Jan. 5, 1937. W. E. WATTERS 2,066,706

RESPIRATORY PROTECTIVE APPARATUS

Filed April 21, 1934

Fig. 1.

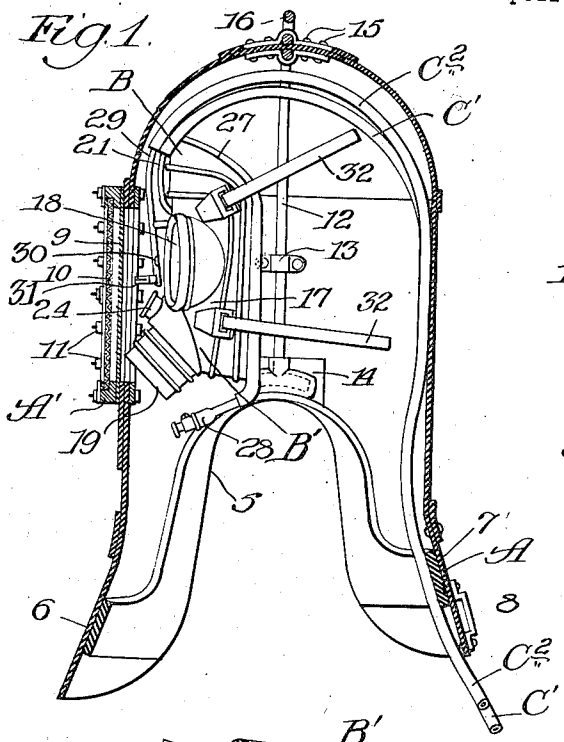


Fig. 2.

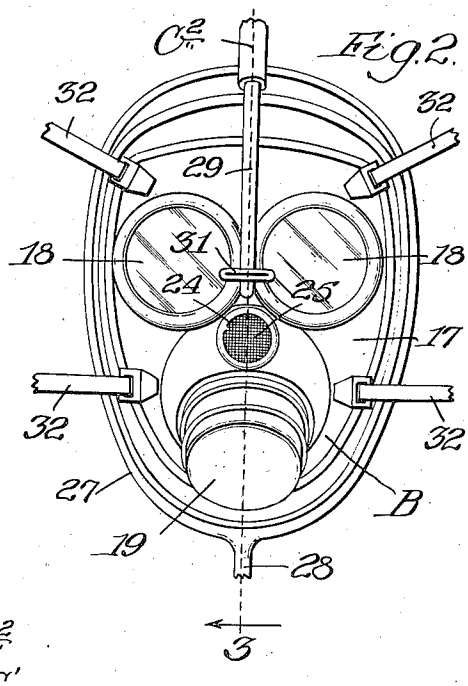


Fig. 3.

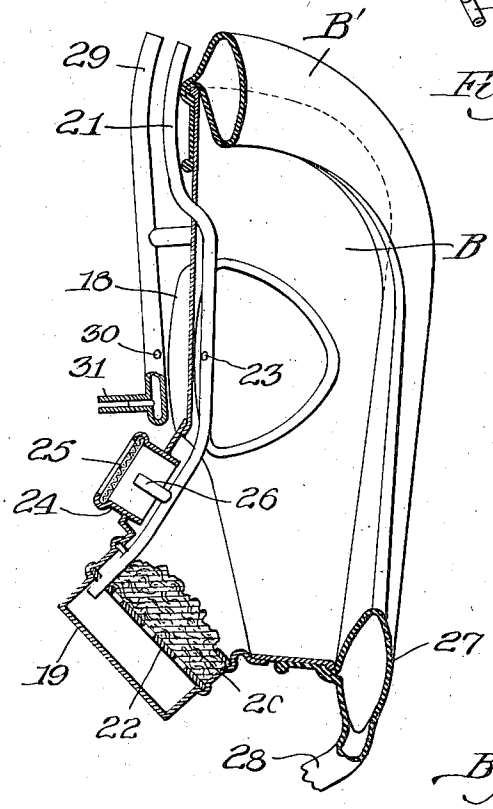
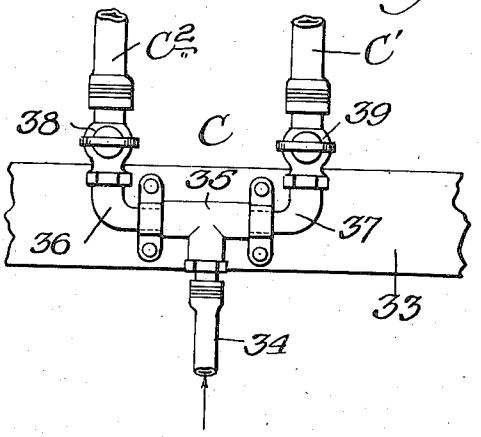


Fig. 4.



