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MECHANICAL BREATHING APPARATUS

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FIG. 1.

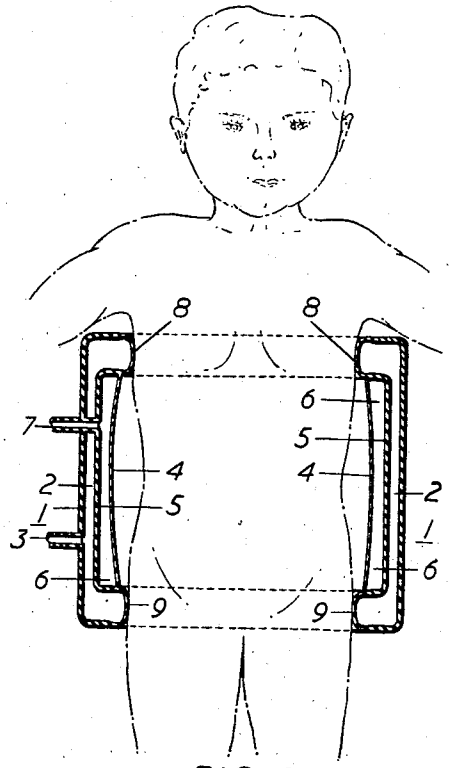
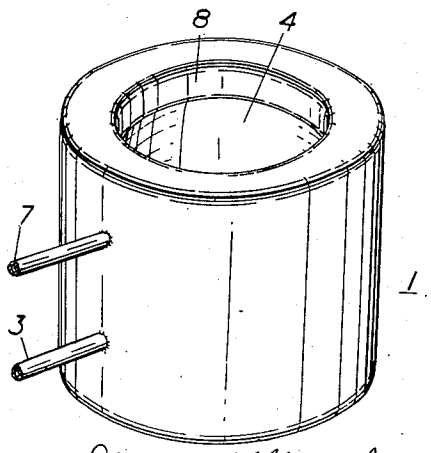


FIG. 2.



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MECHANICAL BREATHING APPARATUS

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3 Claims. (Cl. 128—30)

This invention relates to mechanical breathing apparatus.

The main object of this invention is to provide a breathing apparatus which can be quickly applied to a patient and will present only soft yielding surfaces to the body of the patient.

A further object of the invention is to provide a breathing apparatus which shall be especially useful for application to infants.

According to this invention a breathing apparatus comprises an outer member which can be passed over or about the patient and which is formed so that it can be inflated to make an air-tight closure with the patient at zones about a diaphragm carried by the member and arranged at least to register with the thorax and/or with the abdomen of a patient, the diaphragm leaving between itself and the outer member a chamber to be connected to a pulsating air supply.

The outer member can be formed with local inflation chambers carried at the ends of the outer member so that they can be inflated to make local engagement with the patient about the diaphragm. Alternatively the outer member can be hollow to provide a single inflation chamber, the member having end parts to make the local engagement.

The latter construction is shown in the accompanying drawing in which Figure 1 is a sectional view taken through the apparatus and showing it in position on a patient, and Figure 2 is a perspective view of the apparatus detached.

Referring to the drawing, 1 indicates a hollow inflatable outer reaction sleeve formed of rubber or rubber-like material and providing an air chamber 2 having a connector 3 by which the sleeve can be inflated.

Within the sleeve is a diaphragm sleeve 4 of rubber or rubber-like material: this diaphragm provides between itself and the inner wall 5 of the inflatable outer sleeve 1 a chamber 6 having a connector 7 for connection to a pulsating air supply.

When the sleeve 1 with its diaphragm 4 has been passed over the body, the hollow outer sleeve 1 can be inflated so as to bear lightly at its ends against the skin of the patient and so to form an air seal about the body of the patient: by establishing a pulsating air supply to the chamber 6, the diaphragm 4 is caused to flex backwards and forwards, that is inwardly and outwardly by air reaction against the surface of the sleeve 1 remote from the patient, and to react against the chest wall of the patient and/or the abdomen to promote or maintain inhalation and exhalation of air to and from the lungs.

It is preferred as is shown to hold the diaphragm 4 clear of the skin of the patient and to cause the air, trapped between the face of the diaphragm 4 and the skin, to cause the movement of the diaphragm to be set up on the chest wall of the patient. For this purpose, the ends of the sleeve 1 can be formed with inwardly directed hollow end parts, as shown bulges or flanges 8, 9 to bear, when the sleeve 1 is inflated, against

the skin of the patient, the diaphragm 4 being set within the level of the outer ends of the bulges. As shown in Figure 1, the hollow end parts 8, 9 contact the body of the patient at spaced boundaries of the body region to be acted upon. The sleeve 1 is of channel shape in cross section, the channel hollow flanges providing the inflatable end parts 8, 9, and the channel web spanning the patient's body region to be acted upon and being spaced outwardly from the patient's body contacting portions of the end parts 8, 9.

