

Balaclava and CBRN protective suit

The invention relates to a balaclava, in particular for
5 a CBRN protective suit or the like, provided for use in
combination with a breathing mask or gas mask having a
mask body, with a hood having an inner lining and a
viewing opening, wherein the viewing opening is
10 delimited by a border, and the border is designed to
bear on the mask body when the breathing mask or gas
mask is being worn, wherein the viewing opening has an
upper opening area and an opposite lower opening area,
and also two mutually opposite lateral opening areas,
15 and wherein at least one protruding, elastic sealing
element for bearing flat and in a gas-tight manner on
the mask body is provided on the inside of the hood
adjacent to the border in the area of at least one
lateral opening area.

20 The invention further relates to a CBRN protective suit
with a balaclava of the aforementioned type. The
invention finally relates also to a balaclava or a CBRN
protective suit with a breathing mask or gas mask.

25 Persons who come into contact with toxic substances
capable of being resorbed through the airways have to
protect themselves against these toxic substances by
wearing a breathing mask or gas mask. If there is the
added danger of the toxic substances also being able to
30 be taken in or resorbed through the skin, or if it is
deemed technically necessary from the point of view of
equipment, these persons (e.g. soldiers, firefighters,
police, members of special operations units such as GSG
9 [Border Protection Group 9 of the German Federal
35 Police], etc.) additionally have to wear protective
clothing, in particular CBRN protective suits (CBRN =
chemical, biological, radioactive and nuclear [also
referred to as ABC protective suits]) which avoid

contact of the toxic substances with the skin or the body and which are generally equipped with a hood or a balaclava.

5 In the following, the term "balaclava" is at all times also used for a "hood" which can be worn as such, in particular together with a protective suit, or is part of the protective suit. Here, the term "balaclava" is in principle also to be understood within the meaning
10 of the term "hood".

A balaclava, in particular for a protective suit, generally has a peripheral, elastic border for forming a viewing opening, through which parts of the breathing
15 mask or gas mask protrude, wherein the border of the balaclava is intended to bear on the mask in the state of use. A problem is that the transition from the border to the breathing mask or gas mask is in most cases not adequately sealed. This can lead to toxic or
20 hazardous substances being able to pass through the inadequately sealed transition between the border and the mask body and, consequently, can lead to the wearer of such a balaclava coming into contact with these substances, or these substances can even get under the
25 mask and are thus finally inhaled. This is particularly dangerous for persons who are wearing such protective suits and are exposed to skin poisons, e.g. mustard gas.

30 WO 2004/105880 A1 has already disclosed a hood for protective clothing, said hood having a peripheral border. To improve the sealing of the transition between the border and the mask, at least one peripheral sealing element for bearing sealingly on the
35 mask is provided on the side of the border facing into the viewing opening. In this known hood, the border is designed as a sealing border, thereby resulting in an enhanced sealing action compared to a non-sealing border.

However, it has been found that leaks can occur even when using sealing borders of the kind known from WO 2004/105880 A1, which leaks may endanger the person
5 wearing the mask or protective suit.

US 2013/0025589 A1 discloses a balaclava of the type mentioned at the outset, in which leaks between the balaclava and the mask body are intended to be avoided
10 or at any rate reduced. For this purpose, pockets are provided in the area of the border, which pockets contain an elastically deformable, approximately rectangular filler with straight edges. When a tensile force is applied to the border, the sealing elements
15 adapt to the supporting contour, i.e. to any irregularities of the surface, such that leaks are avoided, for example of the kind that can occur when the border is stretched tightly across indentations.

20 However, particularly when the wearer moves his head, the sealing of the balaclava with respect to the mask body may become inadequate at certain locations, such that hazardous substances in the environment can get into the interior of the balaclava or of the protective
25 suit and endanger the wearer.

The object of the present invention is to make available a balaclava, or a CBRN protective suit with a balaclava, by which it is possible to ensure reliable
30 and permanent gas tightness between the mask and the balaclava.

