

[54] **RESPIRATORY MASK**

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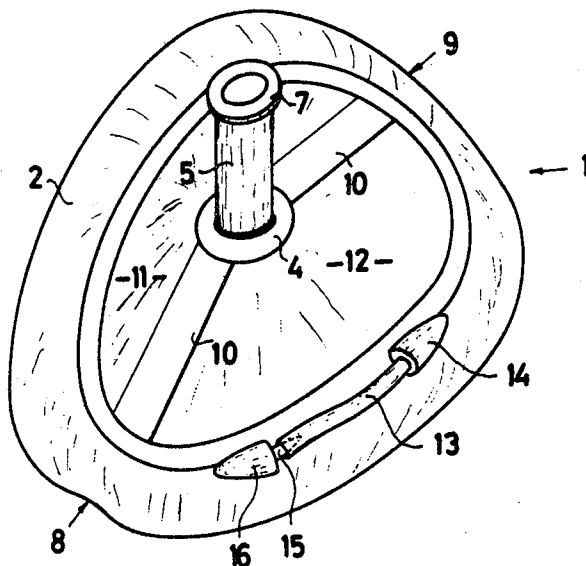
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[57]

ABSTRACT

A respiration mask formed with a domed-shaped portion of flexible material provided at its peripheral edge with a supple ridge which can be inflated as desired, which in the deflated state allows the mask readily to assume a flat shape, and in the inflated state keeps the mask stretched open.

