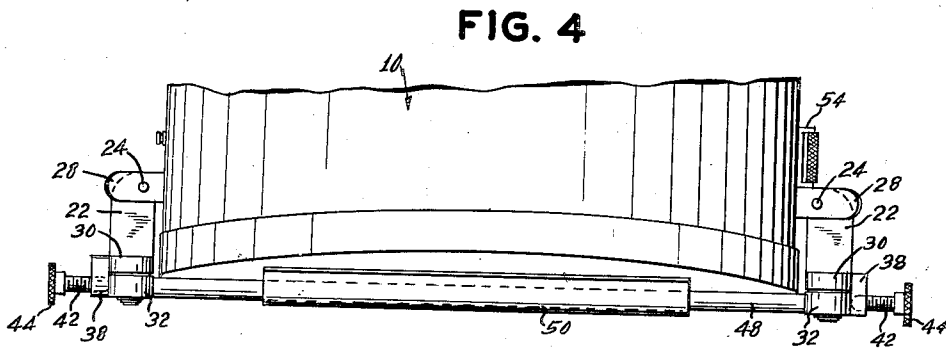
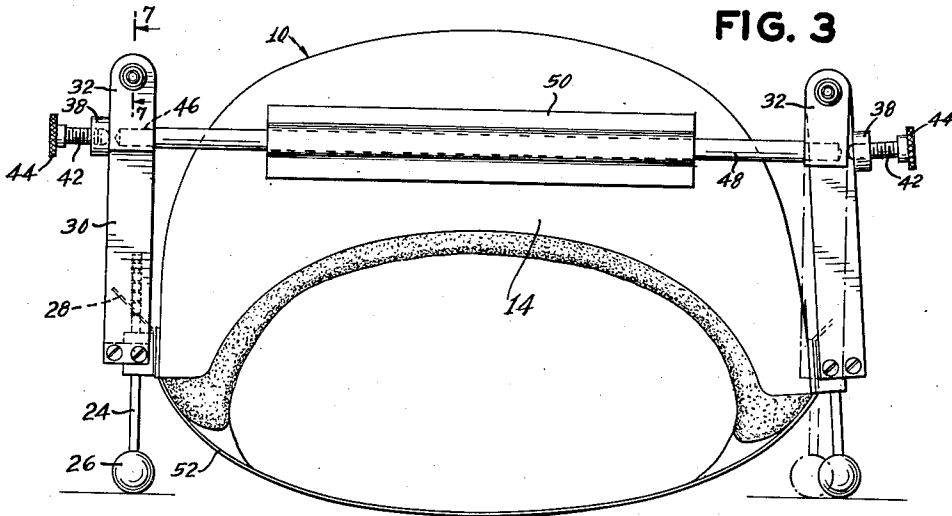
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N. G. KLING
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2 Sheets-Sheet 2



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2,759,474

ARTIFICIAL RESPIRATOR

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Application June 1, 1954, Serial No. 433,401

13 Claims. (Cl. 128—30)

My invention relates to new and useful improvements in artificial respirators.

Respirators have been known which employ a shell-like casing or cuirass adapted to fit over a patient's chest and/or abdomen. It will be understood that when the cuirass is properly positioned and fitted to the body, the pressure therewithin may be varied so as to assist or induce breathing. Such an artificial respirator is shown and described in U. S. Patent application, Serial No. 294,163, filed on June 18, 1952 by Thomas C. Huxley III and assigned to the assignee hereof.

One object of my invention is the provision of new and improved means for adjusting the width of the casing or cuirass in order that it may be properly fitted to the patient's body.

Another object of my invention is to provide means for facilitating the adjustment of the width of the cuirass and to enable fine adjustments to be made if desired.

Another object is the provision of means to prevent or minimize movement of the front flexible wall of a cuirass of the type having such wall, as shown for example in U. S. Patent No. 2,466,108 which is owned by the assignee of my present application.

A further object is to utilize at least part of the width adjusting means for minimizing or preventing movement of the front flexible wall of the cuirass.

A yet further object is generally to provide a cuirass with conveniently operable means to enable the width of the cuirass to be quickly and easily adjusted so that a cuirass of one size may be fitted to any one of a number of patients of different body shapes and sizes.

Other objects of my invention will become clear hereinafter as the characteristic features of construction and mode of operation of my invention are described in detail.

