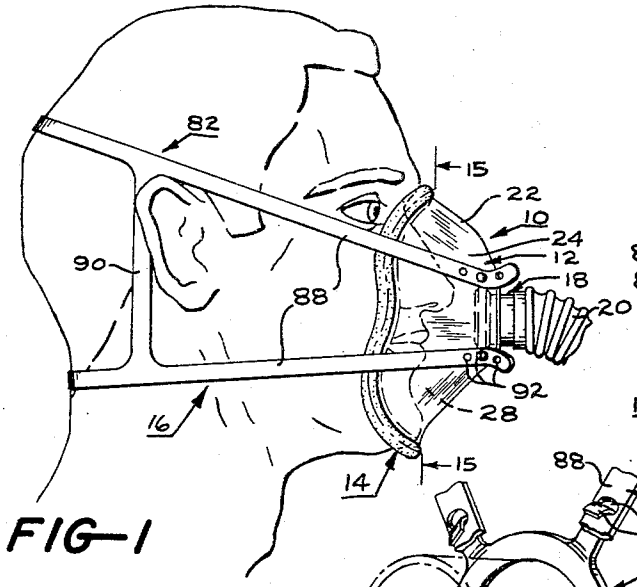
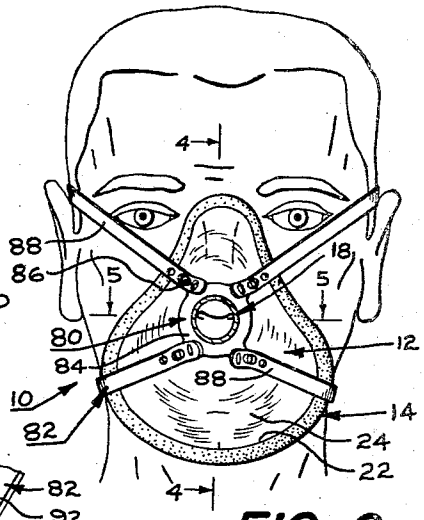
July 11, 1967 V. R. BENNETT 3,330,273

