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[54] VENTILATION DEVICE

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[52] **U.S. Cl.** **98/2.12**

[51] **Int. Cl.** **B60h 1/24**

[58] **Field of Search** 98/2.12, 2.13, 88, 98/89, 93, 95, 96, 97, 98, 99

[56] **References Cited**

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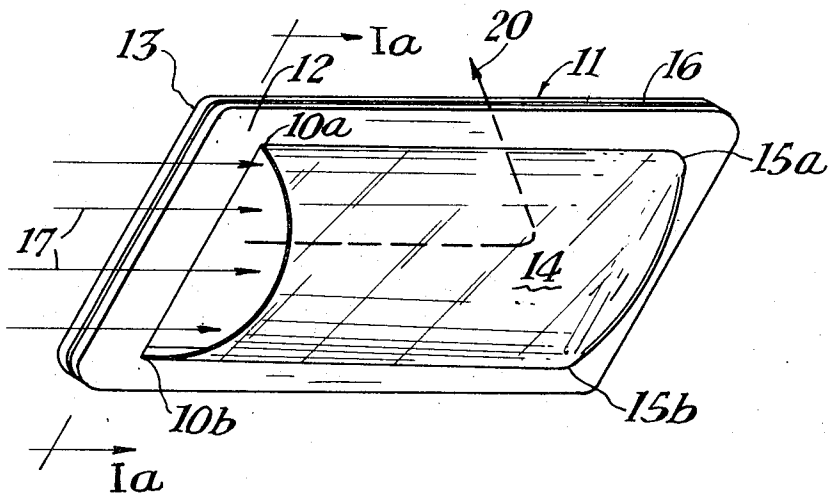
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Primary Examiner—Meyer Perlin
Attorney—H. A. Williamson

[57] **ABSTRACT**

This invention relates to a ventilation device which may be used in an aircraft window and which has an outer rigid portion peripherally surrounding at least a portion of an inner flexible portion and physically connected thereto. The inner flexible portion has at least one portion thereof having a lineal physical dimension greater than the distance between first points on the outer rigid portion where the flexible portion physically connects at the first points on the outer peripheral rigid portion. The inner flexible portion has a second portion thereof having a lineal physical dimension substantially equal to the distance between second points on the outer rigid portion where the flexible portion connects to the outer rigid portion. This structure thereby forms a flexible fluid medium ventilation device whenever the flow of the fluid medium is in the direction of the second points from the first points.

11 Claims, 10 Drawing Figures



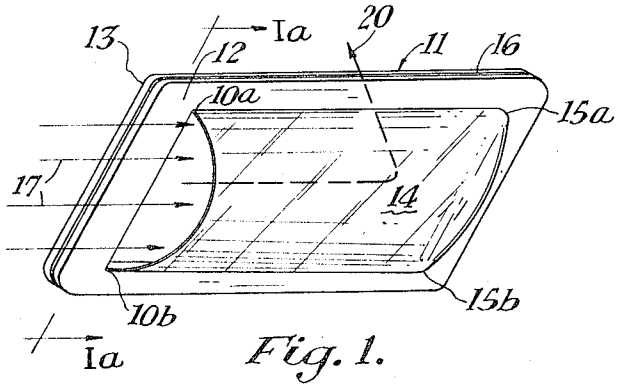


Fig. 1.

Fig. 2.

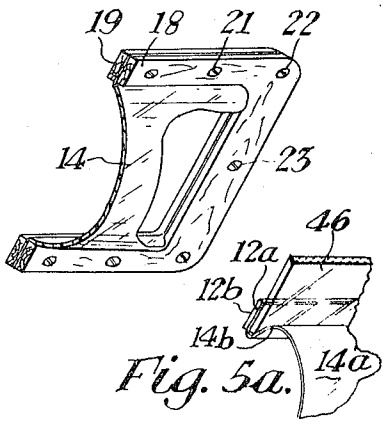


Fig. 5a.

