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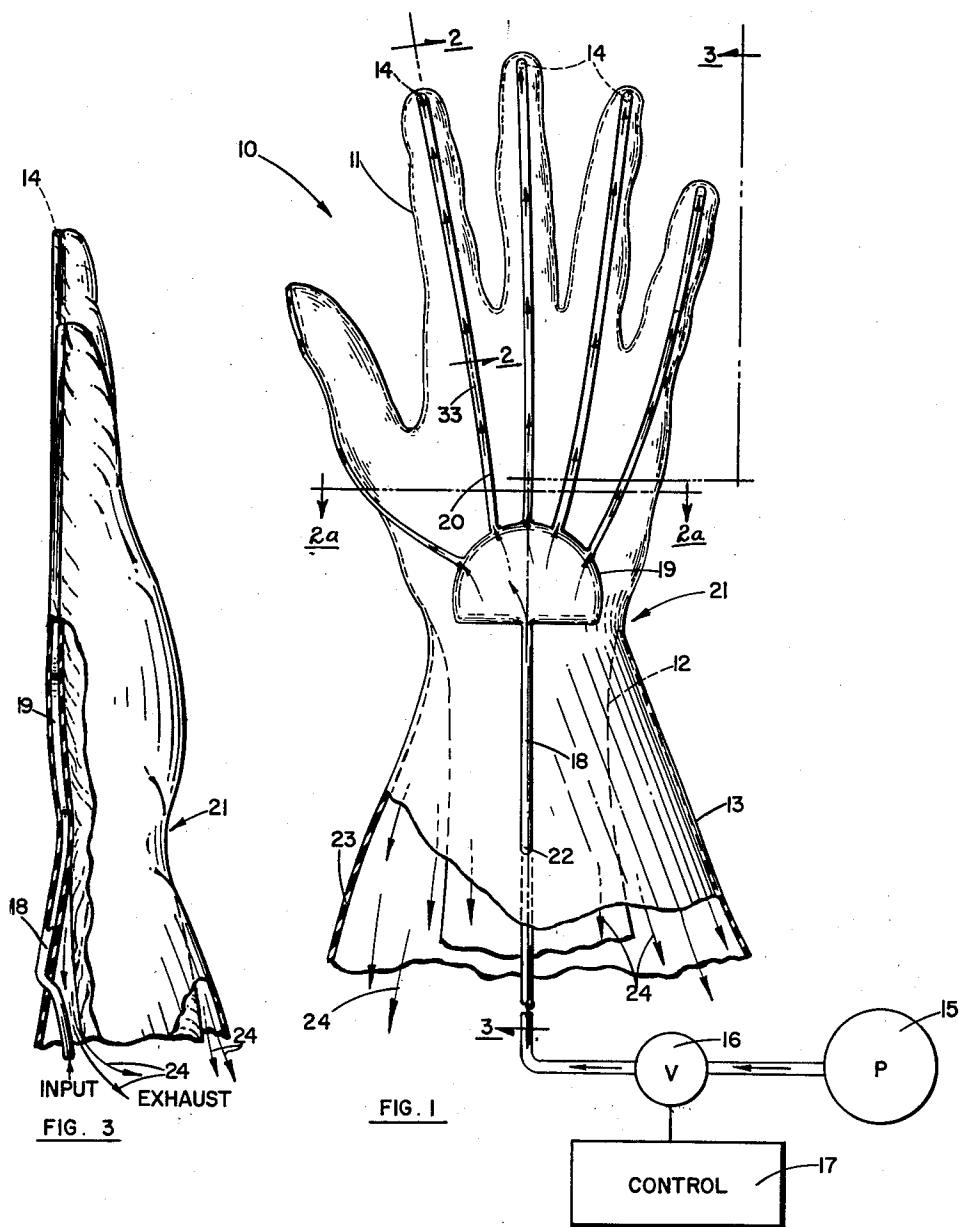
W. B. GINTNER