ORO-NASAL FACE MASK WITH IMPROVED SEALING CUFF

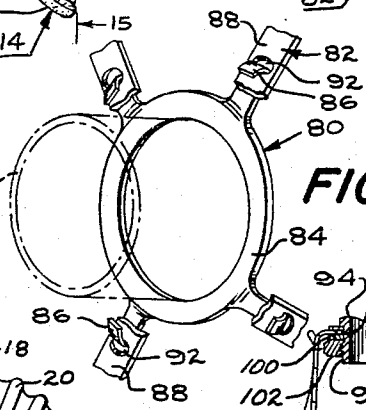
Filed Oct. 15, 1964 2 Sheets-Sheet 1



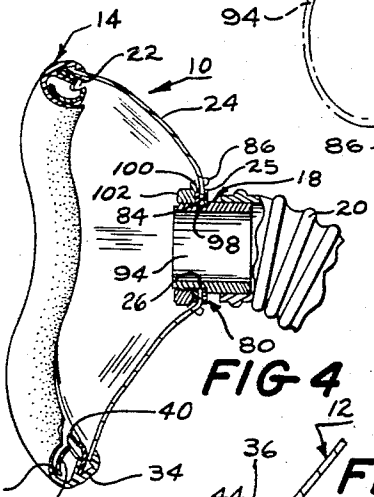
FIG—1



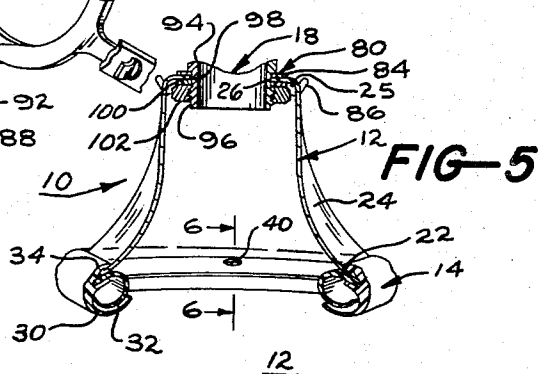
FIG—2



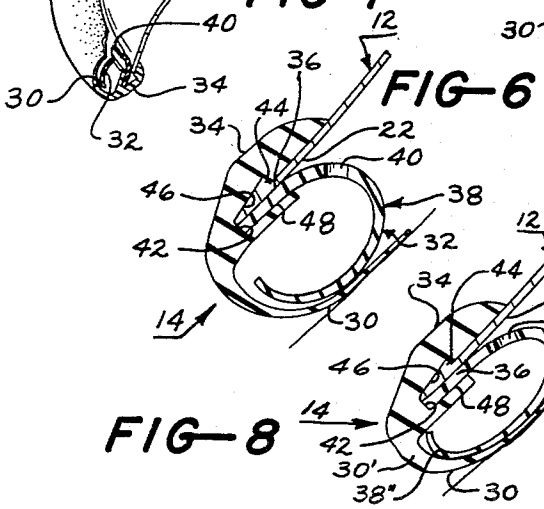
FIG—3



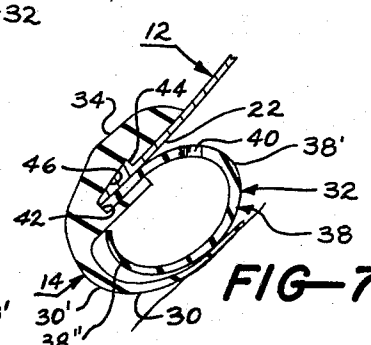
FIG—4



FIG—5



FIG—6



FIG—7

FIG—8

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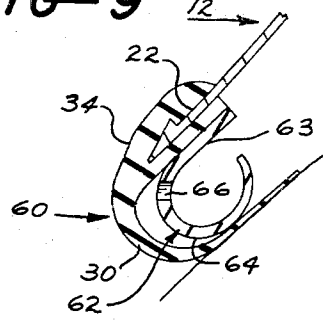
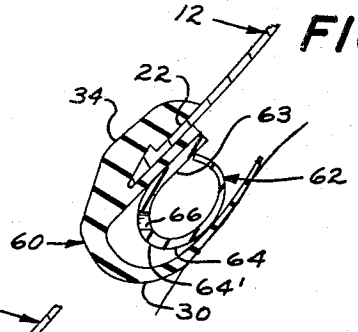
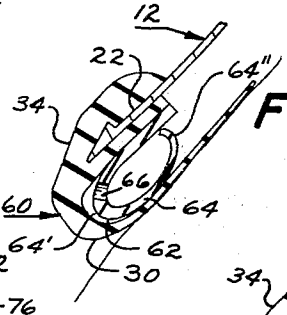
FIG—9



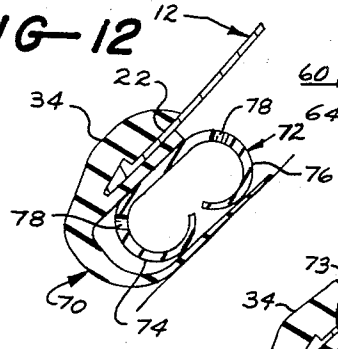
FIG—10



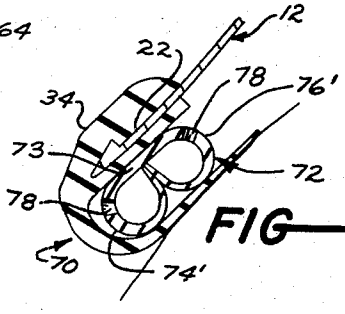
FIG—11



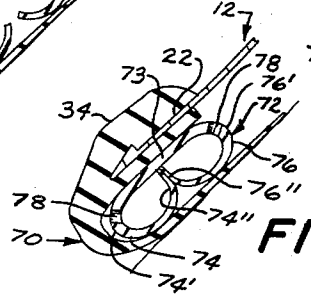
FIG—12



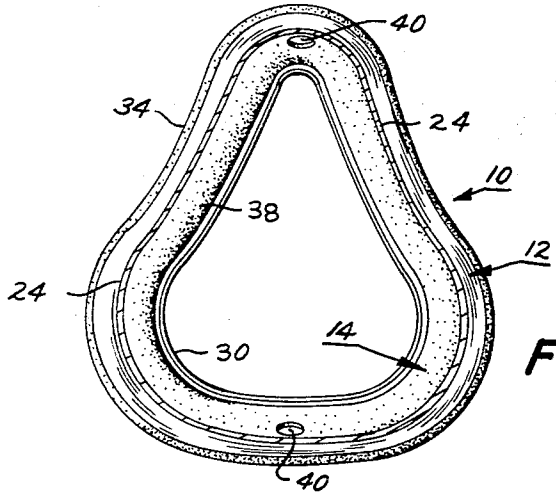
FIG—13



FIG—14



FIG—15



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ORO-NASAL FACE MASK WITH IMPROVED SEALING CUFF

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13 Claims. (Cl. 128—146.7)

This invention relates to an improved oro-nasal face mask for respiratory use, and more particularly to such a mask embodying an improved sealing cuff for effecting a seal between the perimeter of the mask and the face and for cushioning the force exerted by the mask against the face.

The sealing cuff of the invention finds particularly useful application with an oro-nasal mask, and, for this reason, it is described in conjunction with an improved mask of this type. It is to be noted at the outset, however, that the cuff may be used to advantage with other devices adapted to be positioned in sealing engagement with portions of the body, such as respiratory mouth pieces, bathing caps and ear-covering devices. Thus, the illustration and description of the cuff in conjunction with this one type of device is not intended to be limitative.