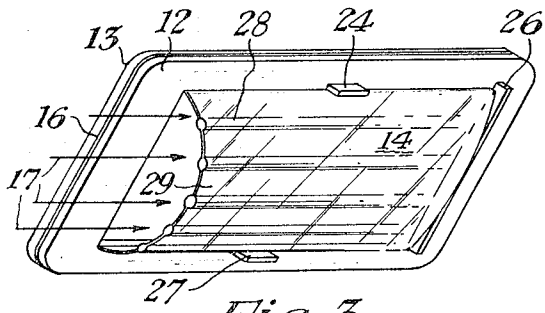


Fig. 3.

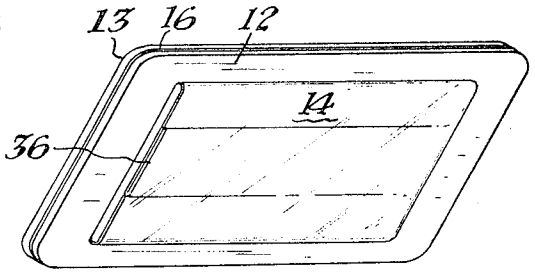


Fig. 4.

Fig. 5.

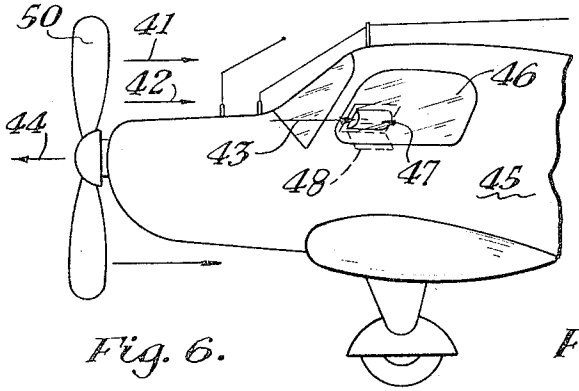


Fig. 6.

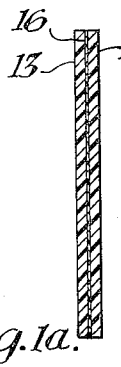
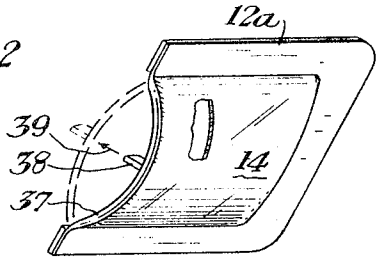


Fig. 1a.



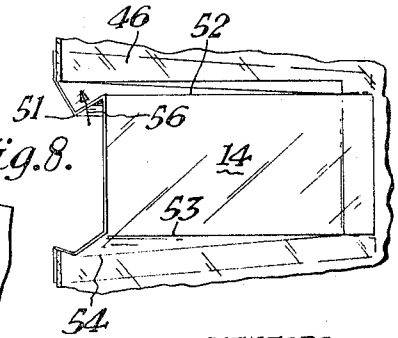
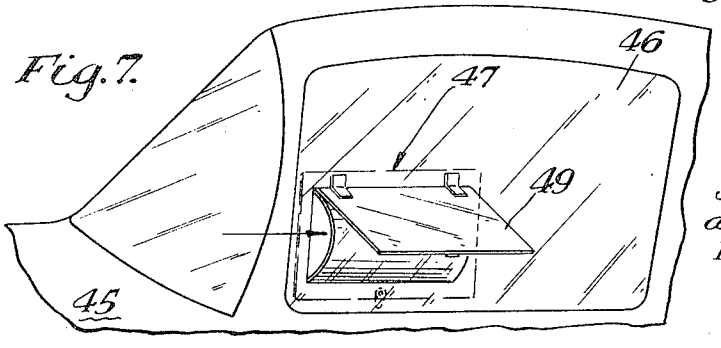


Fig. 8.