3,121,877

GLOVE VENTILATING SYSTEM

Filed June 14, 1960

3 Sheets-Sheet 1



INVENTOR.
WALTER B. GINTNER
BY *John A. Duffy*

AGENT

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W. B. GINTNER

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3 Sheets-Sheet 2

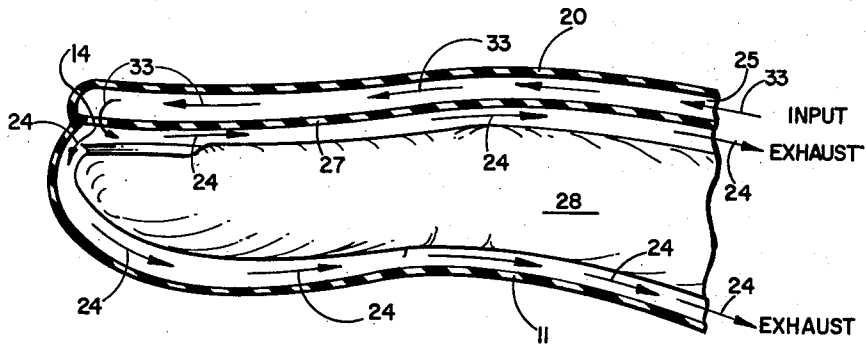


FIG. 2

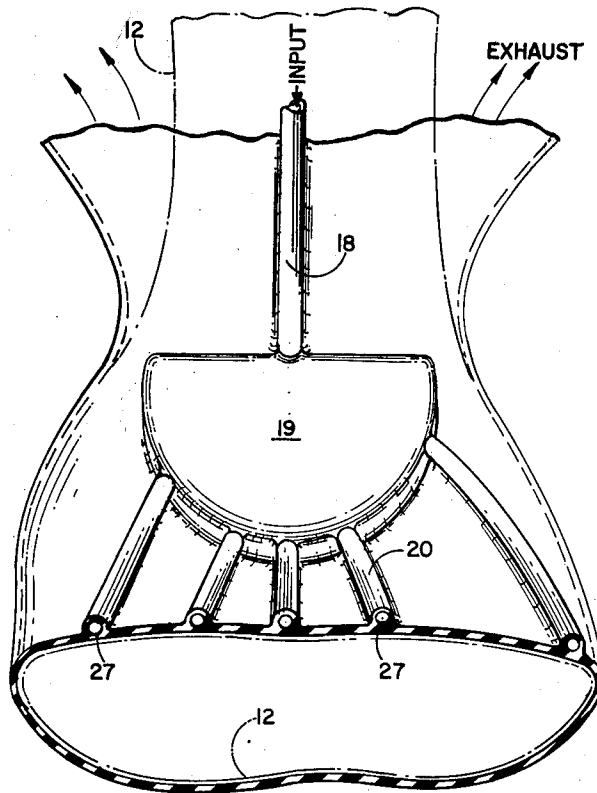


FIG. 2a

INVENTOR.
WALTER B. GINTNER

Filed June 14, 1960

GLOVE VENTILATING SYSTEM

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AGENT

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GLOVE VENTILATING SYSTEM

Walter B. Gintner, South Gate, Calif., assignor to
North American Aviation, Inc.

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4 Claims. (Cl. 2—159)

This invention relates to flexible glove systems and more particularly to a force ventilated glove system.

Flexible glove systems for hand operations are increasingly in demand. Such systems are required in laboratories for the safe handling of hazardous materials, in hospitals for surgical operations, and in manufacturing operations for the assembly of intricate and precision parts. In order to provide maximum dexterity and sensitivity, there must be a snug fit of the gloves on the hands. Additionally in many applications, such as lengthy surgical operations, where it is necessary to operate with gloves on for a considerable length of time, there is a need for a glove system to prevent moisture from accumulating inside the glove.

Glove systems in use today are of limited efficiency and applicability for two principal reasons. One disadvantage of presently manufactured gloves results from the requirement of a snug fit which makes it difficult and time consuming to insert the hand in the glove. Another serious disadvantage in hand operations with present day gloves stems from the perspiration emanating from the hand when the glove is on for any appreciable time. This perspiration causes moisture to accumulate in the glove causing extreme discomfort and disease to the skin. In operating rooms in a hospital, it is necessary for the surgeons to remove and replace moisture laden gloves approximately every twenty minutes in order to work efficiently.