Oro-nasal masks are conventionally used in high altitude flying for supplying oxygen. It is readily apparent that an effective seal is essential in such a use. Any appreciable leakage could produce potentially disastrous consequences. In further regard to this use, it is noted that certain types of masks, notably most of those having an inflated cuff, are adversely affected by changes in atmospheric pressure corresponding to changes in altitude.

Such masks also have widespread application in the medical field. Breathing gas, which often has an anesthetic or medicament added, is administered to a patient. In many cases it is essential to accurately meter the volume of gas being supplied to the patient. In these cases any leakage, of course, adversely affects the accuracy of the measurement.

Another use for oro-nasal masks in the medical field is in administering intermittent, positive pressure-breathing therapy, commonly known as IPPB, to patients having a wide variety of respiratory disorders. In IPPB therapy, the lungs are inflated under a control pressure during the inspiration phase of the breathing cycle. This in turn results in distention of the lung-thorax system somewhat more than in normal inspiration, and hence in more uniform and thorough alveolar aeration. Here again, it will be readily appreciated that effective sealing is essential. Any leakage will prevent the desired control pressure from being applied to the lungs so that full ventilation is not achieved.

In addition to the necessity of good sealing, comfort to the wearer is an extremely important factor, both from psychological and physiological standpoints. Where such a mask is used in conjunction with high altitude flying and in many medical applications, as in administering IPPB therapy, it must be worn for prolonged periods. In the event excessive force is applied against limited facial areas in order to achieve over-all sealing, damage to the facial tissue is likely to occur. Furthermore, severe apprehension frequently stems from the physical discomfort.

Masks heretofore available have not been entirely successful in meeting these requirements of sealing and comfort. It has been found that with a substantial percentage of users the facial contours differ so greatly from the design standard that in some cases sealing cannot be achieved. In other cases the mask is pressed so tightly against raised facial areas in order to seal in relatively

depressed areas as to cause damage to the tissue and bring about severe discomfort and apprehension.

A further problem inherent in the masks of the prior art is in maintaining the desired conditions of sanitation. Particularly in medical usage, it is often the case that masks are used by many different patients. Thus, it will be readily understood that it is important that they be thoroughly cleaned after each use. Certain designs heretofore available have made it extremely difficult, at best, to achieve proper cleaning.

In view of the foregoing, it is a primary object of the invention to provide an improved oro-nasal face mask which obviates the problems of the prior art.

A more specific object is to provide an oro-nasal mask for general use with an improved sealing cuff around its perimeter capable of compensating for substantial irregularities in the facial contour to afford a highly effective seal between the perimeter of the mask and the face of the wearer.

A related object is to provide a mask of the type described embodying a cuff of unique construction whereby mechanical resilience and system pressure in the mask acting on a portion of the cuff combine and afford a highly effective seal.

Another object is to provide a mask of the type described, further characterized in that it may be worn comfortably by persons with a wide variety of facial contours.

Another object of this invention is to provide a mask of the type described in which the cuff is constructed and arranged so that the mask is effectively sealed and may be worn comfortably while subjected to substantial changes in atmospheric pressure, as would be encountered in high altitude flying.

A further object is to provide a mask of the type described which is readily adapted to be thoroughly cleaned following use.

It is another object of the invention to provide an improved oro-nasal mask, having a face piece of narrow width and profile, so as to afford a relatively small breathing chamber and thereby minimize re-breathing of expired gas.

A still further object is to provide an improved mask of the type described capable of accomplishing all of the foregoing objects, yet which is relatively simple in construction and capable of being economically mass produced.

Still another object is to provide an improved sealing cuff for effecting good sealing between a cover member and a portion of the body engageable by such member, even where substantial irregularities are encountered in the surface of the body portion.

These and other objects, features and advantages of the invention will be better understood by referring to the following detailed description, taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a side elevational view of the mask of the invention positioned for use on the face of the wearer;

FIGURE 2 is a front elevational view, similar to FIGURE 1, with a portion of the supply conduit cut away and removed in order to show underlying parts more clearly;

FIGURE 3 is a perspective view of a spider on the forward portion mask and portions of a harness used to hold the mask in position for use;

FIGURE 4 is a vertical sectional view taken along the line 4—4 of FIGURE 2;

FIGURE 5 is a horizontal sectional view taken along the line 5—5 of FIGURE 2;

FIGURE 6 is a fragmentary sectional view on an enlarged scale taken along the line 6—6 of FIGURE 5;

FIGURES 7 and 8 are fragmentary sectional views, similar to FIGURE 6, except that the sealing cuff is shown under different conditions of use;

FIGURE 9 is a fragmentary sectional view, similar to FIGURE 6, of a modified form of the sealing cuff of the invention;

FIGURES 10 and 11 are fragmentary sectional views of the cuff shown in FIGURE 9 in conditions of use corresponding to FIGURES 7 and 8, respectively;

FIGURES 12 is a fragmentary sectional view, similar to FIGURE 6, of still another modified form of the cuff of the invention;

FIGURES 13 and 14 are further fragmentary sectional views of the cuff illustrated in FIGURE 12 in conditions of use corresponding to FIGURES 7 and 8; and

FIGURE 15 is a vertical sectional view through the cuff taken in the direction of the arrows **15** in FIGURE 1.