Fig. 7.



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VENTILATION DEVICE

This invention relates to a ventilation device for use in an environment where there is a flow of a fluid medium past the ventilation device, primarily in one direction.

More specifically, this invention relates to a ventilation device which has an outer rigid portion peripherally surrounding at least a portion of an inner flexible portion and physically connected thereto. The inner flexible portion has at least one portion thereof having a lineal physical dimension greater than the distance between first points on the outer rigid portion where the flexible portion physically connects at the first points on the outer peripheral rigid portion. The inner flexible portion has a second portion thereof having a lineal physical dimension substantially equal to the distance between second points on the outer rigid portion where the flexible portion connects to the outer rigid portion. This structure thereby forms a flexible fluid medium ventilation device whenever the flow of the fluid medium is in the direction of the second points from the first points.

In the field of aviation, especially that which is directed toward intermediate priced craft for use in private or small commercial operations, there has been an ever present need for ventilation of the air craft's cabin especially when taxiing and waiting for clearance to take off. The time spent taxiing and waiting for a visual clearance or control tower approval for takeoff provides an especially acute problem in the summer months or even in winter months when the sun's rays pass through the plastic glass of the cockpit and the infrared portion of the sun's rays becomes trapped within the cabin. Some small aircraft usually have only but a single small window which normally opens in a direction toward the inside of the cockpit or cabin. Little, if any, relief from the heat is afforded the occupant or occupants of the cockpit cabin area since the slip stream of air passing the window of the aircraft creates a lower pressure outside the cockpit, and with few, if any, openings in the aircraft outside of the slip stream or ground air created by propeller backwash or taxiing, there is little air circulation present.

To this problem that has existed for years the invention to be described hereinafter provides a solution to the cabin or cockpit ventilation problem with such stunning simplicity as to set it in the arena of those intellectual creations which merit the dignity afforded by the issuance of a patent.

A primary object of this invention is to provide a portable ground air ventilation air scoop for use in an aircraft window which includes a rigid portion which is positioned at a window of the aircraft and which air scoop has an inner flexible portion which extends outside of the aircraft window and is drawn into this position by a pressure differential between the aircraft cabin and the outside air which moves past the window as a result of aircraft movement and the presence of air near the ground during taxiing or by the passage of air created by propeller backwash.

It is therefore a further object of this invention to provide an improved fluid medium ventilation device which utilizes a rigid portion and a flexible portion, the flexible portion providing a fluid medium scoop device which redirects the fluid medium and thereby provides a ventilation device.

Another object of this invention is to provide a portable ventilation device having an outer rigid portion and an inner flexible portion which allows the inner flexible portion to be folded upon itself in substantially a plane containing the outer rigid portion to thereby provide a relatively flat, easy to store, and therefore a readily portable ventilation device.

Still yet another object of this invention is to provide a ventilation device having a flexible inner portion which has integral therewith at least one structural reinforcing region to provide for physical stability during the passage of the fluid medium into the ventilation device while resisting structural flexure from forces directed by the fluid medium coming from directions other than directly into the ventilation device.

In the attainment of the foregoing objects the preferred embodiment of the invention provides for a portable ground air ventilation scoop in combination with an aircraft window. The air scoop is readily installable in the aircraft window and provides ventilation when there is a flow of air past the ventilation device primarily in one direction. The air scoop has an outer rigid portion peripherally surrounding at least a portion of an inner flexible portion and physically connected thereto. The outer rigid portion has an outer physical dimension greater than the opening created by the aircraft window. The inner flexible portion has at least one portion which has a lineal physical dimension greater than the distance between first points on the outer rigid portion where the flexible portion connects the first points on the outer rigid portion. In addition, the flexible inner portion has at least a second portion thereof which has a lineal physical dimension substantially equal to the distance between second points on the outer rigid portion where the flexible portion connects to the outer rigid portion to thereby form a ground air ventilation device whenever the flow of air is in the direction of the second points from the first points.

