PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 :		(11) International Publication Number:
A62B 18/10	A1	WO 91/01159
		(43) International Publication Date: 7 February 1991 (07.02.91)

(21) International Application Number: PCT/CA90/00216

(22) International Filing Date: 11 July 1990 (11.07.90)

(30) Priority data:
605,984 18 July 1989 (18.07.89) CA

(71) Applicant *(for all designated States except US)*: HER MAJESTY THE QUEEN as represented by THE MINISTER OF NATIONAL DEFENCE OF HER MAJESTY'S CANADIAN GOVERNMENT [CA/CA]; 101 Colonel By Drive, Ottawa, Ontario K1A 0K2 (CA).

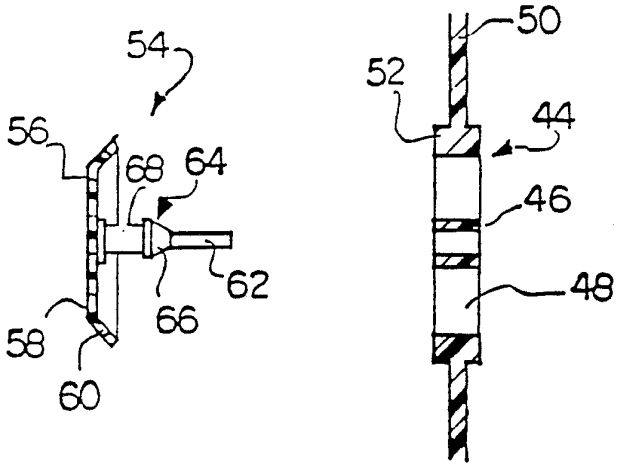
(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: HARRISON, Brian, H. [CA/CA]; 28 Harrison Street, Nepean, Ontario K2H 7N6 (CA). DAVIS, Ronald, E. [CA/CA]; Constance Lake Road, Kanata, Ontario K2K 1X7 (CA).

(74) Agent: ANDERSON, J., Wayne; Directorate of Patent Administration, National Defence Headquarters, 101 Colonel By Drive, Ottawa, Ontario K1A 0K2 (CA).

(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent)*, DK (European patent), ES (European patent), FR (European patent), GB (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), SE (European patent), US.

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: MOLDED NOSECUP VALVE ASSEMBLY



(57) Abstract

In a gas mask, a flexible nosecup is used to prevent humid air that is exhaled from contacting the eye pieces of the mask. The nosecup is equipped with a one-way valve to allow fresh air into the nosecup. The conventional rigid valve body attached to the nosecup is replaced with a valve body (44) molded integrally with the material of the nosecup and a valving element (54) with a concave disk (56) having its rim (60) seated on the annular valve seat (52) of the valve body (44).

* See back of page

DESIGNATIONS OF "DE"

Until further notice, any designation of "DE" in any international application whose international filing date is prior to October 3, 1990, shall have effect in the territory of the Federal Republic of Germany with the exception of the territory of the former German Democratic Republic.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**ES**	Spain	**MC**	Monaco
AU	Australia	**FI**	Finland	**MG**	Madagascar
BB	Barbados	**FR**	France	**ML**	Mali
BE	Belgium	**GA**	Gabon	**MR**	Mauritania
BF	Burkina Faso	**GB**	United Kingdom	**MW**	Malawi
BG	Bulgaria	**GR**	Greece	**NL**	Netherlands
BJ	Benin	**HU**	Hungary	**NO**	Norway
BR	Brazil	**IT**	Italy	**RO**	Romania
CA	Canada	**JP**	Japan	**SD**	Sudan
CF	Central African Republic	**KP**	Democratic People's Republic of Korea	**SE**	Sweden
CG	Congo			**SN**	Senegal
CH	Switzerland	**KR**	Republic of Korea	**SU**	Soviet Union
CM	Cameroon	**LI**	Liechtenstein	**TD**	Chad
DE	Germany, Federal Republic of	**LK**	Sri Lanka	**TG**	Togo
DK	Denmark	**LU**	Luxembourg	**US**	United States of America

MOLDED NOSECUP VALVE ASSEMBLY

FIELD OF THE PRESENT INVENTION

The present invention relates to gas masks and more particularly to the one-way valves used in the nosecups of gas masks.

BACKGROUND

In a gas mask, a nosecup is used to prevent humid air that is exhaled from contacting the eye pieces of the mask and causing fogging problems. A one-way valve is required in the nosecup to allow fresh air in. Current gas masks use a rigid metal valve body crimped onto a hole in the nosecup or a rigid plastic valve body glued into place in a hole in the nosecup. The valving element used with either body is a flat, resilient disk sealing on a flat valve seat on the body.

