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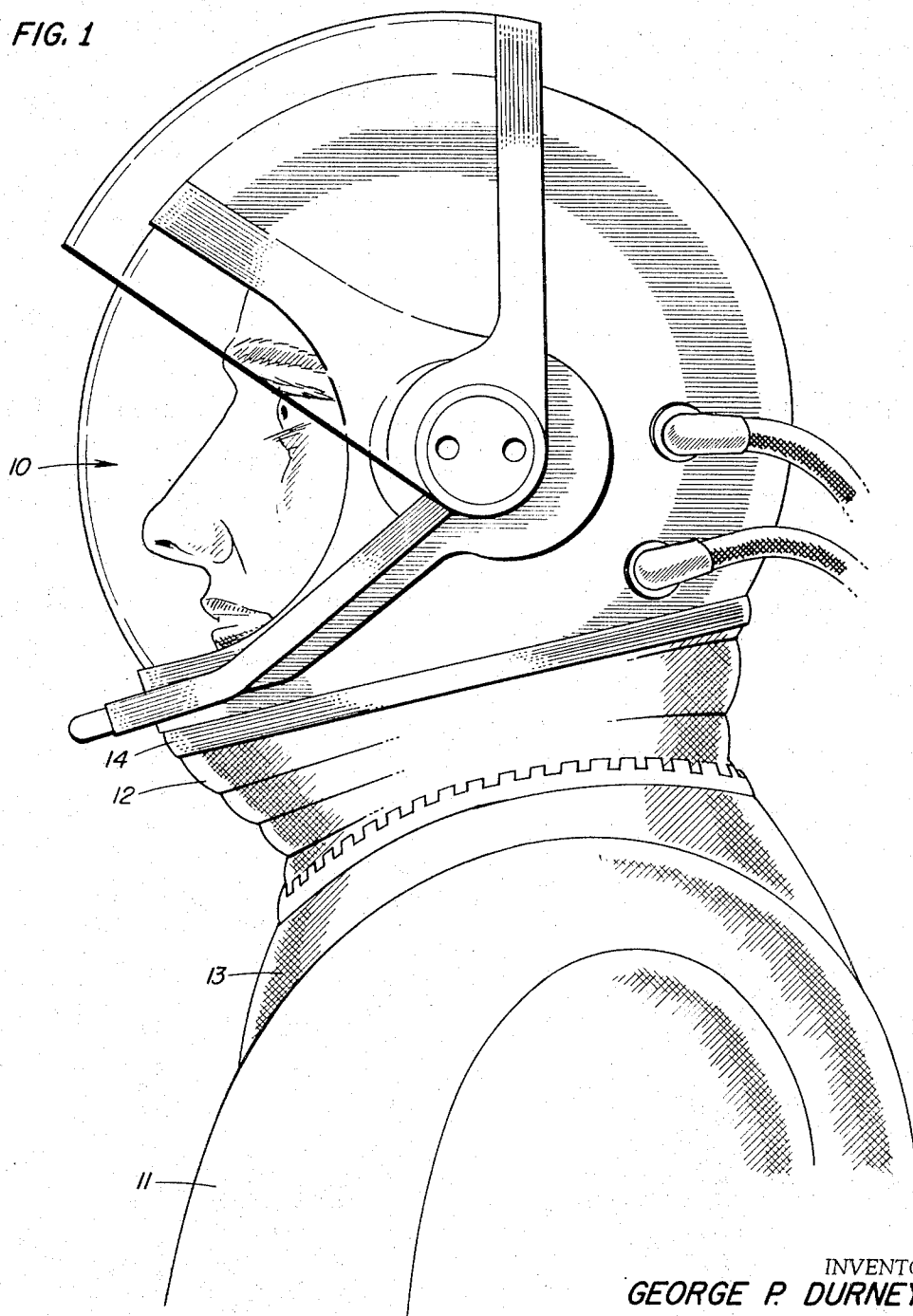
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SHOULDER SEAL BETWEEN A PROTECTIVE SUIT AND HELMET