According to an aspect, there is provided a balaclava in particular for a CBRN protective suit or the like, provided for use in combination with a breathing mask or gas mask having a mask body, with a hood having a
5 viewing opening, wherein the viewing opening is delimited by a border, and the border is designed to bear on the mask body when the breathing mask or gas mask is being worn, wherein the viewing opening has an upper opening area and an opposite lower opening area,
10 and also two mutually opposite lateral opening areas, wherein at least one protruding, elastic sealing element for bearing flat and in a gas-tight manner on the mask body is provided on the inside of the hood adjacent to the border in the area of at least one
15 lateral opening area, and wherein the edge of the sealing element directed toward the border has the shape of an arc segment and is adapted at least substantially to the profile of the border when the balaclava is being worn, characterized in that the
20 sealing element is designed as a gel pad.

In a balaclava of the type mentioned at the outset, the aforementioned object is essentially achieved, according to the invention, by the fact that the edge
25 of the sealing element directed toward the border has the shape of an arc segment and is adapted at least substantially to the profile of the border when the balaclava is being worn.

In connection with the development of the invention, it was found that the sealing border known from WO 2004/105880 A1 provides a comparatively good seal when the balaclava is being worn in the static state.

5 However, when a breathing mask or gas mask is used in conjunction with a balaclava, a movement of the wearer's head results in a movement of the mask relative to the hood. The reason for this is that, when the wearer moves his head, the mask connected directly
10 to the head follows the head movement completely, whereas the hood follows the movement of the head only partially. This movement of the hood relative to the mask body has the effect that leaks or openings occur between the border and the mask body, and therefore
15 contaminants can enter without obstruction.

In tests carried out, it was found that, during the use of a balaclava, leaks and openings occur mainly in the lateral opening area of the viewing opening, at the
20 transition from the border to the mask body. It is here that the invention comes into play, wherein an elastic sealing element, in particular with elasto-plastic properties, is provided which adjoins the border and extends from the border into the hood and, on account
25 of its elastic or elasto-plastic properties, bears flat on the mask body when the balaclava is being worn. The sealing element as such protrudes over the inside. In particular, it protrudes over the lower sealing surface of the border, with the result that, when the border
30 lifts away from the mask body, the opened position is still sealed, specifically via the sealing element provided behind the border.

In tests carried out in connection with the sealing
35 element according to the invention, it was moreover found that very good sealing values are obtained, at the same time with a high degree of wearing comfort, if the sealing element has a crescent shape. A crescent

shape or arc shape of the edge signifies an inwardly curved edge. In this connection, it is preferable that the sealing element as such has a crescent shape overall, i.e. is provided on one side with an inwardly curved edge and is provided on the opposite side with an outwardly curved edge. It is also preferable that the thickest area of the crescent shape lies approximately at the center of the cheek area, with respect to the wearing state, and therefore at the location where the greatest loss of leaktightness occurs in the movement of the mask body relative to the border during a movement of the user's head. This widest area of the crescent also lies in the central area of the sealing element, with respect to the transverse axis. Preferably, the sealing element also has mirror symmetry with respect to the transverse axis.

In the invention, it is also the case that the edge of the sealing element directed toward the border is adapted at least substantially to the profile of the border when the balaclava is being worn. The edge directed toward the border is then preferably the inwardly curved inner side of the crescent in the case of the crescent-like configuration of the sealing element.

By virtue of the crescent shape of the edge of the sealing element directed toward the border, said edge thus being at least substantially adapted to the profile of the border, account is taken of the curvature of the material of the hood in several spatial directions. When the sealing element bears flat on the inside of the hood, with the sealing element adjoining the border in the area of at least one lateral opening area, the edge of the sealing element directed toward the border extends along its entire length at least substantially equidistant from the border, when the balaclava is being worn. The sealing

action of the sealing element is therefore consistently high over its entire length along the border, since the sealing element does not deviate toward the edges from the profile of the border, and therefore losses of
5 leaktightness in the form of gaps could occur as a result of bearing inadequately on the mask contour. This applies in particular to movements of the wearer's head where the border is able to lift away from the mask body in particular at the site where no sealing
10 element is provided or where there is too great a distance between the sealing element and the border.