8 Claims, 9 Drawing Figures



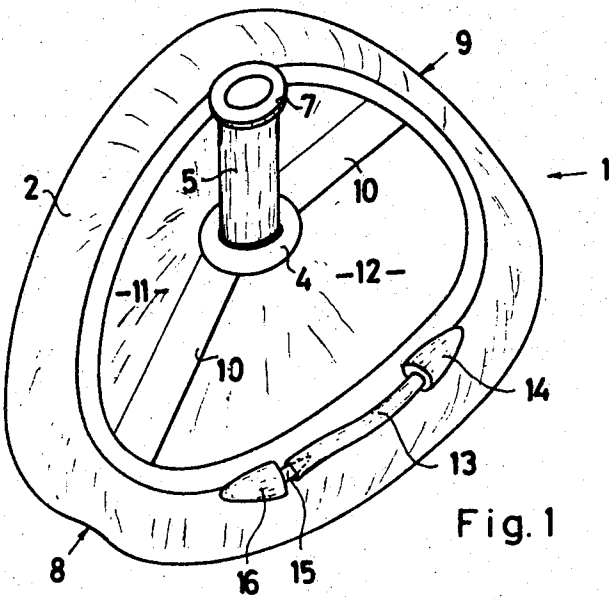


Fig. 1

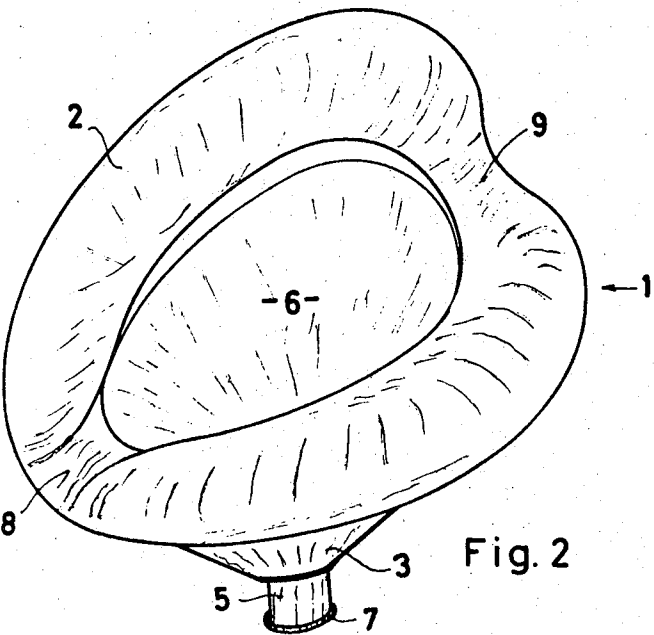


Fig. 2

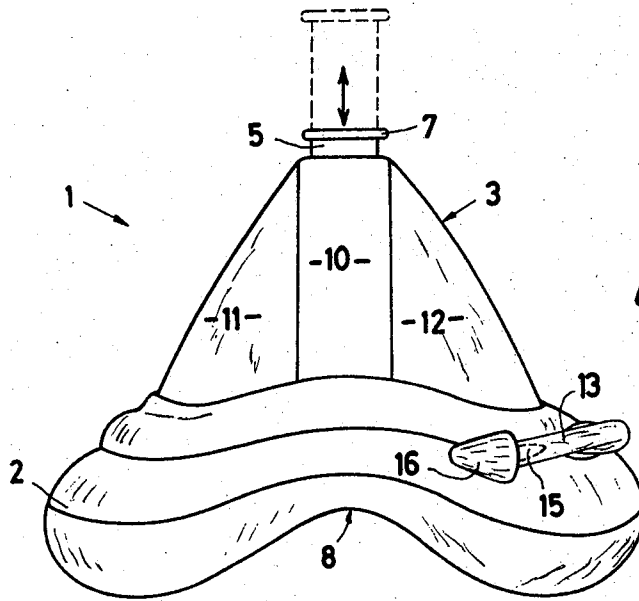


Fig. 3

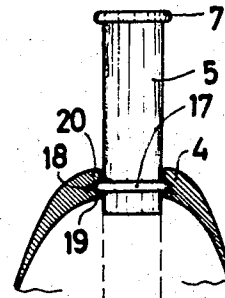


Fig. 4

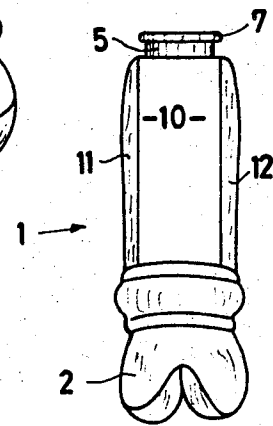


Fig. 6

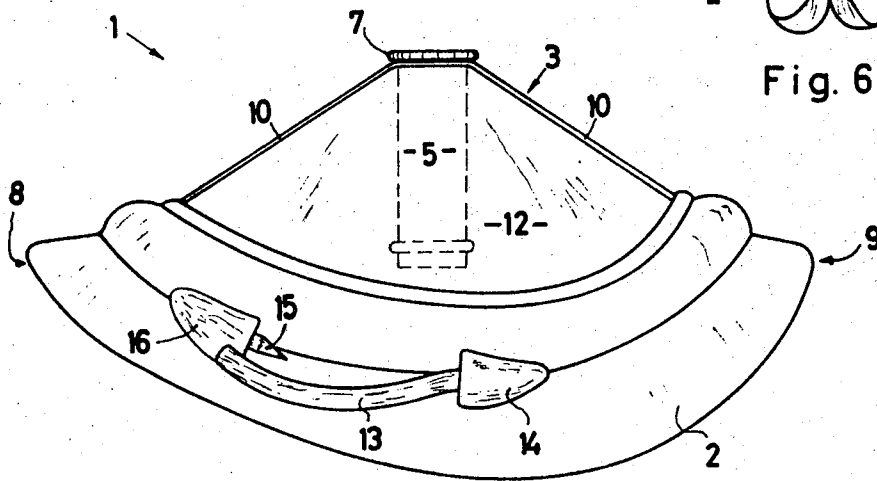


Fig. 5

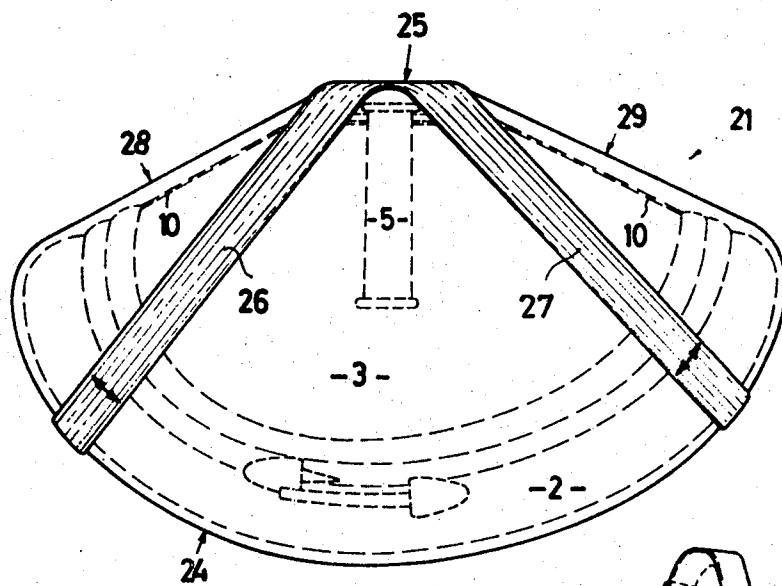


Fig. 7

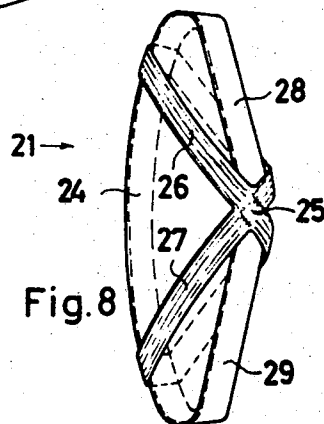


Fig. 8

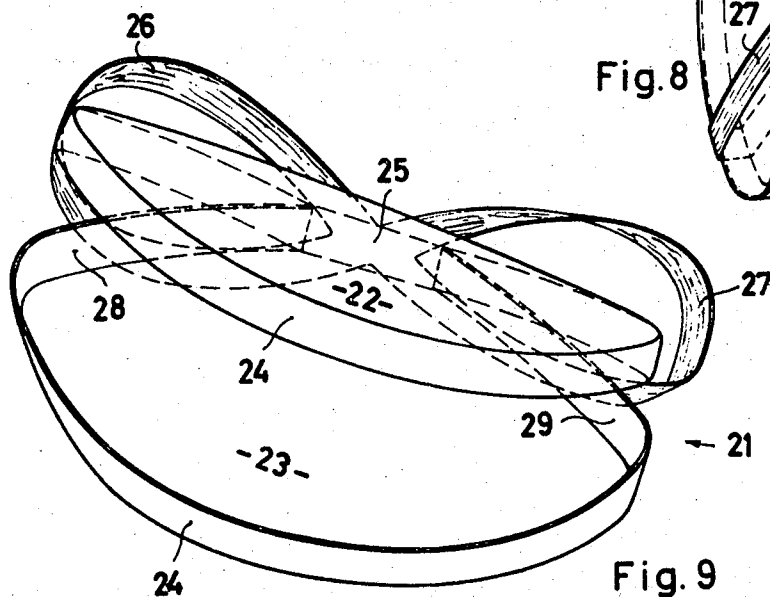


Fig. 9

RESPIRATORY MASK

The invention relates to a respiration mask.

Respiration masks are used for the artificial respiration of patients, especially in first aid emergencies. They can be connected to mechanical sources of air or oxygen, but are also used for so called mouth-to-mouth respiration, the intention being to improve the respiration and make it more hygienic.

A first known type of mask for artificial respiration is made of flexible elastic material, which assumes a flat shape in a folded state, so that they can, for example, be carried more conveniently in a pocket of a jacket. In use, these masks are then folded open and placed around the mouth and nose area of the patient who is to receive respiration. Whilst such masks have the advantage of readily being carryable on one's person, they can only be kept spread over the mouth and nose area of the patient under continuous pressure from the hand holding them, because they tend to contract elastically to the flat shape. Thus they frequently require considerable contact pressures to ensure tight contact, along the whole circumference, to suit the particular shape of face, and these pressures can lead to painful compression areas.