Referring to the drawings and in particular to FIGURES 1 and 2, the mask of the invention, designated by the reference numeral **10**, includes generally a face piece **12**, a sealing cuff **14**, an attachment harness **16**, and a connector assembly **18**. The latter member is adapted for connection to a combined inlet-outlet conduit **20** of suitable respiration apparatus.

The face piece **12** is shaped to cover the frontal portion of the face, including the nose and mouth. It is sized to extend from the bridge of the nose down to a location just under the chin. The width increases from a minimum adjacent the nose to a maximum adjacent the mouth, and then progressively decreases toward its lower end.

The marginal edge **22** of the face piece around its entire perimeter is shaped to conform generally to the surface contour of the face of an average person. The mask is intended for general use and, therefore, the shape is determined by the characteristics of an average person. When the face piece is positioned over the nose and mouth, the rearward side of the marginal edge **22** is in close proximity to the adjacent surface of the face. Actual contact is, of course, prevented by the resilient, deformable sealing cuff **14** which, in addition, provides for perimeter sealing notwithstanding the known differences in facial contour from person to person.

From its marginal edge **22** the face piece **12** projects forwardly and converges centrally to afford a cover-like central portion **24**. The forwardmost end **25** of the face piece **12** is flattened and provided with an inlet-outlet passage **26**. When the mask is positioned for use, as in FIGURES 1 and 2, the face piece **12** and the underlying frontal portion of the face cooperate to define the boundaries of a breathing chamber **28**. Preferably, this chamber is relatively small in volume in order to minimize the rebreathing of expired gas. Provision of a small breathing chamber **28** is achieved by making the face piece **12** of relatively narrow profile and width.

The face piece **12** is preferably formed with a relatively stiff and transparent plastic material. Plastic is preferred from the standpoint that it is strong and durable, impermeable to gas, easily cleaned and may be easily molded into the desired shape. However, other materials, such as metals, may be used.

In order to achieve sealing between the marginal edge **22** of the face piece **12** and the face and for cushioning engagement for comfort of the wearer, the sealing cuff **14** is provided. The cuff is secured to the face piece and extends entirely around its perimeter on the rearward side of the marginal edge **22**. Referring to FIGURES 4 to 6, the cuff **14** is substantially uniform in cross section about the entire perimeter of the face piece **12**. It includes a facial flap **30**, a back-up band **32**, and an attachment flange **34**.

The facial flap **30**, as shown in FIGURE 6, comprises a relatively thin member formed of a flexible and, preferably, at least semi-resilient material. It extends from a location adjacent the marginal edge **22**, curving rearwardly away therefrom and then inwardly at an orientation generally parallel to the adjacent rearward surface of the edge **22**. The latter portion of the flap presents a relatively flat surface for sealing engagement with a face.

In order to initially position the flap for facial engagement and to maintain its position, as well as to afford the cushioning effect desired, the back-up band **32** is provided. It comprises a spring-like and hook-shaped element formed of a resilient, flexible material, and is disposed between the facial flap **30** and the rearward surface of the marginal edge **22**. In the presently preferred embodiment shown in section in FIGURES 4 to 8, the band **32** is hook-shaped and oriented oppositely to the flap **30** so as to cooperate with the latter to form a semi-closed cuff.

The back-up band **32** includes a base portion **36**, disposed adjacent and parallel to marginal edge **22**. Extending from the base portion **36** is a support portion **38** that initially curves inwardly and rearwardly away from the edge **22**, then outwardly to engage the forward or underside of the facial flap **30**, to support it adjacent its terminal end and finally back towards the edge **22**. The terminal end of the band **32** in its normal unflexed condition (FIGURE 6) stops short of the opposite wall of the cuff, which in this case is formed by a portion of the attachment flange **34**.

Use of the back-up band **32** enables the facial flap **30** to be made considerably thinner than if a single unsupported flap were used. This is highly advantageous in that a thinner flap is in turn more flexible, so as to feel softer and more comfortable and more readily conform to irregularities in the facial contour. It also permits the flap to more readily respond to system pressure in the chamber **28** acting on its underside to urge it into tight sealing engagement with the face, as will be brought out below.