It has proven particularly advantageous if the sealing element, at its edge directed toward the border, that
15 is to say at the crescent-shaped edge, has the shape of an arc of a circle. The radius of the arc is preferably between 5 cm and 15 cm, more preferably between 7 cm and 12 cm, and particularly preferably between 8 cm and 10 cm. The profile of the edge in the shape of an arc
20 of a circle means that, when the balaclava is being worn, an adaptation to the profile of the border is achieved with very good approximation.

In a particularly preferred embodiment, the edge of the
25 sealing element directed away from the border has a profile in the shape of an arc of an ellipse. Together with the crescent shape of the edge directed toward the border, the overall result is a convex-concave shape of the sealing element, which is also referred to as ear-
30 shaped. This shape is distinguished by the fact that, in the central area of the sealing element, the greatest part of its overall surface area is available for bearing on the mask body. Preferably, the radii of the outer edge are less than the radius of the inner
35 edge.

Typical dimensions of hoods of the kind in question and customary dimensions and shapes of breathing masks are generally based on the shape of an average human head.

It is therefore particularly advantageous if the sealing element is likewise geared to this shape in terms of its outer dimensions. Of particular importance in this case is the average size of the areas with an irregular contour profile on which a smooth border can bear only inadequately. Particularly advantageous sealing properties are found in a sealing element with a lengthwise extent of between 2 cm and 20 cm, preferably between 5 cm and 15 cm, more preferably between 7 cm and 12 cm, particularly preferably between 8 cm and 10 cm. As regards the maximum transverse extent measured perpendicularly with respect to the lengthwise extent and from edge to edge, the dimensions of the sealing element can be between 1 cm and 12 cm, preferably between 2 cm and 10 cm, more preferably between 3 cm and 7 cm, particularly preferably between 4 cm and 6 cm.

In some cases it is desirable that the sealing element has the greatest proportion of its surface area not centrally but instead closer to the edge, as seen in the longitudinal direction of the sealing element. This may be the case, for example, when the balaclava is to be sealed off in relation to specially shaped breathing masks. For this purpose, it is possible for the sealing element to have an asymmetric shape with respect to its longitudinal direction.

Moreover, the protruding sealing element, provided on the inside of the hood, has the effect that the border is stretched further and thus pressed more onto the mask body, which as a whole improves the sealing effect in a balaclava according to the invention. This was also able to be determined in tests.

Finally, the invention provides a reliable, gas-tight interface between the mask and the balaclava or the hood of a CBRN protective suit.

In the tests carried out, it was also found that the location where the greatest leaks or openings between the border and the mask body occur during movements of the wearer's head lies in the cheek area of the person using or wearing the balaclava. Therefore, in a preferred embodiment, the invention proposes that the sealing element is provided at least in the cheek area of the hood, which corresponds at least substantially to the cheek area of the wearer.

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It is possible in principle to provide the sealing element only in the lateral opening area of the viewing opening, and there in particular in such a way as to include the cheek area. However, it is also possible that the sealing element extends from the lateral opening area into the upper and/or lower opening area of the viewing opening. It will be appreciated that it is advantageous for sealing elements to be provided on opposite sides of the viewing opening with mirror symmetry. The sealing can be effected not just via one sealing element per side of the viewing opening, but also via two sealing elements or a plurality of sealing elements.

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25 In an alternative embodiment, provision can also be made that the sealing element extends circumferentially around the viewing opening. In this embodiment too, peripheral sealing can be effected via a plurality of sealing elements.

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In principle, the sealing element can be made of any material that has an elastic and/or elasto-plastic behavior. For example, it is possible to produce the sealing element from foam. However, it has been found that a foam loses its restoring force over time. Moreover, foams are often susceptible to ageing.

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In a preferred embodiment of the invention, the sealing element is designed as a gel pad. The gel pad

preferably has a polyurethane gel. In principle, however, other gels are also possible. A gel pad can be easily produced by casting, wherein the gel pad preferably has an outer skin for receiving the gel.
5 Such a skin can be introduced into the corresponding mold before the casting operation.