Other objects and advantages of the invention will become apparent from the ensuing description of illustrative embodiments thereof, in the course of which reference is had to the accompanying drawings in which:

FIG. 1 illustrates a three-dimensional preferred embodiment of the invention.

FIG. 1*a* is a cross section taken along the lines 1*a*—1*a* in FIG. 1.

FIG. 2 depicts a partial cross section of another embodiment of the invention which shows a different configuration arrangement.

FIG. 3 sets forth a three-dimensional illustration of another embodiment of the invention.

FIG. 4 shows a preferred embodiment of the invention in its folded or in a readily portable configuration.

FIG. 5 illustrates a three-dimensional view of still yet another embodiment of the invention.

FIG. 5*a* illustrates a portion of another configuration of the invention along the lines 1*a*—1*a* in FIG. 1.

FIG. 6 illustrates the preferred embodiment of the portable ground air scoop ventilation device in use in an aircraft window which opens inwardly.

FIG. 7 illustrates the preferred embodiment of the portable ground air scoop ventilation device in use in an aircraft window which opens outwardly.

FIG. 8 is an illustration of a highly useful configuration of an air scoop.

Reference is now made to FIG. 1, in which there is depicted a preferred embodiment of the invention where there is illustrated a fluid medium depicted by the arrow 17 passing from left to right, as FIG. 1 is viewed. The ventilation device is fabricated of what is basically an outer rigid portion 11 and an inner flexible portion 14. The utility of the rigid outer portion 11 and its cooperation with the flexible inner portion 14 will be explained in more detail hereafter. Basically this figure depicts a construction in which the outer rigid portion 11 is comprised of a first rigid element 12 and a second rigid element 13 which have sandwiched therebetween a portion of the flexible inner portion 14 designated by reference numeral 16. This lamination, as it is to be referred to, of two outer rigid portions plus a portion of the flexible inner portion 14 is best shown in FIG. 1*a* where the cross-section has been taken through the left-hand end of the ventilation device depicted in FIG. 1. It should be understood that the material utilized for the outer rigid portions 12 and 13 may be of a rigid plastic, and the inner flexible portion 14 may also be of a plastic of any suitable type of sufficient strength to withstand the pressures that are incurred by the passage of the fluid medium 17 into the air ventilation device. When the outer rigid portion is a plastic and the inner flexible portion is also plastic, the entire outer rigid assembly may be heat treated as in the case of thermoplastic materials, and the outer rigid portion, as shown in FIG. 1*a*. This will form a unitized peripheral structure that totally encompasses the inner flexible portion 14.

Basically, the physical dimensions of the flexible inner portion 14 are such that between first points 10*a* and 10*b*, the flexible inner material of inner portion 14 has a lineal distance measured along its surface that is greater than the distance between the first points 10*a* and 10*b*. At the right-hand end of the ventilation device there are second points 15*a* and 15*b* where the lineal dimension of the flexible inner portion 14 is selected to be substantially equal to the distance between the points 15*a* and 15*b*. When there is a passage of the fluid medium from left to right, as depicted here, it will become apparent that the flexible inner portion will tend to billow and fill with the fluid medium, and because of the dimensions stated with reference to the opening and of the ventilation device, between the points 10*a* and 10*b*, the fluid medium is compressed and redirected, as is shown by the dotted arrow 20 seen through what is depicted here as a translucent inner flexible portion. In the case here illustrated it may be any gas, or in its latter usage to be described hereafter, the fluid medium is air. The arrow 20 represents the passage of the fluid medium from an outer area to an inner area (not shown in detail). The rigid outer portion 11 is designed to fit up against an opening in any physical environment in which the flow of the fluid medium is primarily in the direction just noted above. It may be in a window, or in the alternative, it may be in a pipe, other conduit or passageway in which the gas or fluid medium movement is primarily in one direction. Accordingly, this device, as presently shown in FIG. 1, remains in its fully inflated condition as shown, as long as there is a flow of the fluid medium into and between the outer rigid portion and the flexible inner portion 14.