Prior art glove systems have been wholly unable to provide any relief from the perspiration created by the hand in the glove other than the removal of the glove and replacement with another dry glove. Further, because of the requirement of a snug fitting glove, glove manufacturers have been unable to produce a glove which can be readily placed on the hand or removed therefrom. Powders and the like, placed in the glove to counteract perspiration caused from the hand have been totally ineffective.

Accordingly, it is an object of this invention to provide an improved flexible glove system.

According to a material aspect of the device of this invention, a glove is provided with inlet means to receive pressurized gas and outlet means spaced from the inlet means for venting the gas to the exterior of the glove. The inlet means are connected to receive the supply of fluid under pressure whereby a resulting flow of gas is provided through the glove. In this manner, perspiration from the hand in the glove is removed with the glove remaining completely dry at all times. Additionally, the pressurized gas in the glove facilitates the insertion and removal of a hand in a snugly fitted glove.

According to a further feature of applicant's invention, and alternative to the main aspect of forced ventilation, a glove system is provided in which the sleeve portion of a glove is attached at an opening in a field box or chamber and means are provided to flexibly support the sleeve portion of the glove to the chamber whereby the glove may be moved in all directions inside the box.

It is therefore another object of this invention to provide a glove system for use in a field box in which a glove may be moved in all directions inside the box.

It is another object of this invention to provide a ventilation system for a glove.

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It is a further object of this invention to provide a forced ventilation system for a glove.

It is a still further object of this invention to provide a pressurized flow of air from the finger tips of a glove to the rear of a glove during insertion and operation by a hand in a glove.

Other objects of invention will become apparent from the following description read in conjunction with the accompanying drawings in which:

FIG. 1 is a view of the back of a glove containing the forced ventilating system of the invention;

FIG. 2 is a partial sectional view of a typical finger of the glove of FIG. 1, particularly illustrating the forced ventilation of gas through the glove;

FIG. 2a is a view, partly in section, taken at 2a—2a in FIG. 1;

FIG. 3 is a sectional view of the glove of FIG. 1 illustrating the complete inlet and outlet operation of the air through the glove;

FIG. 4 is a view of the glove system inserted in a box illustrating the flexible diaphragm means of the invention;

FIG. 5 is a sectional view of the system of FIG. 4; and FIG. 6 is an enlarged view of the means in FIG. 5 for securing the glove to the box.

Referring now to the drawings and more particularly to FIG. 1, the forced ventilating system of this invention may be utilized with a glove 10 having elongated finger and thumb portions such as a portion 11 for receiving the fingers and thumb of a hand illustrated in FIG. 1 by the dotted lines 12 which enclose the outside of the hand. The glove 10 may be of any type flexible glove, such as the common rubber gloves utilized in laboratories and precision manufacturing plants and may have a flare-out portion 13 to facilitate insertion of the hand in the glove.

To supply a gas such as air under pressure to the glove, each of the finger and thumb portions is provided with a fluid inlet opening at an outwardly located area of the finger portion which may be for example, at the fingertip of the finger portion 11. Gas is supplied to the inlet opening 14 (shown more particularly in FIG. 2) by a gas supply system including a source of supply 15 shown in FIG. 1 for example, as a pump for supplying gas under pressure. Gas is supplied from the source 15 through a regulating means 16 which provides gas at its output according to control from a control means 17. Regulating means 16 and control means 17 may comprise for example, a regulating valve operated by a foot pedal switch which controls the volume and pressure of air flowing at the output of the valve 16. Gas is circulated from the output of the regulating means 16 to each of the inlet openings in the finger portions of the glove 10 by an air circulating system shown in FIG. 1 for example, which may comprise a gas passage tube 18 which feeds gas from the output of regulating means 16 to the input of a manifold 19 which in turn distributes the gas equally through air passage tubes such as a tube 20 to each of the finger and thumb portions of the glove 10 such as finger portion 11. The passage tubes 20 terminate at a respective inlet opening 14 at the aforesaid outwardly located area of the finger portions. Thus, gas is circulated from the source 15 through regulating means 16 to the manifold 19 which in turn circulates gas, through conduits 20, to each of the inlet openings such as 14 of the thumb and finger portions of the glove 10.