A second type of mask is known in which the shape is beforehand suited to the mouth and nose area. These can be handled more gently, and the person providing first aid can let go of the mask for periods of time — without it slipping out of its position and away from the face of the patient — during which intervals, between respirations, heart massage may be carried out. The heart massage can thus advantageously be carried out with both hands, and the change between massage and respiration can take place rapidly. Such a procedure can only with great difficulty be carried out by one person alone when using masks of the first type. The rigid dome-shaped masks of the second type are difficult to pack when not in use, and because of their bulkiness are more subject to the danger of damage.

According to the invention there is provided a respiratory mask comprising a foldable dome-shaped portion having, around its peripheral edge, an inflatable and deflatable ridge formed of flexible material, and an axially slidable blowing-in tube mounted in an annular guide carried by said dome-shaped portion, so as to be movable from a first position in which it extends mainly within the dome-shaped portion to a second position in which it extends mainly exteriorly of the dome-shaped portion.

The ridge in addition to providing a good and gentle contact with the contours of the face of the patient, also converts the mask, when desired, into the stretched shape for the use condition by blowing air into the ridge, thereby causing the ridge to assume a pre-determined shape, and to maintain it in this shape, as long as the air pressure in the interior of the ridge is maintained. On venting the interior of the ridge, the mask can be folded up or can automatically, as a result of elastic deformation forces, change to a flattened state.

Preferably, a strip-shaped zone of increased wall thickness and hence of greater flexural stiffness is provided, in the region of the mask between the ridge and the annular guide for the blowing-in tube, this zone extending in particular from the nose region to the chin region, because here the transition from the shape

when the ridge is inflated to the shape when it is deflated or vice versa, can be effected with the minimum possible deformation in the folding direction. The strip of increased wall thickness can at the same time also be pre-tensioned so as to assume a U-shaped cross section and/or as large an angle as possible between its two wall strip parts, which are combined in the region of the guide. The part of the mask between the ridge and the guide for the blowing-in tube can be made in one piece, with the wall regions, apart from the strips of increased wall thickness, being made of such low wall thickness that they present practically no resistance to their deformation. This part can however also be manufactured from two separate shells, the edges of which overlap in the region of the strips of increased wall thickness and are glued together to form zones of increased flexure stiffness.

Since the ridge does not completely contract on releasing the air — unless special measures are provided on the ridge itself to ensure that it assumes as small a ridge interior space as possible in the state where the air has been released — the mask is preferably provided with a case which is matched to the shape of the flattened mask and which receives the mask, with the ridge being compressed to the thickness of the remaining part of the mask. The case is preferably provided with loop-shaped closures, which ensure easy closing and hence compression of the ridge. Furthermore, a mask stored in such a case is safe against damage and soiling.

In order that the invention will be better understood, the following description is given, merely by way of example, reference being made to the accompanying drawings, in which:

FIG. 1 is a perspective view of one embodiment of mask according to the invention, shown ready for use and seen from the blowing-in side;

FIG. 2 is a perspective view of the mask of FIG. 1, seen from the opposite side;

FIG. 3 shows a side view, seen from the nose region, of the mask of FIGS. 1 and 2;

FIG. 4 is a partial section through the mask according to FIG. 3;

FIG. 5 is a view of the mask in the flattened side, seen from the broad side;

FIG. 6 shows the mask according to FIG. 5, viewed from the narrow side;

FIG. 7 is a front view of a case for the mask, with the flattened mask illustrated therein;

FIG. 8 is a perspective side view of the case shown in FIG. 7; and

FIG. 9 shows the case of FIGS. 7 and 8 in the open position.

The mask 1 represented as ready for use in FIGS. 1 to 3 includes a ridge 2, which is fixed to a foldable dome-shaped portion 3, and which is located between the ridge 2 and an annular guide 4 through which a blowing-in tube 5 projects. A flange 7 by means of which the tube can be connected to a mechanical source of air or oxygen is provided on the outwardly projecting end of the tube 5, which is connected at its other end to the inner space 6 of the mask 1. Furthermore, the tube end with the flange 7 can be used as a blowing-in orifice for the mouth-to-mouth respiration by the person providing first aid.