FIG. 2 illustrates another method of construction which is contemplated as being equally suitable for the constructing of a ventilation device of the type here under discussion. In this case the outer rigid portions 18 and 19 are made of fiber or, as depicted here, wood, and are secured together by wood screws 21, 22 and 23 with a portion of the flexible inner portion 14 sandwiched therebetween, as shown in this illustration presented in FIG. 2. The outer rigid portions may be selected from any material such as plastic, wood, fiber, metal, or glass.

Reference is now made to FIG. 3 in which there is depicted a similar ventilation device as that shown in FIG. 1 but with additional features that may be necessary when present in certain environmental conditions. In this figure, were applicable, the same reference numerals used in FIG. 1 will also apply. The principal difference in the embodiment of FIG. 3 is the utilization of reinforcing region elements 28 and 29 of which there are depicted a plurality. These rigid regions may be formed within the inner flexible portion 14 by the lamination of small rods in the direction depicted between two thin portions of flexible inner material here shown as a translucent plastic. It will be understood, of course, that when reference is made to flexible inner portions and the use of plastic as a potential material, it should be recognized that any suitable flexible material susceptible of flexure may be employed in the ventilation scheme here under discussion.

These reinforcing regions 28 and 29, or elements as they may be called, allow for the situation when the fluid medium depicted by arrow 17 is not the only or predominant pressure or moving mass in which the ventilation device is utilized. Therefore, should a direct blast of gas or the fluid medium come from some other direction than that depicted by the arrow 17, there would tend to be a flexure of the inner portion 14 which might tend to collapse or deform the opening of the ventilation device at the entry end where the arrow 17 is directed, thereby reducing the efficiency of the ventilation unit here under discussion. Accordingly, these reinforcing regions may be provided to maintain physical stability.

There is also depicted in FIG. 3 a number of flange elements 24, 26 and 27 whose dimensions and purpose are as follows. The dimensions of the flanges 24 and 27 need only be sufficient to ensure that when the ventilation device is pressed into an opening the flanges 24 and 27 extend into the openings and provide a means of securing the outer rigid portion to the opening into which the ventilation device is installed. It is apparent that the forces brought about by the entry of the fluid medium 17 will have a tendency to cause the entire ventilation device to shift its position to the right. To remedy this there may be provided a flange element 26 which also would be dimensioned such that it would fit within the opening to which the ventilation device of FIG. 3 were inserted, thereby providing an inherent barrier to lateral movement in the direction depicted by the fluid medium arrow 17. This would afford stability to the ventilation device should the pressure created by the passage of the fluid medium 17 be so great as to cause the entire ventilation device to slip within the opening.

FIG. 4 sets forth the preferred embodiment of the ventilation device depicted in FIG. 1, with the inner flexible portion folded as shown by the reference numeral 36 to provide a substantially flat package which is readily portable and easily stored as its dimension would be little greater than the total thickness of the

two outer rigid portions **13** and **16.** This storage capacity and its portability are significant attributes of this improved ventilation scheme.