The gel pad according to the invention preferably has the following properties, which are possible
10 individually but also in combination with each other:

- dimensional stability,
- good dissipation of shearing forces
- good damping and pressure distribution
- good skin compatibility
- 15 - high level of expansion
- high level of shock absorption
- individually adjustable hardness
- good adhesion
- free of plasticizer
- 20 - UV-stabilized
- free of outgassing, in particular at high temperature variations
- age-resistant.

25 Good sealing properties have in particular been achieved with gel pads that had a thickness of 0.4 to 2 cm, preferably of 0.8 to 1.6 cm, and in particular of approximately 1.2 cm.

30 The length and/or the maximum width of the sealing element, independently of the thickness, can vary depending on the design of the hood and/or of the mask body. In a preferred embodiment of the invention, the length of the sealing element is between 5 and 15 cm,
35 preferably between 7.5 and 11.5 cm, and in particular approximately 9.5 cm.

Independently of the thickness and length, the maximum width of the sealing element is preferably between 2

and 6 cm, more preferably between 3 and 5 cm, in particular approximately 4.2 cm.

To increase the wearing comfort and to make it easy to
5 sew in or work in the sealing element, the sealing
element is stepped or beveled at least in some areas
along the edge. The aforementioned flattening applies
in particular in the areas that do not constitute the
edge of the sealing element directed toward the border.
10 In the area of the edge directed toward the border, the
sealing element is preferably not flattened, i.e.
neither stepped nor beveled.

It is also advantageous, for sealing reasons, if the
15 sealing element directly adjoins the border or is at a
short distance from the border. The distance should
preferably be ca. 1 cm at most. With a very small
distance of the border from the sealing element, a
direct sealing action is obtained between the sealing
20 element and the mask body, even if the border lifts
away from the mask body when the wearer moves his head.

The sealing element as such can be worked into the
inner lining of the hood or sewn onto the inner lining.
25 In both cases, the sealing element markedly heightens
the inside of the inner lining in relation to adjacent
areas of the inner lining, resulting ultimately in the
protruding area bearing flat and in a sealing manner on
the mask body.

30 In another preferred embodiment of the invention, a
flexible cover layer is provided on the outside of the
inner lining above the sealing element. The cover layer
as such is in any case provided in the area of the
35 sealing element so as to bear sealingly on the mask
body. It is particularly preferable that the cover
layer directly adjoins the border or is at a distance
of up to 1 cm from the border.

In the case where the sealing element is sewn onto the inner lining of the hood, the sewn-on cover layer forms a pocket for receiving the sealing element.

- 5 To ensure that the cover layer bears on the mask body with the greatest possible sealing action, the cover layer is preferably applied free of folds in the area of the sealing element. Despite the elastic or elasto-
10 plastic properties of the sealing element, it can happen that, if the cover layer is sewn on in the area of the sealing element with folds, leaks can occur between the mask body and the cover layer in the area of the sealing element.
- 15 In extreme cases, for example as a result of a very pronounced movement of the head or of damage to the material of the hood in the border area, it is possible that the border will lift away from the mask body in some areas, despite the shape of the sealing element
20 having been adapted in the aforementioned manner. Resulting losses of leaktightness allow hazardous substances, in particular gases and aerosols, to enter the interior of the balaclava or of the protective suit and endanger the health of the wearer. It is therefore
25 particularly advantageous that the cover layer has a filter material suitable for taking up contamination. For example, it is recommended if the filter material of the cover layer contains activated carbon.
- 30 Since loss of leaktightness can in principle occur at any point between the border and the mask body, it is preferable that the cover layer extends at least substantially about the circumference of the viewing opening. In this way, at least part of any incoming
35 contamination can be taken up or filtered.

To ensure that the border bears efficiently on the mask body, the border is preferably designed as an elastic strip or cord. To achieve a good sealing action between

the border and the mask body, provision can additionally be made, in a preferred embodiment of the invention, that the border, on its underside directed toward the mask body, has a sealing coating, in particular a coating having silicone. In this embodiment, a good sealing action is obtained between the underside of the border and the mask body. If the border lifts away from the mask body when the user moves his head, which lifting can take place in particular in the cheek area of the hood body, the sealing element exerts a corresponding sealing action, which prevents entry of contamination into the inner area of the hood body.