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Patented Jan. 5, 1937

2,066,706

UNITED STATES PATENT OFFICE

2,066,706

RESPIRATORY PROTECTIVE APPARATUS

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Application April 21, 1934, Serial No. 721,798

5 Claims. (Cl. 128—141)

This invention relates to respiratory protective apparatus and particularly to protective apparatus for use by sand blasters, or other operators working in dust-laden air.

The primary object of the invention is to provide a high degree of protection for the worker against harmful dusts which may be insoluble, such as silica, metal dusts, and the like, which may be microscopic in character. The dust particles which are considered most damaging to the lungs are those of about 1 micron (1/25000 of an inch) in diameter. When such very small particles are dispersed in the air, they are carried about like smoke and settle very slowly from quiet air. In order to provide the highest degree of protection, an air mask is worn inside of a helmet having a substantially air-tight head-portion so that the mask operates in an environment of practically dust-free air.

A further object of the invention is to provide an improved method for supplying fresh air to an operator working in harmful air conditions.

While the invention is also adapted to provide protection from noxious gases, and the like, it is particularly adapted to provide protection for the operator against abrasive action of rebounding sand, and the like. Sand blasters have for some time followed the practice of wearing a hood over the head, neck and shoulders, and under this hood, a respirator equipped with either a wet or dry filtering material. Respirators, however, have not been effective in sand blasting work because, as a rule, they are too inefficient as filters to provide adequate protection against the microscopic dust which rapidly clogs the filters.

The present invention is an improvement on my patent, No. 1,845,460, which shows an air mask worn under a hood. In the present invention, an improved air mask is worn within a special protective helmet arranged so that all of the air which is introduced into the mask or to ventilate and keep the windows clear, is discharged downwardly through the bottom of the helmet, about the shoulders of the wearer.

A further object of the invention is to provide apparatus which is adapted for use under various operating conditions. That is, the helmet ventilation may be regulated to suit the comfort of the wearer without increasing the interior mask pressure, which, of course, is the pressure of the breathing zone.

The invention is illustrated in a preferred embodiment in the accompanying drawing, in which—

Figure 1 is a vertical sectional view of the improved apparatus, showing the face mask in the relative position with respect to the helmet as it is ordinarily held by the operator; Fig. 2, a front elevational view of the improved mask; Fig. 3, a vertical sectional view taken as indicated at line 3 of Fig. 2; and Fig. 4, an elevational view of the air-control means mounted on the belt of the wearer.

Referring to the drawing, A designates a helmet provided with a window A′; B, a face mask having a pneumatic cushion B′; and C, valve means for controlling the air passing to the mask conduit C′ and the mask and helmet conduit C^2.

Preferably, the helmet A is made of rather stiff rubber in a form which will provide a substantially airtight enclosure for the head and neck of the wearer. The base portion or bottom of the helmet is provided with openings 5 to receive the wearer's shoulders and the bib portion 6 extends down over the breast of the operator. The back portion 7 is provided with a keeper 8 through which a belt may be inserted to strap the helmet in position. The window A′ comprises an internal transparent member 9, preferably of celluloid or a similar flexible material, and an outer screen 10 of very fine mesh which protects the window from the abrasive action of flying particles of dust. The window and screen are secured in position by means of a plurality of bolts 11. By using the proper thickness of rubber, the helmet is semi-rigid and metal frame members 12 are secured to the side portions thereof by means of keepers 13 and 14. The top portions of the frame members are riveted to the crown of the helmet, as indicated at 15, and a ring 16 is provided on the outside thereof to facilitate hanging up the device.

Referring now to the air mask, it will be seen that a metal closure 17 is provided with windows or eye-pieces 18 and an air-tight mouthpiece 19 in which may be secured a moistened sponge 20. Air is introduced from the conduit C′ by means of a metal tube 21 which enters the upper portion of the mask and terminates below a partition 22 in the mouthpiece 18. The tube is provided with a pair of by-passes 23 through which air may blow over the inside of the windows 18 to prevent dust and moisture from clogging thereon. The face mask is further provided with an exhaust port 24 equipped with a protecting screen 25. If the mask is properly fitted, all of the air which enters the mask is discharged through said screen. In order to aid the discharge of the air, the tube 21 is also provided with a nozzle 26 which discharges through the screen 25 and, op-

erating under the Bernoulli principle, creates a suction which exhausts all exhaled breath.