In the accompanying drawings:

Fig. 1 is a perspective view of a respirator of the type described as actually used on a patient;

Fig. 2 is a sectional view taken along the line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary top plan view of the means for adjusting the width of the casing or cuirass;

Fig. 5 is a fragmentary side elevational view of the means for adjusting the casing or cuirass;

Fig. 6 is a sectional view taken along the line 6—6 of Fig. 5; and

Fig. 7 is a sectional view taken along the line 7—7 of Fig. 3.

Referring now to the drawings in detail, a shell shaped casing or cuirass 10 constructed of a lightweight, semi-rigid material which is sufficiently rigid to resist deformation under moderate suction, such as Plexiglas, is adapted to fit over a front portion of the body of a patient such as the chest and to rest thereupon to enclose the patient's chest. The casing is provided with a sealing means made of a soft, yielding, air impervious material such as a strip of foam rubber 12 which extends around the lower edge

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of the casing and fits against patient's body. A flexible wall 14 is connected to the end of the cuirass adjacent the patient's lower abdomen and is adapted to make a close fitting connection with the lower portion of the patient's abdomen as at 16. The casing or cuirass is provided with an opening 15 which is adapted to receive a tube 20. The tube 20 is connected to means for varying the pressure within the sealed casing. This pressure varying means forms no part of my present invention and accordingly is not shown.

Attached to each side of the casing 10 adjacent the flexible wall 14 is a support 22 and extending therethrough a shaft 24. Connected to the lower portion of the shaft 24 is a spherical member 26. Also connected to the support is a spring 28 which extends upward in a plane parallel to the major axis of the shaft 24 and then is bent so as to intersect the shaft. At the point of intersection spring 28 is provided with an aperture 29 which receives the shaft 24 and the spring is so biased that it normally holds the shaft in any desired position by friction. With the shaft 24 so held, member 26 will bear upon the patient's bed. A similar arrangement is provided on each side of the cuirass and yields a simple means for relieving the patient of the weight of the cuirass while a proper fit is still maintained between the casing 10 and the body of the patient.

As thus far described in detail, the cuirass is essentially the same in construction as the cuirass described in the above-mentioned application of Thomas C. Huxley III. My improvement resides in means for adjusting the width of the cuirass so that a proper fit may be made between the sealing means 12 and the patient's body. In accomplishing this purpose, I provide a pair of pivot spreaders 30 each of which is connected at one end to one of the supports 22. At the other end thereof each of the pivot spreaders 30 is pivotally connected to a pivot support bar 32 by means of a pivot pin 34. Disposed between each of the pivot spreaders 30 and the pivot support bars 32 is a spacer or washer 36 which facilitates the pivoting of pivot spreaders 30 with respect to support bars 32. A flange 38 is rigidly connected to each of the pivot spreaders 30 and extends toward and overlaps the support bars 32. The flanges are each provided with a threaded aperture 40. Threadably mounted in each threaded aperture 40 of the flanges 38 is an adjusting screw 42 having an enlarged end portion 44 preferably with a serrated edge which facilitates the turning of the screw. Slidably mounted in recesses 46 in the pivot support bars 32 is a spreader bar 48 which extends substantially the width of the flexible wall 14. The spreader bar 48 is normally in substantial alignment with screws 42. Wall 14 is provided with a slot 50 through which the spreader bar 48 passes for reasons which will be made clear presently. Connected to one side of casing 12 are belts 52 which are adapted to fit around the back of the patient and be connected to buckles or securing means 54 connected to the casing on the opposite side.

With such an arrangement it will be clear that when it is desired to widen the casing 10 belts 52 can be loosened and one or both of the adjusting screws 42 may be turned so as to bear against and move longitudinally toward its associated pivot support bar 32. The support bar, however, will be unable to move since it is held in position by the spreader bar 48 and its opposite support bar and adjusting screw. Accordingly, the pivot spreader 30 will rotate on its associated pivot pin 34 away from the patient's body as is best shown in Fig. 3, and accordingly widen the casing. If the width of the casing is too great for the patient's body, belts 52 may be tightened and secured to buckles 54 to narrow the casing. Flexible wall 14 is made of thin sheet rubber which is sufficiently

stretchable and elastic to allow lateral adjustment of the cuirass without impairing the function of said wall. It will be seen therefore that a simple but exact adjustment of the width of the casing or cuirass may be achieved with my novel arrangement.