The shape of the mask 1, which can be seen from FIGS. 1 and 2, is based on the anatomical dimensions of the facial contours around the mouth and nose area. It is therefore constructed so as to be longish in the direction of the connection of the contact area 8 for the bridge of the nose and the contact area 9 for the chin, and as a result of the overall dome-shaped construction encloses the mouth and nose when in use. A strip-shaped zone 10 of increased wall thickness of the mask portion 3, which can be formed by overlapping and gluing together or welding together the adjacent wall regions 11 and 12 of the mask portion 3 and optionally by placing an additional stiffening strip of material, of a film of inherently low flexural stiffness, underneath the zone, also runs in the same direction. The mask portion 3 can however also be manufactured in one piece, with the strip 10 being formed at the same time.

The ridge 2 can be inflated to the shape shown in FIGS 1 to 3 by means of an air hose 15, which is connected to the interior of the ridge 2 via a tightly closing hollow attachment 14. On inflation, the ridge 2 assumes the shape which has been shown and hence forces the mask portion 3 into the domed shape shown, against the elastic deformation force of the strip 10, which urges the mask portion 3 to assume the flattened shape, as can in part be seen from the FIGS. described later. After inflation the free orifice of the air hose 13 is closed with a conical mandrel 15, to the conical circumferential surface of which the hose 13 adheres tightly under self-locking friction, even against the compressed air prevailing inside the ridge. The mandrel 15 is at the same time held in a projection 16 on the lateral outer surface of the ridge 2, at about the same height of the ridge as the hollow attachment 14, with the distance from it being less than the free length of hose.

FIGS. 3 and 4 illustrate that the blowing-in tube 5 is held in the guide 4 so that it is displaceable along its longitudinal axis. In use, the tube 5 is drawn out of the inner space of the mask 1, so that the inner space 6 is free for the mouth and nose region of the patient and so that the opposite end of the tube is conveniently accessible to the lips of the person providing first aid or for connection to a mechanical source of air. At the same time the tube rests with an annular rib 17, formed on its end facing toward the inner space, in an annular groove 18 formed in the guide 4, with the radially outer side of the rib 17 resting tightly against the base surface of the annular groove 18. The lip 19 facing the inner space 6 of the mask 1 is at the same time made thinner than the lip 20 which faces outwards. This ensures that the rib 17 can relatively easily be displaced out of the annular groove 18 into the inner space 6 of the mask 1 and back again, in the course of which the thin lip 19 is bent accordingly, whilst bending of the thicker lip 20 requires rather higher forces. When the tube is pulled out rapidly, it cannot, therefore, also subsequently bend the lip 20 after bending the lip 19, in such a way that the tube would be completely loosened from the guide and could be reintroduced into it laboriously and with loss of valuable time. Only with deliberate appropriately high exertion or force can the tube 5 be loosened from the guide 4 so as to be replaced by a similar tube or a tube of different shape.

The FIGS. 5 and 6 show the mask 1 in the flattened state, in the appropriate shape for packaging. To obtain this form, the hose 13 is pulled off the mandrel 15 and the interior of the ridge 2 thereby vented. The stress on the ridge is released, and the ridge follows the elastic bending forces of the strip 10 of the mask part 3. In this embodiment, the strip is so constructed that it seeks to assume as straight a position as possible, that is to say the angle enclosed by its two parts, divided by the guide 4, in the side view of FIG. 5 widens out under the force of the elastic deformation forces. As a result, the wall regions 11 and 12 of the mask portion 3 are shaped into wall parts which run approximately parallel, whilst the ridge 2 is folded together to give an approximately semi-circular double layer. FIG. 6 shows the shape of the mask in the flattened state, that is to say with air released from the ridge. Admittedly it is not possible to ensure without special aids that the ridge 2 should assume the position drawn in FIG. 6. Depending on the material chosen, sideways protrusion of the ridge 2 and an increased danger of damage cannot be prevented.