Moreover, the invention also relates to a CBRN protective suit having a balaclava of the aforementioned type, and also to a balaclava and a CBRN protective suit that each have an assigned breathing mask or gas mask.

Further features, advantages and possible uses of the present invention will become clear from the following description of illustrative embodiments with respect to the drawing and from the drawing itself. All of the features described and/or illustrated here, either individually or in any combination, form the subject matter of the present invention, independently of their summary in the claims or their references to other claims.

In the drawing:

Fig. 1 shows a view of a balaclava according to the invention,

Fig. 2 shows a perspective side view of the balaclava from Fig. 1,

Fig. 3 shows a balaclava with a breathing mask or gas mask,

Fig. 4 shows a view of a protective suit with a
5 balaclava,

Fig. 5 shows a perspective view of a sealing element according to the invention, and

10 Fig. 6 shows a plan view of the sealing element according to Fig. 5.

Fig. 1 shows a balaclava 1 which can be used as such or else in combination with a CBRN protective suit 2 shown
15 in Fig. 4. In the embodiment shown in Fig. 4, the balaclava 1 is part of the CBRN protective suit 2. In the illustrative embodiment depicted in Fig. 4, the balaclava 1 is permanently connected to the CBRN protective suit 2 and constitutes the hood of the
20 latter. However, it is also possible that the balaclava 1 can be connected releasably to the CBRN protective suit 2, for example by zip fasteners and/or hook-and-loop fasteners.

25 The balaclava shown in Fig. 1 is moreover designed in such a way that it can be opened at the front via a hook-and-loop connection. When the balaclava is opened in this way, the viewing opening 6 is also fully opened. In an alternative embodiment, the balaclava is
30 closed in its lower area. The hook-and-loop connection 19 is then not provided. Such a balaclava has a lower head opening, through which the user's head has to be inserted. In such an embodiment, it is recommended to provide a closure element, for example in the form of a
35 zip fastener or a hook-and-loop connection, which reaches as far as the lower opening area 9 of the viewing opening 6 but only partially opens the front part of the balaclava. By opening the closure element,

it is possible to enlarge the viewing opening 6 in order to put the balaclava on.

In addition, it will be appreciated that the balaclava
5 1 can in principle also be worn without a CBRN protective suit 2.

The balaclava 1 is provided for use in combination with a breathing mask or gas mask 3, as is shown in
10 particular in Fig. 3. The breathing mask or gas mask 3 has a mask body 4.

Moreover, the balaclava 1 has a hood 5, which is provided with a viewing opening 6. The viewing opening
15 6 is delimited by a border 7. The border 7 thus constitutes the outer edge of the hood 5 or the transition to the viewing opening 6. When the breathing mask or gas mask 3 is being worn, the border 7 is designed to bear on the mask body 4, as is shown in
20 Fig. 3.

The viewing opening 6 as such has an upper opening area 8 and an opposite lower opening area 9. Furthermore, two mutually opposite lateral opening areas 10, 11 are
25 provided. Adjacent opening areas merge directly into each other.

In the balaclava 1 shown, a sealing element 13 is provided on the inside 12 of the hood 5. The sealing
30 element 13 is provided adjoining the border 7 in the area of the lateral opening area 10, 11. The sealing element 13 protrudes over the remaining area of the inner surface of the inside 12 of the hood 5 and also over the border 7, as is shown in particular in Fig. 1.

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When the balaclava is being worn, the sealing element 13 bears flat and in a gas-tight manner on the mask body 4. The sealing element 13 itself is made of an elastic material and preferably has elasto-plastic

properties. This signifies that the sealing element 13 adapts to irregularities of the mask body 4 and lies flat and in a gas-tight manner on the mask body 4. After the breathing mask or gas mask 3 has been taken
5 off, the sealing element 13 returns to its original shape on account of its elastic properties.

In the illustrative embodiment shown, a sealing element 13 is provided on each of the two lateral opening areas
10 10, 11, specifically in the central part of the lateral opening areas 10, 11. This central part constitutes the cheek area 14 of the hood 5.