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2 Sheets-Sheet 1

FIG. 1



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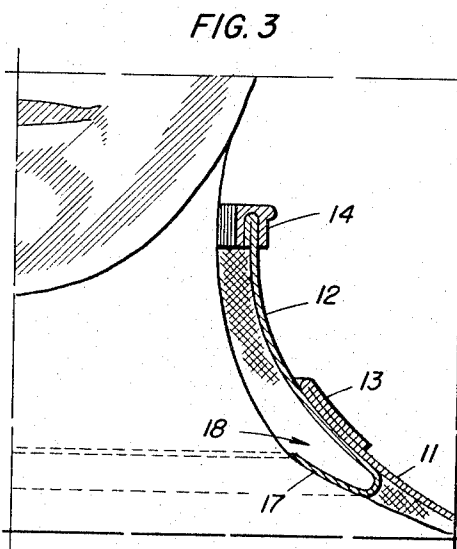
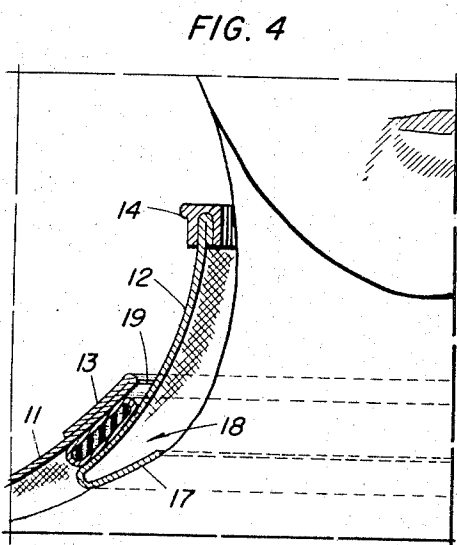
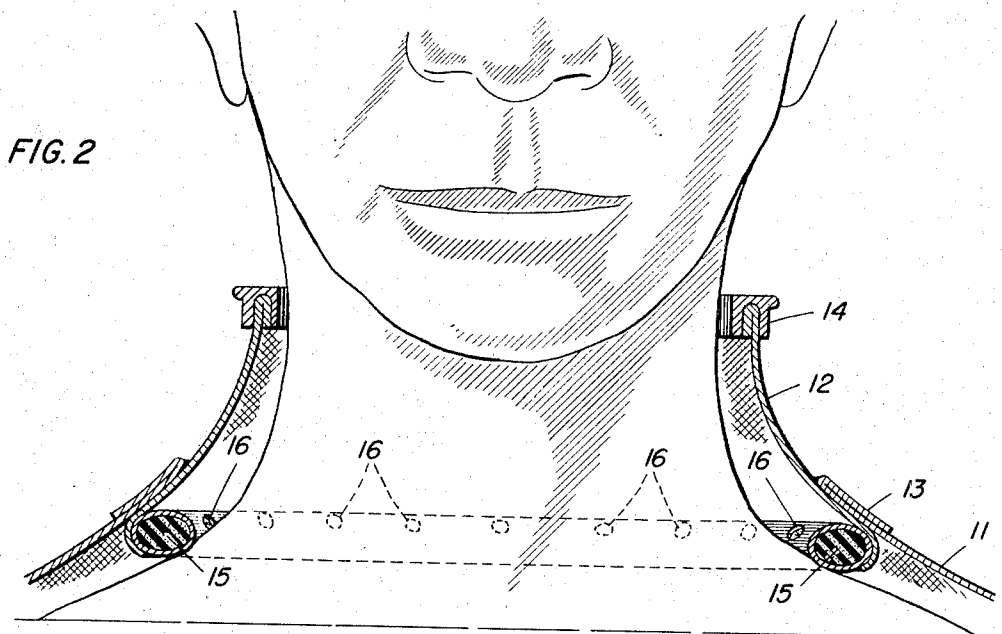
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2 Sheets-Sheet 2



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## SHOULDER SEAL BETWEEN A PROTECTIVE SUIT AND HELMET

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### ABSTRACT OF THE DISCLOSURE

An oxygen-type seal between an aviator's helmet and his flying suit, the closure being made by an expandable seal which is inflated by the oxygen pressure within the helmet, the seal expanding between a reinforced collar on the flying suit and the wearer's shoulders. The expandable seal is located on the helmet in the area of the lower neck rather than up around the face.

This invention relates to aviator's pressurized suits and helmets and more particularly to improvements in structure for sealing the helmets and attached neck portions thereof.