Further advantage may be gained by making the flap **30** of a tapered configuration, as illustrated in FIGURE 6, i.e., progressively thinner in its face-engaging portion from its inner towards its terminal end. This further enhances the ability of the flap to conform to irregularities, both mechanically and under the influence of system pressure, yet it still has the same desired resistance to bending or flattening in its curved region, designated by the numeral **30'**. Similarly, the back-up band may be formed so that its support portion **38** is tapered or progressively thinner from the base portion towards its terminal end, although not to as great an extent as the flap. Optimum spring action from this member, which is, in effect, cantilevered, can be obtained in this manner.

The interior of the cuff **14** is vented to the mask chamber **28** by apertures **40**, illustrated in FIGURES 5, 6 and 15. Preferably, two such apertures, located at the top and bottom of the mask, are provided. They permit pressure within the breathing chamber **28** to act against the underside of the facial flap **30** to assist in obtaining sealing. In addition, they permit water trapped within the cuff following cleaning to drain out.

The cuff **14** is secured to the marginal edge **22** of the face piece **12** by any suitable means. For cleaning purposes, a detachable connection is desired. To this end, the flange **34** is formed with a slot **42** for receiving the edge. The perimeter of the flange portion forming the slot is made slightly smaller in over-all perimeter than the perimeter of the face piece. Installation is achieved simply by stretching the flange slightly to position the slot **42** over the edge. In order to insure a secure, gas-tight connection, the wall thickness of the edge **22** on the forward side is tapered to afford an inwardly facing stop shoulder **44**. The mating surface of the flange **34** is in turn formed with a correspondingly shaped groove **46** for receiving the shoulder.

For convenience of manufacture, the attachment flange **34** is formed integrally with the facial flap **30**. The back-up band **32**, on the other hand, is here formed separate-

ly from the flap **30** and interposed between the rearward surface of the marginal edge **22** and the adjacent portion of the flange **34**. Attachment of the band to the flange of the interface **48** to make the cuff **14** a unitary structure is achieved by bonding with a suitable adhesive or the like.

Preferably, the entire cuff is formed of a resilient and highly flexible material, such as plastic or rubber. Such materials have the desired physical characteristics and, in addition, are durable and easily formed into the desired shapes. In some applications, it may be desirable to form the back-up band of a slightly stiffer material in order to obtain the required spring action. This same result may often be achieved by appropriately varying the thicknesses of the various parts.

When the mask **10** is positioned for use as in FIGURES 1 and 2, the sealing cuff **14** accomplishes the desired sealing by virtue of the combined effects of the mechanical resilience of the back-up band **32** and facial flap **30**, and the mask pressure exerted against the flap. The face-engaging portion of the flap **30** is initially positioned for sealing engagement with the face by the band **32**. The cuff is shown in FIGURE 6 in a normal or substantially undeformed condition as would exist prior to facial contact. When the mask is pressed firmly against the face to establish pressure sealing, the cuff **14** flattens slightly toward the condition illustrated in FIGURE 7. This initial flattening causes bending of the flap in the region **30'** and bending of the band **32** in the curved region **38'** of its support portion. Such bending, and hence flattening of the cuff, is yieldably resisted by the resilience of the band **32** and, to a lesser extent, of the flap **30**.

Should further force be applied in pressing the mask against the face, the terminal end of the band pivots sufficiently to engage the opposite wall of the cuff **14** (here the surface of the attachment flange **34**). Upon such band engagement, further flattening of the cuff produces lateral bulging of the band with additional resistance imposed by virtue of bending of the band in the region **38''**, as well as in the region **38'**, being required. The condition of the cuff **14** following this further flattening is illustrated in FIGURE 8.

In the event the marginal edge **22** of the face piece **12** were shaped to conform exactly to the contours of the face, the cuff **14** would be deformed substantially to the same extent around the entire perimeter of the face piece **12**. In such an optimum situation, a good balance between sealing and comfort is attained with deformation of the cuff approximately to the extent illustrated in FIGURE 7. In providing a mask suitable for general use, such close tolerances are not possible, and the cuff would be deformed in localized areas around its perimeter to different extents, between the conditions illustrated in FIGURES 6 and 8. In cuff areas corresponding to depressed facial areas, the cuff would more nearly approach the condition illustrated in FIGURE 6, whereas in raised facial areas, it would more nearly approach the condition illustrated in FIGURE 8.

Once the mask **10** is in place and system pressure is delivered to the breathing chamber **28** through passage **26**, the seal is further enhanced because of pressure being exerted on the underside or forward face of the sealing flap **30** to urge it tightly against the face (FIGURES 7 and 8). The vent apertures **40** insure that system pressure is applied to the entire surface of the flap. As set forth above, such pressure sealing is dependent upon primary sealing first having been established by the mechanical resilience of the cuff **14**.