Furthermore when the casing is properly adjusted as to the width and is fitted against the patient's body and the pressure varying means is being operated, with spreader bar 48 connected to the flexible wall 14 by means of slot 50, the flexible wall will be prevented from flapping in and out excessively to annoy the patient. Accordingly my novel arrangement in addition to providing a fine adjustment of the width of the casing or cuirass also enhances the comfort of the patient by reducing the flapping of flexible wall 14 to thereby quiet the operation of the entire apparatus.

It will be obvious to those skilled in the art that although I have shown and described my novel width adjusting means for artificial respirator in connection with a respirator which is adapted to fit over only the chest of a patient, my adjusting means is also suitable for use with respirators employing cuirasses which extend over the lower abdomen or both the chest and the lower abdomen of the patient as well.

Having thus described my invention, it will become obvious to those skilled in the art that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim and desire to secure by letters patent is:

1. In a respirator of the type having a casing adapted to fit over a portion of the body of a patient, means for adjusting the width of said casing comprising fixed support means, a pivot spreader attached at one end to said casing and pivotally mounted on said support means at the other end, and an adjusting screw threadably associated with said pivot spreader and adapted to bear against said support means, whereby when said screw is bearing against said support means and is turned so as to move longitudinally toward said support means, said pivot spreader will rotate so as to change the width of said casing.

2. In a respirator of the type having a casing adapted to fit over a portion of the body of a patient, means for adjusting the width of said casing comprising support means, a pivot spreader attached at one end to a side of said casing adjacent the bottom thereof and pivotally mounted at its other end on said support means, a spreader bar extending the width of said casing and mounted at one end in said support means for positioning and an adjusting screw threadably mounted on means associated with said pivot spreader and adapted to bear against said support means, whereby when said screw is bearing against said support means and is turned so as to move longitudinally toward said support means, the latter will be maintained in fixed relative position by said spreader bar and said pivot spreader will rotate so as to change the width of said casing.

3. In a respirator of the type having a shell like semi-rigid casing provided with a flexible wall and adapted to fit over a portion of the body of a patient, means for adjusting the width of said casing comprising a pair of support means, one on each side of said casing; a pair of pivot spreaders, one for each support means, each pivotally mounted at one end on its associated support means and attached at its other end to the adjacent side of said casing adjacent said flexible wall; a spreader bar extending substantially the width of said casing and being mounted at each end in said support means, and a pair of adjusting screws, one for each pivot spreader, each threadably connected to its associated pivot spreader and adapted to bear against its associated support means, whereby when one of said adjusting screws is bearing against its associated support means and is turned so as

to move longitudinally toward said support means, the associated pivot spreader will rotate so as to widen said casing.

4. A respirator comprising a shell-like semi-rigid casing provided with means adapted to seal said casing to the upper abdomen of a patient, said casing being further provided with a flexible wall sealed to the lower or abdominal edge of said casing and adapted to make a sealed connection with the patient's abdomen, said casing being adapted to be connected to means for rhythmically varying the pressure within said casing when said casing is fitted to the patient's abdomen, and means for adjusting the width of said casing for fitting said casing to the patient comprising a pair of support bars, one on each side of said casing, and disposed substantially in the plane of said resilient wall bar, a pair of pivot spreaders one associated with each support, each of said spreaders being attached at one end to the bottom of a side of said casing adjacent said flexible wall and being pivotally mounted at its other end on its associated support bar, a spreader bar extending between said support bars and being mounted thereon and being connected to said flexible wall for reducing the flapping thereof when the pressure in said casing is varied, a pair of adjusting screws, one for each pivot spreader, each being threadably connected to its associated pivot spreader and adapted to bear against the associated support bar, whereby when said adjusting screws are bearing against said support bars and are turned so as to move longitudinally toward said support bars, said pivot spreaders will rotate so as to widen said casing.

5. In a respirator having a semi-rigid casing adapted to fit over a portion of the body of a patient and provided with a flexible wall at the lower end of said casing, a spreader bar extending the width of said casing along said flexible wall and being connected thereto for reducing the flapping of said wall, and means associated with said spreader bar for adjusting the width of said casing.

6. In a respirator having a semi-rigid casing adapted to fit over and seal against a portion of the body of a patient and provided with a flexible wall, said casing being adapted to be connected to means for varying the pressure in said casing when said casing is sealed against the abdomen of the patient, and a rigid member extending across said flexible wall and connected thereto for reducing the flapping of said wall when the pressure is varied.