The pneumatic cushion B′ is of the well-known type and comprises a tubular rubber cushion **27** which may be inflated by means of the usual valve **28** provided in its bottom portion.

The conduit C^2 connects with a metal tube **29** which is rigidly mounted on the front of the mask. Said tube is provided with a pair of ports **30** which are disposed to blow air over the front of the eye-pieces or windows **18** to keep the same clear from dust and moisture. The lower end of the tube is provided with a fantail nozzle **31** which directs air from the conduit C^2 over the inner side of the helmet window **9**. As indicated in Figs. 1 and 2, the mask is provided with the usual head straps **32** to hold the mask in position on the head of the wearer. At certain times, for example when the weather is uncomfortably warm, the operator may wish to vary the ventilation of the helmet without changing the pressure within the face mask. Also, he may find it necessary to regulate the face mask pressure due to changes in the pressure of the main supply line. In order that these may be conveniently controlled by the wearer without removing the helmet, a belt **33** is provided on which is mounted the valve means C. A flexible conduit **34** brings air from the supply line to a T-joint **35** to which are connected elbows **36** and **37**. A hand-operated valve **38** is interposed between the elbow **36** and the flexible conduit C^2 and a similar valve **39** is disposed between the elbow **37** and the conduit C′ to control the amount of air passing therethrough.

It will be understood that as the head and neck portion of the helmet is substantially air-tight, all of the air which is admitted through the conduits C′ and C^2 must be discharged through the base of the helmet. As the base portion fits rather snugly about the body of the wearer, the air will be continually moving out therefrom and dust will have no opportunity to get into the head portion of the helmet and the operator is doubly protected.

By carrying both of the conduits C′ and C^2 on the face mask and belt, and helmet may be readily removed from the operating room when not in use and stored in a room where dust will not have an opportunity to settle on the inside of the helmet.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, but the appended claims should be construed as broadly as permissible, in view of the prior art.

I claim:

1. In combination: an open-bottom helmet having a substantially air-tight head-portion equipped with a window, said helmet being adapted to fully enclose the head and neck of a man; and a mask comprising a face covering with a window therein, a conduit positioned to conduct air into said mask and direct some of the air against the inner portion of said mask-window, a second conduit positioned to direct air against the outer portion of the mask-window and against the inner portion of the helmet-window, and adjustable means for controlling the flow of air through each of said conduits individually.

2. In combination: a helmet having a substantially air-tight head-portion equipped with a window and an open base-portion adapted to fit snugly onto the shoulders of a man; a mask adapted to be worn within said helmet, said mask comprising a face covering adapted to fit snugly on the face of a man, a window in said face covering, a conduit mounted on the mask to conduct air into said mask and against said mask-window, and a second conduit mounted on said mask to conduct air against the outer portion of said mask-window and against said helmet-window; and means for regulating the amount of air through each of said conduits individually.

3. In combination: a helmet of semi-rigid material having an open base-portion adapted to fit snugly onto the shoulders of a man and be supported thereon, and a substantially air-tight head-portion equipped with a window; a mask adapted to be worn within said helmet, said mask comprising a face covering adapted to fit snugly on the face of a man, a window in said face covering, a conduit mounted on the mask to conduct air into said mask and against said mask-window, and a second conduit mounted on said mask to conduct air against the outer portion of said mask-window and against said helmet-window; and means for regulating the amount of air through each of said conduits individually.

4. A device as specified in claim 3, in which the outer side of the helmet-window is provided with a fine screen mounted in spaced relation to said window.

5. In combination: a helmet having a substantially air-tight head-portion equipped with a window and an open base-portion adapted to fit snugly onto the shoulders of a man; a mask adapted to be worn within said helmet, said mask comprising a face covering adapted to fit snugly on the face of a man, a window in said face covering, a conduit mounted on the mask to conduct air into said mask and against said mask-window, and a second conduit mounted on said mask to conduct air against the outer portion of said mask-window and against said helmet-window; a belt; and means for regulating the amount of air flowing through said conduits from a single supply conduit comprising a pair of valves mounted on said belt.

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