With the currently used constructions, the valve body must be produced as a separate item and then assembled into the nosecup. The present invention aims at the provision of a valve that is simpler and less expensive to produce.

SUMMARY

According to the present invention there is provided a valve for a flexible nosecup of a gas mask, said valve comprising a valve body moulded integrally

with the nosecup and including a peripheral valve seat substantially thicker than the nosecup, a resilient valving element with a concave configuration and a rim engaging the peripheral seat, and valve mounting means mounting the valving element on the valve seat, and resiliently deforming a centre portion of the valving element towards the valve seat.

By using an integrally molded valve body, the number of parts and cost of production of the valves are significantly reduced. The rubber valve body is configured such that it is relatively rigid compared to the thin wall of the nosecup. Consequently, distortions of the nosecup when it is worn on the face will result primarily in a deflection or distortion of the thin wall of the nosecup itself rather than of the valve body. In the event that the valve body is flexed slightly, the distortion is accommodated by the concave, resiliently deformed valving element without losing the sealing capability of the valve on the valve body.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings, which illustrate a prior art of the valve in an exemplary embodiment of the present invention:

Figure 1 is a side elevation of a gas mask

nosecup, partially broken away to show the valve;

Figure 2 is a front elevation of a prior art valve body;

Figure 3 is a cross-section of a prior art valve;

Figure 4 is a front elevation of a valve body according to the present invention;

Figure 5 is a sectional, exploded view of a valve according to the present invention;

Figure 6 is a sectional view of the valve of Figure 5;

Figure 7 is a view like Figure 6 with the valve body flexed; and

Figure 8 is a view like Figure 7 with the valve body flexed in a double curve.

DETAILED DESCRIPTION

Referring to the accompanying drawings, Figure 1 illustrates a nosecup 10 that is, in use, located within and assembled to a gas mask face piece. The nosecup has an exhaust opening 12 and an inlet valve 14.

A typical prior art inlet valve 14 is illustrated in Figures 2 and 3. The valve consists of a rigid thermoplastic valve body 16 in the form of an annular channel 18. Located centrally within the body 16 is a

hub 20 joined to the channel 18 by four spokes 22. The hub 20 is in the form of a collar with a central bore 24. The nosecup is made from a flexible sheet rubber 28. It is made with a hole into which the valve body 16 fits, with the edge of the hole seated in the annular channel 18 and secured to the valve body by an appropriate adhesive (not illustrated).

On the inner side of the annular channel 18 is an annular rib 30 that serves as a valve seat for a valving element 32. The valving element includes a flat, resilient disk 34 and a stem 36 projecting from the centre of the disk. Part way along its length, the stem has a head 38 with a tapered leading face 40. Between the head and the disk, the stem has a seat 42 of smaller diameter than the maximum diameter of the tapered face 40. The valving element is installed on the valve body by pressing the stem through the bore 24 through the hub 20, resiliently compressing the head 38 until it has passed through the hub and has expanded on the opposite side.

In use, air may pass from the outside of the nosecup, between the seat 30 and the resilient disk 34, when the wearer inhales. On exhalation, the disk 34 is forced against the seat 30 to prevent moist air from

passing from the noseup into the facepiece.

The prior art valve with a metal body is similar to that illustrated in Figures 2 and 3, but with the metal body crimped onto the flexible sheet material 28 of the nosecup.

An embodiment of the present invention is illustrated in Figures 4 through 8. As shown more particularly in Figures 4 and 5, the valve of the present invention includes an annular valve body 44 of molded rubber material with a central hub 46 joined to the valve body by three spokes 48. The valve body 44 is integrally molded with the flexible sheet material 50 of the nosecup, but it is significantly thicker than the material 50 so as to be substantially more rigid. One side of the valve body 44 provides an annular valve seat 52 for engagement with a valving element 54.

The valving element 54 has a concave head 56 with a flat, circular central panel 58 surrounded by an annular rim 60 flaring from the periphery of the centre panel 58 towards the valve seat 52. A stem 62 projects from the centre of the panel 58. It includes a head 64 with a tapered face 66 and a seat 68, all of which correspond to the comparable components of the stem of the prior art valve.

The assembled condition of the valve is illustrated in Figures 6, 7 and 8. As shown in Figure 6, when the valve is assembled, the centre panel 58 is deformed to a dished shape by the engagement of the edge of rim 60 with the valve seat 52. This provides a biasing force engaging the valving element on the valve seat.