It will be appreciated that the cuff of the invention is readily capable of compensating for substantial irregularities in facial contour to afford an effective seal. Considerable travel occurs in flattening from the condition of FIGURE 6 to that of FIGURE 8. Moreover, the mask is worn comfortably even where substantial variations in localized areas, as exemplified by the showings of FIGURES 6 and 8, are present. This stems from the fact that the facial flap, being thin and formed of a highly flexible material, has a very soft and pliable feel. In addition, the resistance to flattening of the cuff is spring-like, or progressively increases with the degree of flattening. Since the cuff is vented to the breathing chamber **28**, changes in atmospheric pressure have no detrimental effect on its performance. Accordingly, the mask **10** is especially well suited for high altitude flying.

Two alternate embodiments of the cuff invention, designated by the reference numerals **60** and **70**, are illustrated in FIGURES 9 to 11 and 12 to 14, respectively. In each of these latter embodiments, the back-up band is oriented differently in one case and configurated differently in another case than the band **32** of the embodiment previously described, but the function of the cuff is the same.

The cuff **60** has a back-up band **62** that is hook-shaped and cantilevered like the band **32** previously described, but it faces the same way as the facial flap; that is, its support portion **64** initially curves outwardly and rearwardly away from the marginal edge **22** of the face piece, then inwardly parallel to the face-engaging portion of the facial flap and finally back toward the edge. The base **63** of the band is in this case bonded to the rearward surface of the attachment flange **34**. The resulting cuff **60** is open as opposed to the semi-closed cuff **32**.

In use, the cuff **60** functions identically to the cuff **14**, with FIGURES 10 and 11 corresponding to FIGURES 7 and 8 insofar as flattening of the cuff against the face is concerned. In FIGURE 10, simple bending of the facial flap **30** in the region **30'** and of the band **62** in the region **64'** to pivot the terminal end of the support portion **64** into engagement with the opposite wall of the cuff has taken place. Still further flattening has taken place in the condition of FIGURE 11, producing lateral bulging of the band **62** against the added resistance to bending in the region **64''**.

Vent apertures **66**, located at the top and bottom, as in FIGURE 15, insure that system pressure acts on the underside of the flap **30** for sealing and that any water trapped during cleaning may be drained.

The cuff **70** includes a back-up band **72** with two hook-shaped and cantilevered support portions **74** and **76**. A base portion **73** is bonded to the attachment flange and the two support portions **74** and **76** extend from its opposite ends and curve toward and face one another.

Again the functioning is essentially the same as the other embodiments, with FIGURES 13 and 14 corresponding to FIGURES 6 and 8. Flattening initially causes bending of the flap **30** in the region **30'** and of the support portions **74** and **76** in their regions **74'** and **76'**, respectively, to pivot the terminals ends of such portions inwardly. Yieldable resistance is imposed by resilience of the material forming these parts. Once the terminal ends of the support portions **74** and **76** contact the opposite wall of the cuff, as in FIGURE 13, further flattening necessitates lateral bulging of the support portions. Added resistance is imposed since bending also takes place in the regions **74''** and **76''**. Vent apertures **78** are again provided for the purposes previously indicated. This latter embodiment may prove especially advantageous where greater cushioning or resistance to flattening is desired.

The mask **10** is held in place on the face of the wearer by the harness assembly **16**. It includes a spider **80** and a head harness **82**. The spider **80** comprises an annular ring **84** having four radially projecting lugs **86** at angularly spaced locations. The ring **84** is positioned around the inlet-outlet passage **26** on the forward end **24** of the face piece, and is held in place by the connector assembly **18**.

The harness **82** may be of any suitable configuration for comfort, provided it is arranged to hold the mask firmly against the face. In the illustrative case, it includes

a pair of straps **88**, one of which extends above and the other below the years. The two straps are joined just behind the ears by a pair of webs **90**. At the ends of these straps, holes **92** are provided for receiving the lugs on the spider in the manner illustrated in FIGURE 3. To enable adjustment for different head sizes, a plurality of holes **92** are provided in each strap.

For the purpose of supplying and exhausting gas from the breathing chamber **28** and for securing the spider **80** in position, the connector assembly **18** is provided. The assembly includes a tubular sleeve **94** of a diameter just slightly greater than that of the inlet-outlet passage **26**. The rearward end **96** of the sleeve is necked down so as to be receivable within the passage and to afford an annular rearwardly facing shoulder **98** at the juncture. Referring to FIGURES 4 and 5, it may be seen that the spider **80** is held in place by virtue of the ring **84** being interposed between the shoulder **98** and the forward end of the face piece. To hold the assembly together and afford a sealed connection, a resilient, deformable washer **100** is disposed around the sleeve and against the face piece and a nut **102** is threaded on the correspondingly threaded end of the sleeve. Connection of the mask to suitable respiration apparatus is achieved by simply slipping the end of the inlet-outlet conduit **20** over the forward portion of the sleeve **94**, as shown in FIGURE 4.