The modern aviator's physiological protective system comprises a coverall portion with a pressurized system included therein, which covers the wearer's body up to his neck, to enable the body to withstand the high external forces imposed by high speed and high altitude flight and a helmet with attached neck section. In order to provide the aviator with breathing oxygen, the helmet must be pressurized by the breathing oxygen and this portion sealed off from the rest of the suit. In common use today are two general types of sealing methods. A first method of sealing the breathing oxygen portion of the flight gear provides a seal which fits about the wearer's face and is pulled snug by means of straps or wires. A second common system employs a seal in the neck section attached to the helmet, said seal merely being a restriction about the neck of the wearer to separate the helmet portion into which the breathing oxygen is piped from the rest of the suit. The obvious disadvantage of the two above-noted systems is that they are uncomfortable to wear and tend to foster a discontent with the entire suit system.

In the system of the present invention the pressure seal between the helmet portion and the suit portion of the flight gear is placed around the wearer in the area where his neck joins his body rather than around his neck proper or around his face. To accomplish this, the neck section which is attached to the helmet terminates at the lower end in a seal of the type which expands and seals by the use of the pressurized breathing oxygen in the helmet portion. This expanding seal coacts with a ring on the upper edge of the chest portion of the flight suit. The result of this coaction is a seal which presses on the outside against the ring in the flight suit and on the inner side expands to press against the wearer's body, thus forming a tight seal between the helmet and the flight suit.

An object of the present invention is to provide a new and improved seal for the helmet and neck portion of an aviator's flight gear.

A further object of the present invention is to provide a sealing means for the helmet and neck portion of an aviator's flight gear which is more comfortable to the wearer and more efficient in operation.

Another object of the present invention is to provide a sealing means for the head and neck portions of a flight helmet which utilizes the pressure in the helmet to promote efficient sealing.

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Other objects, advantages and novel features of the invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings wherein:

FIG. 1 is an overall view of the physiological protection system incorporating the invention;

FIG. 2 is a cross-sectional view of the seal of the invention;

FIG. 3 is a cross-sectional view of an alternative embodiment of the seal; and

FIG. 4 is a cross-sectional view of a third embodiment of the seal of the invention.

The present invention is meant to be used with the standard aviator's physiological protective system, the upper portion of which is shown in FIG. 1. This protective system consists of a rigid shell helmet 10 which has a clear visor on the forward portion and into which breathing oxygen is supplied. The aviator also wears a protective coverall or flight suit 11, which encompasses his body up to the neck and contains the standard system for protecting the body against the forces imposed by high speed and high altitude flight. Attached to the lower portion of the helmet is the neck section of the protective uniform which is sealingly connected to the helmet. This neck portion 12 terminates at the lower end with a seal which cooperates with reinforced collar 13 of flight suit 11 and the shoulders of the wearer to seal off the helmet and neck section of the protective suit in order to hold the breathing oxygen therein. It is with this sealing means that the present invention is concerned.

The position of the seal in relationship to the suit 11 and the wearer's body is shown more clearly in FIG. 2. It is seen that the suit 11 terminates at the upper end in a reinforced collar 13 which completely encircles the lower neck portion of the wearer. The flight helmet 10 terminates at its lower end at a collar 14 to which is attached the neck section 12. This neck section 12 has the sealing means at its lower end. A preferred embodiment of the sealing means is shown in FIG. 2 and comprises a sponge filled seal which has a plurality of holes 16 on the inner portion thereof communicating with the breathing oxygen portion of the helmet. Therefore, as the breathing oxygen pressure is communicated through holes 16, it will cause the sponge-filled seal 15 to expand and press against reinforced collar 13 of the flight suit and the wearer's shoulders, thus providing a tight seal between the helmet portion and the lower portion of the physiological protective system.

An alternative embodiment of the present invention is shown in FIG. 3. In this embodiment a type of seal known as an inverted lip seal is used instead of the sponge filled seal of FIG. 2. In this inverted lip seal 17 the outer surface presses against and cooperates with reinforced collar 13 of the flight unit while the air pressure acting at 18 causes the lower portion of the seal to be spread apart and press against the wearer's shoulders thereby tightly but comfortably sealing the wearer's body and the flight suit.