As shown in FIGS. 7, 8 and 9 a case 21 is provided in which the flattened mask 1 can be carried safely on one's person so as to require little space.

As can in particular also be seen from FIGS. 8 and 9, the case 21 consists of two dishes 22 and 23 which are constructed to correspond to the shape of the flattened mask 1 and which when snapped together enclose the mask 1 between them, with their edge regions overlapping and forming a good lateral stiffening of the closed case.

As can be seen from FIG. 7, the flattened mask 1 and hence the case 21 have roughly the shape of a sector of a circle. The case includes two dish parts 22 and 23, each having an arcuate end wall 24, two side walls 28 and 29 extending at an oblique angle from an apex 25, and a front sector shaped wall joined thereto. When the flattened mask is in the case, the pushed-in tube 5 is adjacent to the apex 25 of the case 21, and here the two dish parts 22 and 23 are connected to one another so that they bend elastically. Furthermore, two looped tapes 26 and 27 are fixed at this point, which can be pushed from the side walls 28 and 29 of the case over the snapped-together dishes 22 and 23. The widths of the tapes here correspond in the regions of the case adjacent to sides 28 and 29, roughly to its circumference in the tape direction. The further the loops 26 and 27 are pushed towards one another along the circular arc region 24, the greater becomes the circumference of the case in the particular tape direction, so that the tapes become tensioned and thus exert a pressure on the dish parts 22 and 23, in the closing direction. This pressure in particular is also communicated to the ridge 2 which is not yet quite flat and freed of air, and which hereupon assumes the flat form required for complete closing of the case. The increasing tension of the tapes 26 and 27 on being pushed towards one another can for example be achieved by in each case fixing the loops — as shown in FIGS. 6 to 9 — somewhat outside the center of the apex 25, so that when they are pushed along they describe a circular arc of which the center point is displaced relative to the arcuate end wall 24. The same effect can be achieved if the end wall 24 of the housing is more strongly curved than the circular arc described by the ends of the tapes 27 and 26 which

engage with the wall 24. The center point of the wall 24 has here to be regarded as being displaced from the apex 25 of the case into the surface of the case.

I claim:

1. A foldable respiratory mask comprising:

A. A flexible foldable dome-shaped portion having a peripheral edge and a supply orifice at the apex of said dome;

B. An inflatable flexible member connected to said dome-shaped portion and extending around said peripheral edge, and

C. A strip-like deformable member substantially more rigid than said dome-shaped portion for reinforcing said dome-shaped portion, said strip-like deformable member extending from a first part of said inflatable member to said air supply orifice and then from said air supply orifice to a second part of said inflatable member opposite said first part, whereby when said inflatable member is inflated the mask is open and ready for use, and when said inflatable member is deflated said strip-like deformable member causes the mask to assume a relatively flat configuration.

2. The mask of claim 1 including an annular guide in said dome-shaped portion.

3. The mask of claim 2 including an axially slidable blowing-in tube mounted in said orifice, said tube being

movable from a first position in which it extends mainly within the dome-shaped portion to a second position in which it extends mainly exteriorly of said dome-shaped portion.

4. The mask of claim 3 including an annular exterior rib on said blowing-in tube and wherein said annular guide includes means defining an annular groove positioned effective to form a thicker lip exterior to said groove than interior thereto, whereby said rib is releasably engageable in said groove when said blowing-in tube is in said second position.

5. The mask of claim 3, wherein said blowing-in tube has an exterior annular flange formed thereon exterior to said dome-shaped portion.

6. The mask of claim 1 including an air inlet hose operatively connected to said inflatable and deflatable ridge, and a mandrel mounted on said ridge, said inlet hose being engageable on said mandrel effective to maintain inflating air in said ridge.

7. The mask of claim 1 wherein at least said foldable dome-shaped portion is formed of flexible plastic material.

8. The mask of claim 1, wherein said first part of said inflatable member is the part covering the chin and wherein said second part of said inflatable member is the part covering the nose.

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