While certain embodiments of the invention have been illustrated and described in considerable detail, it will be understood that is only by way of illustration, and that numerous changes in the details of the construction and arrangements of the various parts may be made without departing from the spirit and scope of the invention.

I claim:

1. An oro-nasal mask, comprising: a face piece shaped to cover the nose and mouth, and having a forwardly projecting central portion defining a breathing chamber with an inlet-outlet passage, and a marginal edge conforming generally to the surface contour of the face; and a sealing cuff extending around said face piece at said marginal edge, said cuff providing in cross-section, a thin, flexible flap extending rearwardly away from said marginal edge and then inwardly generally parallel to the adjacent surface of said marginal edge of spacing therefrom to present a flat surface adapted for sealing engagement with the face, and spring means including a band of resilient, flexible material cantilevered adjacent one end from a location adjacent said marginal edge and having a support portion disposed between said marginal edge and said face-engaging flap portion and at spacing therefrom in engagement therewith and extending along the underside of the latter to position said face-engaging flap portion for such sealing engagement and yieldably resist movement thereof toward said marginal edge.

2. An oro-nasal face mask, comprising: a face piece shaped to cover the nose and mouth, and having a forwardly projecting central portion defining a breathing chamber with an inlet-outlet passage, and a marginal edge conforming generally to the surface contour of the face; and a continuous sealing cuff secured to and extending around said face piece at said marginal edge, said cuff providing in cross section a thin, flexible facial flap curving rearwardly away from said marginal edge and then inwardly generally parallel to the adjacent surface of said marginal edge at spacing therefrom to present a flat surface adapted for sealing engagement with the face, and a hook-shaped back-up band formed of a thin, resilient, flexible material and having a base portion adjacent said marginal edge and a support portion curving rearwardly away from said marginal edge and then back toward the same, said support portion being disposed intermediate said marginal edge and the face-engaging portion of said facial flap at spacing from said marginal edge and engageable with said flap portion to position the latter for such sealing engagement and yieldably resist movement thereof toward said marginal edge.

3. The subject matter of claim **2** further characterized in that the thickness of said facial flap in at least said face-engaging portion tapers to a minimum at its terminal end.

4. An oro-nasal face mask, comprising: a face piece shaped to cover the nose and mouth, and having a forwardly projecting central portion defining a breathing chamber with an inlet-outlet passage, and a marginal edge conforming generally to the surface contour of the face; and a unitary sealing cuff secured to and extending around said face piece at said marginal edge, said cuff providing in cross section a relatively thin, flexible facial flap curving rearwardly away from said marginal edge and then inwardly generally parallel to the adjacent surface of said marginal edge at spacing from the opposite wall of said cuff to present a flat surface for sealing engagement with the face, and a back-up band formed of a thin resilient, flexible material and having a base portion adjacent said marginal edge and a support portion integral with said base portion that initially curves rearwardly away from said marginal edge, then extends along the underside of said face-engaging portion of said facial flap in engagement therewith, and finally curves back toward said marginal edge with its terminal end stopping short of the opposite wall of said cuff, whereby movement of the face-engaging portion of said flap toward said marginal edge upon said mask being pressed firmly against the face is yieldably resisted initially by the bending of said band to pivot said terminal end into engagement with the opposite wall of said cuff and, thereafter, by lateral bulging of said band.

5. An oro-nasal face mask comprising: a face piece shaped to cover the nose and mouth, and having a forwardly projecting central portion defining a breathing chamber with an inlet-outlet passage, and a marginal edge conforming generally to the surface contour of the face; and a continuous sealing cuff formed of a resilient, flexible material extending around said face piece at said marginal edge and having a substantially uniform cross section along its entire length, said cuff providing in cross section attachment means for securing said cuff to said face piece, a thin facial flap integral with said attachment means and extending rearwardly away therefrom and then inwardly generally parallel to the adjacent surface of said marginal edge at spacing therefrom to its terminal end so as to present a flat surface for sealing engagement with the face and a thin spring-like and hook-shaped back-up band having a base portion secured to said attachment means adjacent said marginal edge and a support portion cantilevered from said base portion and extending rearwardly, then along the underside of said face-engaging portion in engagement therewith at a location spaced outwardly of the terminal end of said flap and finally back toward said marginal edge with its terminal end stopping short of the opposite wall of said cuff.

6. The subject matter of claim **5** further characterized in that the thickness of said support portion of said back-up band tapers from a maximum adjacent said base portion to a minimum adjacent said terminal end.

7. The subject matter of claim **5** further characterized in that said attachment means detachably secures said cuff to said face piece.