As discussed in the foregoing, the flexible sheet material 50 on the nosecup is considerably more flexible than the valve body 44 with its thicker cross-section. Consequently, most flexing of the nosecup will occur in the material 50 because it is the main body of the nosecup. However, it is possible that the rubber valve body will deform as illustrated in Figures 7 and 8. In that case, the pre-stress induced in the valving element 54 by the dishing of the centre panel 58 will bias the rim 60 towards the valve body 44 and keep the edge of the rim 60 in sealing contact with the valve seat 52. Figure 7 illustrates a situation where the valve body 44 is bowed away from the valving element 54, while Figure 8 illustrates an arrangement where the valve body 44 has a double curvature. As shown, in both cases, the rim 60 remains in sealing contact with the valve seat 52.

While one embodiment of the present invention

has been described in the foregoing, it to be understood that other embodiments are possible within the scope of the invention. The invention is to be considered limited solely by the scope of the appended claims.

CLAIMS:

1. A valve for a flexible nosecup of a gas mask, said valve comprising a valve body molded integrally with the nosecup and including a peripheral valve seat substantially thicker than the nosecup, a resilient valving element with a concave configuration and a rim engaging the peripheral seat, and valve mounting means mounting the valving element on the valve seat, and resiliently deforming a centre portion of the valving element towards the valve seat.

2. A valve according to Claim 1 wherein the valve seat is substantially circular.

3. A valve according to Claim 2 wherein the valve body includes a hub located within the peripheral valve seat and a plurality of spokes securing the hub to the seat.

4. A valve according to Claim 3 wherein the valving element comprises a rim portion surrounding the centre portion and projecting therefrom towards the valve seat.

5. A valve according to Claim 4 wherein the valving element centre portion is substantially flat and circular in a relaxed state.

6. A valve according to Claim 5 wherein the valve

securing means deform the centre portion of the valving element to a dished shape.

7. A valve according to Claim 6 wherein the securing means comprise a stem projecting from the centre portion of the valving element and stem engaging means on the valve body.

8. A valve according to Claim 7 wherein the stem engaging means comprise a hub located centrally within the valve seat.

9. A valve according to Claim 8 wherein the hub comprises a collar in which the stem engages.

10. A valve according to Claim 9 including spokes securing the hub to the valve seat.

11. A valve for a gas mask nosecup molded as a flexible, resilient sheet material, said valve comprising a valve body molded integrally with the nosecup and including an annular valve seat substantially thicker than the sheet material, a hub concentric with the valve seat and a plurality of spokes joining the hub to the valve seat, a resilient valving element including a circular centre panel and a substantially frusto-conical rim around the centre panel engaging the valve seat, and a valve stem secured to the centre of the centre panel and to the hub and resiliently deforming the centre panel

to a concave configuration to bias the rim into engagement with the valve seat.