Instead of having one sealing element 13 for each
15 lateral opening area 10, 11, it would also be possible (not shown here) to provide two sealing elements 13 or a plurality of sealing elements 13. It would also be possible in principle that a sealing element 13 of a lateral opening area 10, 11 or several of these sealing
20 elements extend into the upper and/or lower opening area 8, 9. Furthermore, the one or more sealing elements 13 could also extend circumferentially around the viewing opening 6.

25 The sealing element 13 shown in Figures 5 and 6 is a gel pad, which has a polyurethane gel. This gel pad is produced by casting and has an outer skin.

The sealing element 13 in the present case has a
30 thickness of approximately 1.2 cm, a maximum length L of approximately 9.5 cm and a maximum width B of approximately 4.2 cm. As will be seen from Figures 5 and 6, the sealing element 13 has a stepped configuration 15 at least in some areas along the edge.
35 Only the edge 16 of the sealing element 13 directed toward the border 7 is not stepped.

The sealing element 13 shown in Figures 5 and 6 has in principle an oval shape, in particular an elliptic

shape, with a peripheral stepped configuration 15. On the side directed toward the border 7 when the balaclava is being worn, a part of the basically elliptic sealing element 13 is removed by means of an arc-shaped cut. In the present case, this results in a crescent shape of the sealing element 13, with a profile of the inner edge 16 having the shape in particular of an arc of a circle, which inner edge 16 in the present case is not stepped and instead is designed as a plane surface, in the present case with a height of approximately 1.2 cm. The curvature of the edge 16 directed toward the border 7 can be defined by a radius which, in the embodiment shown in Figures 5 and 6, measures approximately 9 cm. Since it has a profile in the shape of an arc of an ellipse, the edge directed away from the border 7 has a plurality of different radii in sections, all of which, however, are smaller than the radius of curvature of the edge 16 directed toward the border 7.

As will be seen in particular from Fig. 2, the sealing element 13 directly adjoins the border 7. The edge 16 of the sealing element 13 directed toward the border 7 is adapted at least substantially to the profile of the border 7. For this purpose, the sealing element 13 has a crescent shape (Fig. 6), which could also be referred to as ear-shaped.

In the illustrative embodiment shown, the sealing element 13 is sewn onto the inner lining 17 of the hood 5. To secure the sealing element 13 and sew it on, a flexible cover layer 18 is used which is provided on the inner lining 17 above the sealing element 13. The cover layer 18 directly adjoins the border 7. In the area of the sealing element 13, the cover layer 18 is applied free of folds. In the illustrative embodiment shown, the cover layer 18 extends circumferentially about the viewing opening 6. The cover layer is a filter material containing activated carbon.

The border 7 itself is designed as an elastic strip, on the underside of which a sealing coating is provided.

5 In tests carried out in connection with the balaclava 1 according to the invention, a breathing mask or gas mask 3 was fitted onto a dummy upper body with a head. Sensors or measurement transducers were placed in the area of the dummy head and on the mask body 4. The
10 balaclava 1, with sealing elements 13 that were each provided in the cheek area 14 of the two lateral opening areas 10, 11, was then pulled onto the dummy head. The dummy upper body, with the balaclava 1 pulled on, was then placed for 30 minutes in a test chamber.
15 Thereafter, a test gas was introduced into the test chamber, and the gas uptake in the hood 5 of the balaclava 1 was examined via the sensors.

In a parallel test under identical conditions, a
20 balaclava without sealing elements 13 was used. A comparison of the test results revealed that improved sealing results were already obtained in the balaclava 1 according to the invention even when the latter is worn statically.

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Thereafter, the dummy upper body with head was used in a test in which a CBRN protective suit 2 according to the invention with a balaclava 1 was used. The head of this dummy upper body was moved by motor, such that a
30 relative movement took place between the head and the mask 3, connected thereto, and the balaclava 1. The measurement was carried out under the aforementioned test conditions. In a supplementary test with a CBRN protective suit having a balaclava without sealing
35 elements, markedly poorer sealing values were determined after evaluation of the test results.