7. In a respirator having a semi-rigid casing adapted to fit over and seal against the upper abdomen of a patient and provided with a flexible wall, said flexible wall having provided therein a slot extending the width of said wall, said casing being adapted to be connected to means for varying the pressure within said casing when said casing is sealed against the abdomen of the patient, and a rigid member disposed within said slot and secured at both ends for reducing the flapping of said flexible wall when the pressure is varied.

8. In a respirator of the type having a shell like semi-rigid casing provided with a flexible wall and adapted to fit over a portion of the body of a patient, means for adjusting the width of said casing comprising a pair of support bars, one on each side of said casing; a pair of pivot spreaders, one for each support bar, each pivotally mounted at one end on its associated support bar and attached at its other end to the adjacent side of said casing adjacent said flexible wall, a spreader bar extending substantially the width of said casing and being mounted at each end in said support bars and a pair of adjusting screws, one for each pivot spreader each threadably associated with its associated pivot spreader and adapted to bear against its associated support bar, whereby when one of said adjusting screws is bearing against its associated support bar and is turned so as to move longitudinally toward said support bar, the associated

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pivot spreader will rotate so as to widen said casing, a belt secured to said casing on one side and adapted to pass around the patient, securing means secured to said casing on the other side and adapted to engage and hold said belt whereby when said belt is tightened, the width of said casing will be decreased.

9. In combination with a cuirass type respirator, means for adjusting the width of the cuirass comprising a fixed pivot support bar, a pivot spreader secured at one end to a side of the cuirass and pivotally mounted at the other end on said fixed pivot support bar, an adjusting screw threadably connected to said pivot spreader and adapted to bear against said support bar, a belt secured to one side of said cuirass and adapted to fit around a patient, a buckle adapted to hold said belt and secured to the opposite side of said cuirass, whereby when said screw is turned so as to bear against and move longitudinally toward said support bar, said pivot spreader will rotate away from said support bar to widen said cuirass, and when said belt is tightened, the width of said cuirass is reduced.

10. In combination, a semi-rigid shell like casing adapted to be connected to means for varying the pressure therein, said casing having sealing means around its edges for making a close fitted connection with a frontal portion of the body of a patient, a flexible wall having a slot therein and sealedly connected to said casing and adapted to be fitted at its lower edge to the body of the patient, a pair of pivot spreaders at opposite sides of said casing, a pair of pivot support bars, one for each pivot spreader, each pivot spreader being connected at one end to the adjacent side of the casing and being pivotally connected at its other end to its associated pivot support bar, a spreader bar slidably mounted in each pivot support bar and passing through said slot in said flexible wall, a pair of flanges, one for each pivot spreader, each of said flanges being secured to its associated pivot spreader and overlapping its associated pivot support bar, each flange being provided with a threaded aperture which is substantially aligned with said spreader bar, a pair of adjusting screws, one for each threaded aperture, each adjusting screw being threadably mounted in its associated threaded aperture and adapted to bear against said associated pivot support bar at a point in substantial alignment with said spreader bar, a belt secured to one side of said casing, and a buckle secured to the opposite side for holding said belt.

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11. In a respirator having a semi-rigid casing adapted to fit over and seal against a portion of the body of a patient and provided with a flexible wall, said casing being adapted to be connected to means for varying the pressure in said casing when said casing is sealed against the abdomen of the patient, and means for minimizing movement of said flexible wall in response to variations of pressure within said casing comprising stiffening means extending transversely of said wall above the lower edge of the latter whereby the lower edge portion of said wall is free to conform flexibly to the underlying part of the patient's body.

12. In a respirator having a semi-rigid casing adapted to fit over and seal against a portion of the body of a patient and provided with a flexible wall, said casing being adapted to be connected to means for varying the pressure in said casing when said casing is sealed against the abdomen of the patient, said casing being open at its bottom for communication of the interior of the casing with the underlying portion of the patient's body, and means including individually adjustable devices at the opposite sides of the casing operatively connected to the opposite sides, respectively, of said casing near said bottom for adjusting the width of the lower portion of the casing.

13. Apparatus for producing artificial respiration, comprising a casing adapted to fit over and enclose at least the frontal portion of the patient's abdominal region, means for sealing the marginal edges of said casing to the patient's frontal portion, and means at the lower end of said casing to adjust the width thereof to the patient, said last mentioned means comprising a spreader bar extending transversely of said casing for substantially the width thereof, and screw operated means carried by said casing and operatively connected to said spreader bar for relative pivotal movement for adjusting the width of said casing relative to said spreader bar.

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