8. An oro-nasal face mask, comprising: a face piece shaped to cover the nose and mouth, and having a forwardly projecting central portion defining a breathing chamber with an inlet-outlet passage, and a marginal edge conforming generally to the surface contour of the face; and a sealing cuff extending around said face piece at said marginal edge, said cuff providing in cross section attachment means for securing said cuff to said face piece, a thin resilient, flexible facial flap connected to said attachment means and curving rearwardly away from said marginal edge and then inwardly generally parallel to the ad-

jacent surface of said marginal edge at spacing therefrom to its terminal end so as to present a flat surface adapted for sealing engagement with the face, and a hook-shaped back-up band formed of a thin resilient, flexible material and having a base portion connected to said attachment means adjacent said marginal edge and a support portion curving initially rearwardly and inwardly away from said marginal edge, then outwardly along the underside of said face-engaging portion of said facial flap at spacing from said marginal edge, and finally forwardly back toward said marginal edge with its terminal end stopping short of the opposite wall of said cuff, said support portion engaging the underside of said face-engaging portion at a location spaced outwardly of said terminal end to position the latter for such sealing engagement.

9. An oro-nasal face mask, comprising: a face piece shaped to cover the nose and mouth, and having a forwardly projecting central portion defining a breathing chamber with an inlet-outlet passage, and a marginal edge conforming generally to the surface contour of the face; and a sealing cuff extending around said face piece at said marginal edge, said cuff providing in cross section attachment means for securing said cuff to said face piece, a thin resilient, flexible facial flap connected to said attachment means and curving rearwardly away from said marginal edge and then inwardly generally parallel to the adjacent surface of said marginal edge at spacing therefrom to its terminal end so as to present a flat surface adapted for sealing engagement with the face, and a back-up band formed of a thin resilient, flexible material and having a base portion connected to said attachment means adjacent said marginal edge and a support portion curving initially rearwardly and outwardly away from said marginal edge, then inwardly along the underside of the face-engaging portion of said facial flap at spacing from said marginal edge, and finally forwardly back toward said marginal edge with its terminal end stopping short of the opposite wall of said cuff, said support portion engaging the underside of said face-engaging portion at a location spaced outwardly of said terminal end to position the latter for such sealing engagement.

10. An oro-nasal face mask, comprising: a face piece shaped to cover the nose and mouth, and having a forwardly projecting central portion defining a breathing chamber with an inlet-outlet passage, and a marginal edge conforming generally to the surface contour of the face; and a sealing cuff extending around said face piece at said marginal edge, said cuff providing in cross section attachment means for securing said cuff to said face piece, a thin flexible facial flap connected to said attachment means and extending rearwardly away from said marginal edge and then inwardly generally parallel to the adjacent surface of said marginal edge to present a flat surface adapted for sealing engagement with the face, and a back-up band including a base portion connected to said attachment means adjacent said marginal edge and a pair of hook-shaped support portions initially extending rearwardly away from said base portion at laterally spaced locations, then toward one another along the underside of said face-engaging portion of said facial flap and finally back toward said base portion, whereby said band positions said face engaging portion of said facial flap for

such sealing engagement and yieldably resists flattening of said cuff toward said marginal edge.

11. The subject matter of claim 10 including means on said band for providing constant communication between said breathing chamber and the entire underside of said face-engaging portion of said facial flap.

12. A sealing cuff for use with a member for covering a body portion to afford a perimeter seal and to cushion the force of engagement, comprising in cross-section: means adapted for attaching said cuff to said cover member; a flap formed of a thin, flexible material connected to said attachment means and extending therefrom to present adjacent its terminal end a flat sealing surface for engagement with said body portion; and a back-up band formed of a thin resilient, flexible material cantilevered from said attachment means, said band including a base portion connected to said attachment means and a spring-like support portion curving away from said attachment means and extending along the underside of the engaging portion of said flap and finally extending back toward attachment means, said support portion being engageable with the underside of said flap to yieldably resist movement of the latter toward said attachment means.

13. An oro-nasal face-mask, comprising: a face piece shaped to cover the nose and mouth, and having a forwardly projecting central portion defining a breathing chamber with an inlet-outlet passage, and a marginal edge conforming generally to the surface contour of the face; and a sealing cuff extending around said face piece at said marginal edge, said cuff providing in cross-section attachment means for securing said cuff to said face piece, a thin resilient flexible facial flap extending rearwardly away from said marginal edge and then inwardly generally parallel to the adjacent surface of said marginal edge at spacing therefrom to present a flat surface adapted for sealing engagement with the face, and a spring-like band of thin resilient, flexible material cantilevered from said attachment means and having a support portion disposed between said marginal edge and the face-engaging portion of said facial flap and extending along the underside of said flap at spacing from said marginal edge for yieldably resisting movement toward said marginal edge, the cuff being arranged whereby system pressure within said breathing chamber acts uniformly on the underside of said face-engaging portion of said flap to urge it into tight sealing engagement with the face.

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