List of reference signs:

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|----|----------------------------|
| 1 | balaclava |
| 2 | CBRN protective suit |
| 3 | breathing mask or gas mask |
| 4 | mask body |
| 5 | mask hood |
| 6 | viewing opening |
| 7 | border |
| 8 | upper opening area |
| 9 | lower opening area |
| 10 | lateral opening area |
| 11 | lateral opening area |
| 12 | inside |
| 13 | sealing element |
| 14 | cheek area |
| 15 | stepped configuration |
| 16 | edge |
| 17 | inner lining |
| 18 | cover layer |
| 19 | hook-and-loop fastener |

Claims:

1. A balaclava, in particular for a CBRN protective suit or the like, provided for use in combination with a breathing mask or gas mask having a mask body, with a hood having a viewing opening, wherein the viewing opening is delimited by a border, and the border is designed to bear on the mask body when the breathing mask or gas mask is being worn, wherein the viewing opening has an upper opening area and an opposite lower opening area, and also two mutually opposite lateral opening areas, wherein at least one protruding, elastic sealing element for bearing flat and in a gas-tight manner on the mask body is provided on the inside of the hood adjacent to the border in the area of at least one lateral opening area and wherein the edge of the sealing element directed toward the border has the shape of an arc segment and is adapted at least substantially to the profile of the border when the balaclava is being worn, characterized in that the sealing element is designed as a gel pad.
2. The balaclava as claimed in claim 1, characterized in that the edge directed toward the border has the shape of an arc of a circle, and in that, preferably, the radius of the arc is between 5 cm and 15 cm, preferably between 7 cm and 12 cm, and particularly preferably between 8 cm and 10 cm.
3. The balaclava as claimed in claim 1 or 2, characterized in that the edge of the sealing element directed away from the border has the shape of an arc of an ellipse.

4. The balaclava as claimed in one of the preceding claims, characterized in that the lengthwise extent of the sealing element is between 2 cm and 20 cm, preferably between 5 cm and 15 cm, more preferably between 7 cm and 12 cm, particularly preferably between 8 cm and 10 cm, and/or in that the maximum transverse extent of the sealing element is between 1 cm and 12 cm, preferably between 2 cm and 10 cm, more preferably between 3 cm and 7 cm, particularly preferably between 4 cm and 6 cm.
5. The balaclava as claimed in one of the preceding claims, characterized in that the sealing element has an asymmetrical shape with respect to its longitudinal direction.
6. The balaclava as claimed in one of the preceding claims, characterized in that the sealing element has a crescent shape.
7. The balaclava as claimed in one of the preceding claims, characterized in that the sealing element is provided at least in the cheek area of the hood, and/or in that the sealing element extends into the upper and/or lower opening area or in that the sealing element extends circumferentially around the viewing opening.
8. The balaclava as claimed in one of the preceding claims, characterized in that the gel pad has a polyurethane gel and/or is produced by casting and has an outer skin for receiving the gel.
9. The balaclava as claimed in one of the preceding claims, characterized in that the sealing element

is stepped or beveled at least in some areas along the edge.

10. The balaclava as claimed in one of the preceding
5 claims, characterized in that the sealing element directly adjoins the border or is at a distance of up to 1 cm from the border.
11. The balaclava as claimed in one of the preceding
10 claims, characterized in that the sealing element is worked into the inner lining of the hood or is sewn onto the inner lining, and/or in that a flexible cover layer is provided on the outside of the inner lining above the sealing element,
15 and/or in that the cover layer directly adjoins the border or is at a distance of up to 1 cm from the border.
12. The balaclava as claimed in one of the preceding
20 claims, characterized in that the cover layer is applied free of folds in the area of the sealing element, and/or in that the cover layer has a filter material containing in particular activated carbon.
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13. The balaclava as claimed in one of the preceding
claims, characterized in that the cover layer extends at least substantially about the
30 circumference of the viewing opening.
14. A CBRN protective suit having a balaclava as
claimed in one of the preceding claims.
15. The balaclava as claimed in one of the preceding
35 claims or CBRN protective suit as claimed in claim 14, with a breathing mask or gas mask.