In FIG. 4 another embodiment of the present invention is illustrated. In this concept the inverted lip seal of FIG. 3 is used but a sponge rubber pad 19 is added. A sponge rubber pad 19 is placed on the outer side of inverter lip seal 17 and it is this pad which will contact reinforced collar 13. The inverted lip seal 17 functions as stated above, i.e., the air pressure from the helmet section acting at 18 forces the two parts of the seal apart, the inner portion then contacting the wearer's shoulders and the outer portion forcing sponge pad 19 against the reinforced collar 13 to complete the seal.

It is therefore seen that by use of the present inven-

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tion a much more comfortable and more efficient seal is provided for the aviator's physiological protective system. The seal fits about the body at a point which lends itself well to cooperating with the seal and at which the slight constrictive action of the seal will not be uncomfortable to the wearer. Furthermore, sealing is accomplished not by the lacing or otherwise fastening of a constrictive means, but by the action of the breathing oxygen pressure in the helmet. This provides a constant comfortable sealing pressure which is placed on the seal at all times without worry by the wearer. As for the operation of the present device, it is obvious and simple. The seal connected to the neck portion of the helmet is donned with the helmet and the rigid collar 13 of the flight suit is placed thereover. The only operation necessary to accomplish the sealing is the pressurizing of the helmet and neck portion by the supply of breathing oxygen. The seal will remain effective as long as pressure is placed on the sealing area by action of rigid collar 13 and the pressurized gas is present in the seal itself.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. In a physiological protective system the combination of

a protective coverall which covers the torso of the wearer's body and which terminates at the wearer's neck in a reinforced collar;

a helmet having a neck ring, means for supplying breathing oxygen into the helmet;

a neck section attached to said neck ring, said neck section terminating in a shoulder seal means, said shoulder seal means fitting inside said reinforced collar and arranged to expand outwardly against the reinforced collar, said shoulder seal being adapted to rest on the wearer's shoulders;

whereby the coaction of said shoulder seal means, said reinforced collar, and the wearer's shoulders provides gas sealing means for said helmet and said neck section.

2. The combination of structure of claim 1 and further wherein said shoulder seal means comprises a sponge-filled expansion element, said element having openings which are in communication with said neck section;

whereby the pressure created in the helmet by the supply of breathing oxygen thereto will be communicated to the inside of said expansion element, causing expansion against said reinforced collar and the wearer's shoulders to form a seal.

3. The combination of structure of claim 1 and wherein said shoulder seal means comprises

an inverted lip type expansion seal having an opening toward and in communication with said neck section;

whereby the pressure created in said helmet by the breathing oxygen supplied thereto is communicated to said inverted lip seal causing said inverted lip seal

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to expand outwardly against said reinforced collar and inwardly against the wearer's shoulders.

4. The combination of structure of claim 1 and wherein said shoulder seal comprises a sponge pad outwardly of and attached to said lip seal whereby upon expansion outward of said lip seal said sponge pad engages and cooperates with said reinforced collar.

5. In combination with an aviator's physiological protection system including a protective coverall, a helmet, means for supplying breathing oxygen to the helmet and a neck section attached to said helmet, a sealing means for containing the oxygen in said helmet and said neck section comprising

a reinforced collar attached to the upper portion of said protective coverall;

an expansion seal attached to the lower portion of said neck section and coacting with the inner surface of said reinforced collar and adapted to rest on the wearer's shoulders, said expansion seal having openings therein in communication with said neck section;

whereby the pressure of the breathing oxygen supplied to said helmet and said neck portion will be communicated to said expansion seal, causing said seal to expand outwardly against said reinforced collar and inwardly against the wearer's shoulders.

6. The combination of structure of claim 5 and further wherein said expansion seal comprises

a sponge-filled tube having said openings,

whereby the pressure of the breathing oxygen from within said neck section causes said sponge-filled tube to expand outwardly against said reinforced collar and inwardly against the wearer's shoulders to form a seal.

7. The combination of structure of claim 1 and wherein said shoulder seal further comprises

an inverted lip type expansion seal having an opening toward and in communication with said neck section;

whereby the pressure created in said helmet and said neck section by the breathing oxygen supplied thereto is communicated to said inverted lip seal, causing said seal to expand outwardly against said reinforced collar and inwardly against the wearer's shoulders.

8. The combination of structure of claim 7 and wherein said lip seal further comprises

a sponge pad outwardly of and attached to said lip seal;

whereby upon expansion outward of said lip seal said sponge pad engages and cooperates with said reinforced collar.

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