It will now be obvious that the sleeve 1 need not be hollow but could be constituted by a single thickness wall having at its ends hollow bulges equivalent to the bulges 8, 9 which alone need be inflated to provide the closures, about the diaphragm 4, with the skin of the patient.

The diaphragm 4 may be arranged so as to "cover" or register with only the area of the chest and/or abdominal wall of the patient: it could however be arranged as is shown in the drawing to extend completely around the patient, i. e. to "cover" not only the chest and/or the abdominal wall but also the back of the patient.

In order to provide the requisite reaction by the outer hollow sleeve 1, this sleeve can be formed of a tougher or less resilient rubber than the diaphragm 4: in such a case, the bulges 8, 9 can be formed of a softer rubber especially at the parts where they touch the skin of the patient.

It will be clear that the apparatus can be quickly fitted in position on a patient and the requisite mechanical breathing action quickly initiated: the application pressure would be low and yielding and the apparatus is readily carried and easily maintained in a clean condition.

While the apparatus is capable of general use, it is particularly well adapted to initiate or maintain the inhaling and exhaling action of the lungs of prematurely and stillborn infants. In such cases very small quantities of air have to be inhaled and exhaled to and from the lungs and at a relatively high frequency. This can easily be arranged with the apparatus of this invention by providing an air pump of small capacity to supply the pulsating air to the diaphragm chamber 6, the outer hollow sleeve 1 or the chambers being inflated as by a small hand bulb or pump. The outer sleeve can very quickly be placed about the infant and the operation can be started without delay. Such an infant is, of course, extremely fragile but the soft nature of the embracing sleeve avoids the possibility of injury.

The apparatus in this particular use enables such a condition of birth to be dealt with with a greater chance of success than is obtained at the present time by the common expedient of human breathing or blowing of air into the mouth of the infant or by using a pulsating air supply (similarly introduced) from what is known as the "positive breathing" apparatus: in the former case the lungs of the infant become charged with impure air for obvious reasons which, in the case of the use of positive breathing apparatus, follow from the fact that, relative to the capacity of the pulsating air supply line by which air is supplied to the infant, the air capacity of the lungs of the infant is very small and the same air used and re-used which may well cause fatal results.

Although the present invention has been described in conjunction with preferred embodiments, it is to be understood that modifications and variations may be resorted to without departing from the spirit and scope of the invention, as those skilled in the art will readily understand. Such modifications and variations are considered to be within the purview and scope of the invention and appended claims.

I claim:

1. Breathing apparatus comprising an outer reaction sleeve shaped to pass over the body of the patient and having spaced inwardly directed hollow end parts which are inflatable to contact the body of the patient at spaced boundaries of the patient's body region to be acted upon; a diaphragm sleeve extending between said end parts and supported by the inflation thereof clear of the patient's body, whereby to provide an entrapped air cushion between said reaction sleeve end parts, said diaphragm sleeve and the patient's said body region; means to inflate said end parts to contact the body of the patient at said spaced boundaries; and means to apply a pulsating air-pressure to the surface of the diaphragm sleeve remote from the body of the patient whereby the diaphragm sleeve is caused to move inwardly and outwardly to apply a breathing action on the patient via the air trapped between the diaphragm sleeve, said end parts and the patient's said body region.

2. A construction as defined in claim 1 in which said reaction sleeve, in cross section, is of channel shape, the channel flanges being hollow and providing said inwardly directed reaction sleeve end parts, and the channel web spanning the patient's body region to be acted upon and being spaced outwardly from the patient's body contacting portions of said end parts.

3. Breathing apparatus comprising a hollow inflatable outer reaction sleeve shaped to pass over the body of the patient and having spaced inwardly directed hollow inflatable end parts which are formed by inflation of said reaction sleeve to contact the body of the patient at spaced boundaries of the patient's body region to be acted upon; a diaphragm sleeve within the reaction sleeve and extending between said end parts and held thereby clear of the patient's body, said diaphragm sleeve defining a chamber between itself and said reaction sleeve and providing an entrapped air cushion between said reaction sleeve end parts, said diaphragm sleeve and the patient's said body region; means to inflate said reaction sleeve to cause said end parts to contact the patient's body; and means to apply a pulsating air pressure to said chamber whereby said diaphragm sleeve is caused to move inwardly and outwardly to apply a breathing action on the patient via the air trapped between the diaphragm sleeve, said end parts and the patient's said body region.

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