FIG. **5** represents still yet another embodiment of the invention. No reference numerals have been used to designate the outer rigid portions but in this embodiment it is clearly shown that the outer portion **12***a* need only surround a portion of the periphery of the inner flexible portion **14.** In this FIG. **5** the outer rigid portion **12***a* has a U-shape and provides a lighter and somewhat less bulky ventilation device. It will be noted in this embodiment the inner flexible portion **14** is only physically secured to a single outer rigid portion. The physical connection of the inner portion to the outer portion may be by means of an adhesive or other physical attachment technique. In addition to this aspect it includes a resilient reinforcing region **37** which extends across the open end of the U-shaped outer rigid portion **12***a*. This resilient reinforcing region or element **37** may in practice be any encapsulated metal spring-like element that may have secured thereto a manual actuating tab **38.** It can be readily appreciated that pulling the tab **38** in the direction of the arrow **39** would cause the inner flexible portion, which is held at its opening end in position because of the resilient nature of the portion **37** in an outward open position, to flex when pulled by the tab **38** into an inwardly directed position shown by the dashed line in the direction of the arrow **39.** Accordingly, this provides and further secures in a different manner two basic functions, one, to hold the ventilation device and its inner flexible portion in a firm but continuously flexed open position; and two, simultaneously affording the user of the ventilation device a tab **38** upon which he may manually pull the inner flexible portion away from the passage of the fluid medium entering the ventilation device and thereby prevent further ventilation while he is in the process of removing the ventilation device of FIG. **5** from the window or opening into which it has been inserted.

In FIG. **5***a* there is shown a slightly different configuration embodying the invention where in this case the outer rigid portion **12***a* may be of a type of plastic which has been made relatively rigid either by making it thicker than the inner flexible portion **14***a* or by securing it to another more rigid plastic portion **12***b* by any suitable means. In this configuration the air scoop is merely placed in the window and when filled with and inflated by incoming air the flexible inner portion **14***a* balloons, so to speak, and a portion **14***b* of flexible inner portion **14***a* presses against the outer surface of window **46,** a portion of which window is illustrated here. This pressing aids in securing the air scoop to the plane window **46,** thereby holding the entire air scoop in position.

Turning now to FIG. **6,** there is illustrated the preferred embodiment of the ventilation device shown utilized in a manner most contemplated. From the figure it is apparent that the aircraft **45** has a side window **46,** which aircraft window **46** has in turn an inwardly opening window here shown in dashed outline by reference numeral **48.** Inserted in the window is an air ventilation device which will be referred to in this aircraft embodiment as an air scoop, and which air scoop serves the very important function of providing ventilation to the cabin of the aircraft while the aircraft is taxiing in the direction of the arrow **44** or, in the alternative, when the aircraft is sitting and the only air flow movement is caused by the propeller **50** which directs a flow of air as shown by the arrows **41, 42** and **43** backward toward the aircraft front window and past the side window **46** of the aircraft. As the air passes the side of the aircraft window **46** there is experienced a differential in pressure from within the cabin and that outside the cabin. As the air passes the window this differential causes the inner flexible portion of the air scoop to billow into its open position, as shown in this figure, and allow the passage of the onrushing air **43** into the cockpit where the pilot and passengers are afforded the comfort of circulating air while taxiing or waiting for takeoff.

FIG. **7** depicts another environment in which the air ventilation scoop **47** is positioned in the aircraft window **46** and which window **46** has an outwardly opening window **49.**

Reference is now made to FIG. **8** in which there is depicted in three-dimensional form another highly advantageous configuration of an air scoop embodying the invention. As noted earlier the inner flexible portion **14** is present but the plastic has preset creases **51, 52, 53** and **54** that are substantially longitudinal of the inner flexible portion **14.** This allows for ready folding as shown by directional arrow **56.**

It is therefore seen that this invention provides for a ventilation device uniquely adaptable for aircraft usage which by its very simplicity of construction will afford an advantageous circulation of air to a hithertofore restricted area of aircraft and will greatly enhance pilot and passenger comfort during taxiing and before takeoff.

Having thus described our invention, what we claim is:

1. A portable ground air ventilation scoop in combination with an aircraft window and for ready insertion in said aircraft window when there is a flow of air past said ventilation device primarily in one direction, said combination comprising,

a. said portable ground air ventilation scoop having an outer rigid portion peripherally surrounding at least a portion of an inner flexible portion and physically connected thereto, said outer rigid portion having an outer physical dimension greater than the opening created by said aircraft window,

b. said inner flexible portion having at least one portion thereof having a lineal physical dimension greater than the distance between first points on said outer rigid portion where said flexible portion connects at said first points on said outer peripheral rigid portion, said flexible inner portion having a degree of flexibility sufficient to allow the flexible portion to fold upon itself in substantially a plane containing said outer rigid portion to thereby provide a flat, easy to store, and readily portable ventilation device.