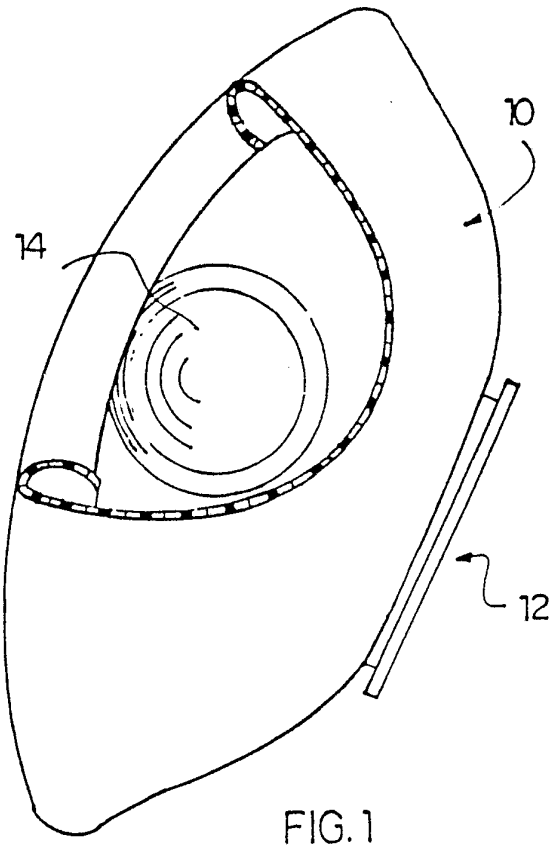


FIG. 1

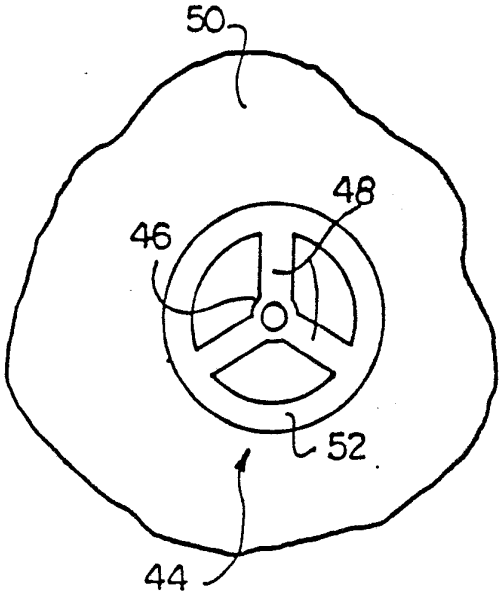


FIG. 4

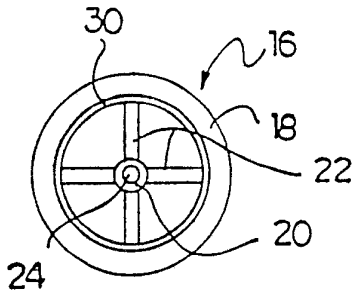


FIG. 2

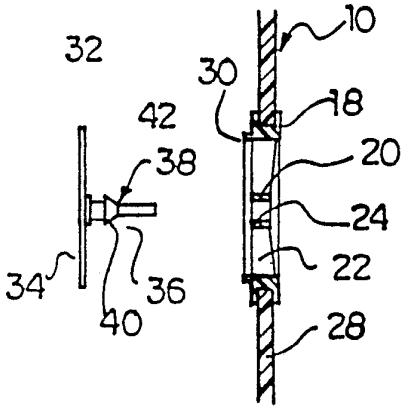


FIG. 3

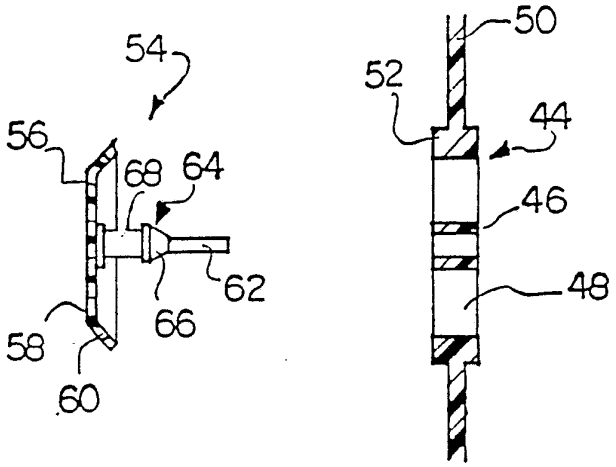


FIG. 5

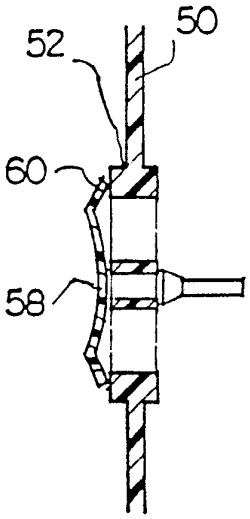


FIG. 6

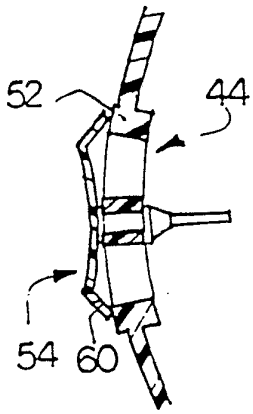


FIG. 7

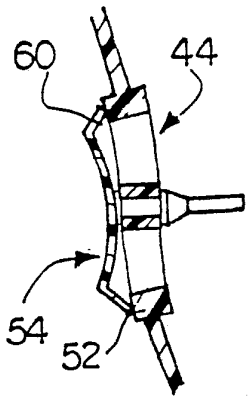


FIG. 8

INTERNATIONAL SEARCH REPORT

International Application No PCT/CA 90/00216

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 A62B18/10

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	A62B

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category °	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
X	US,A,2051023 (BULLARD) 18 August 1936 see the whole document	1-3, 11
Y		4-10

X	US,A,3085591 (SCHNEIDER) 16 April 1963 see the whole document	1-3
A		4-11

Y	EP,A,182550 (AVON) 28 May 1986 see abstract; figure 3	4-10

° Special categories of cited documents :[10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
15 NOVEMBER 1990	6.12.90
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	WALVOORT B.W.

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

PCT/CA 90/00216

SA 37988

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information. 15/11/90

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A-2051023		None		
US-A-3085591		None		
EP-A-182550	28-05-86	AU-B-	588005	07-09-89
		AU-A-	4993685	22-05-86
		CA-A-	1268686	08-05-90
		JP-A-	61131764	19-06-86