2. The portable air ventilation scoop of claim **1,** wherein said inner flexible portion has at least a second portion thereof having a lineal physical dimension substantially equal to the distance between second points on the outer rigid portion where said flexible portion connects to said outer peripheral rigid portion to thereby form a ground air ventilation device whenever said flow of air is in the direction of said second points from said first points.

3. The portable air ventilation scoop of claim **2,** wherein said peripheral portion circumferentially surrounds said flexible inner portion.

4. The portable air ventilation scoop of claim 1, wherein said peripheral portion circumferentially surrounds said flexible inner portion.

5. The portable air ventilation scoop of claim 1, wherein said outer rigid portion is comprised of two units with at least a portion of said flexible inner portion interposed therebetween and mutually connected to said two units to provide an integral outer rigid portion

6. The portable air ventilation scoop of claim 1, wherein said flexible inner portion has integral therewith structural reinforcing regions to provide for physical stability during the passage of air from said first point toward said second point while resisting structural flexure from forces directed by air movement coming from different directions.

7. The portable air ventilation scoop of claim 1, wherein positioned and integral therewith on said outer rigid peripheral portion is at least one flange element that protrudes into the window opening thereby enhancing the positioning and retention of said portable air ventilation scoop in said aircraft window.

8. The portable air ventilation scoop of claim 1, wherein said flexible inner portion has integral therewith a structural reinforcing region of a resilient nature such that said resilient reinforcing region is located substantially and integral with said inner flexible portion between said first point on said outer peripheral rigid portion.

9. The portable air ventilation scoop of claim 1, wherein said inner flexible portion has an integrally connected tab portion means located on an inner surface of said flexible portion to allow the manual withdrawal of said flexible portion into and through said outer peripheral portion.

10. A ventilation device for use in an environment where there is a flow of a fluid medium past said ventilation device primarily in one direction, said device comprising,

a. an outer rigid portion peripherally surrounding at least a portion of an inner flexible portion and physically connected thereto,

b. said inner flexible portion having at least one portion thereof having a lineal physical dimension greater than the distance between first points on said outer rigid portion where said flexible portion connects at said first points on said outer peripheral rigid portion, said flexible inner portion having a degree of flexibility sufficient to allow the flexible portion to fold upon itself in substantially a plane containing said outer rigid portion to thereby provide a flat, easy to store, and readily portable ventilation device,

said inner flexible portion having at least a second portion thereof having a lineal physical dimension substantially equal to the distance between second points on said outer rigid portion where said flexible portion connects to said outer peripheral rigid portion to thereby form a flexible fluid medium ventilation device whenever said flow of said fluid medium is in the direction of said second points from said first points,

said inner flexible portion also having a number of preset creases which are substantially longitudinal of the inner flexible portion.

11. A ventilation device for use in an environment where there is a flow of a fluid medium past said ventilation device primarily in one direction, said device comprising,

a. an outer rigid portion peripherally surrounding at least a portion of an inner flexible portion and physically connected thereto,

b. said inner flexible portion having at least one portion thereof having a lineal physical dimension greater than the distance between first points on said outer rigid portion where said flexible portion connects at said first points on said outer peripheral rigid portion, said inner flexible portion having a degree of flexibility sufficient to allow the flexible portion to fold upon itself in substantially a plane containing said outer rigid portion to thereby provide a flat, easy to store, and readily portable ventilation device,

said inner flexible portion having an integrally connected tab portion means located on an inner surface of said flexible portion to allow the manual withdrawal of said flexible portion into and through said outer peripheral portion.

* * * * *