Air is circulated to the glove 10 in FIG. 1, by the supply source 15 according to the arrows shown. Thus, the inlet means to the glove such as the opening 14 at the finger tip portion of the finger portion 11 receives air

from the supply source 15 traveling in a direction shown by the arrow 33. Gas may enter the opening 14 and flow across the hands inside the glove to an outlet means which may be for example, a rear portion 23 of the glove 10 as shown by arrows 24. Thus there is provided a complete circulating path through each of the fingers of the glove 10. In this manner, a forced ventilation system is provided in the glove 10, commencing at each of the outwardly located openings 14 and ending at rear portion 23 of the glove 10. The circulating system for the glove 10 in FIG. 1 may be located on the back of the glove to allow freedom of movement and feed for the operator who utilizes the front part of the glove to touch the material to be handled. The circulating system, including the air passages and the manifold, may be integrally mounted on the back of the glove 10 if desired to provide a compact glove system. The manifold 19 may be formed of rubber molded to the back of the glove 10 having small openings to the air passage tubes 20. In the glove 10, as shown in FIG. 1, there is provided a flare-out portion 13 in order to facilitate the connection of the air passage tube 18 to the source of supply. The tube 18 which is on the outside of the glove may be constructed so as to pass through the outside of the glove to the inside at a point 22 located rearwardly of the wrist portion 21. In this manner the tube 18 enters the glove 10 from the regulating means 16 from the inside of the glove and passes to the outside of the glove at the point 22 thereby facilitating the connection of the air passage tube 18 to the regulating means 16.

In order to more fully understand the exact operation of the forced ventilating system of this invention which eliminates perspiration emanating from the hand maintaining the glove completely dry and which facilitates the insertion of the hand into the glove, reference will now be made to the view in FIG. 2 which is a sectional view of a typical finger portion 11 of the device in FIG. 1. In FIG. 2 a finger 28 for the right hand is shown in its inserted position in the glove 10 whereby the glove is ready for operation. Gas is circulated by the passage tube 20 from the supply source 15 (of FIG. 1) at the inlet 25 as shown by the arrows 33. Gas enters the inside of the glove at the opening 14 and from there travels between the inner surface 27 of the glove and the hand circulating throughout the glove to the exhaust as shown by the arrows 24. In this manner, the finger 28 has gas such as dry air circulated around its whole surface to remove the perspiration created by the finger. The glove 10 is maintained dry at all times, eliminating the necessity for removal of the hand from the glove because of discomfort caused by perspiration creating moisture in the glove.

In addition to removing the perspiration in the glove caused by the finger 28, the gas entering the opening 14 at the fingertip portion creates a pressure area as the finger is inserted in the glove. The gas from the opening 14 is restricted and builds up a pressure between the finger being inserted and the fingertip of the glove. This temporarily expands the glove facilitating the entrance of the fingers into the fingertip portion thereby allowing the finger to be inserted in the glove with a minimum of effort.

In the forced ventilated rubber system of the glove 10, illustrated in FIG. 1, gas is circulated through the glove by a circulating system connected to receive the gas under pressure from the supply source 15 and having air passage tubes connected through a manifold 19 to each of the finger and thumb tip portions. Alternatively, gas may be supplied by any means desired to the outwardly extending areas of the finger and thumb tip portions as long as there is provided a circulating system commencing at the outwardly extending areas and passing through the glove to be exhausted at the rear of the glove.

The forced ventilating systems shown in FIG. 1 greatly facilitates the insertion and removal of a hand by the temporarily created pressure between the finger and glove

while the hand is being inserted. In order to provide a snug fit after the hand is in place, the control means 17 may be operated to stop the flow of gas to the glove thereby allowing a snug fit to be realized. Likewise, during the working period when the hand and fingers begin to perspire, the operator need only press a foot control switch which may comprise the control means 17 to operate the regulating means 16 for any desired time to allow gas to pass over the perspired surfaces of the skin, thus evaporating the moisture. In this manner the hand need never be removed from the glove and the operator may work in comfort as long as desired. Lengthy operations with a flexible glove have been heretofore impracticable because of the extreme discomfort caused after approximately twenty minutes of operating a hand in the flexible glove with no means for evaporating the moisture created by the perspiration of the hand. The even distribution of the forced gas ventilating system of FIG. 1 wherein air is supplied from the manifold 19 equally through several passages 20 to each of the thumb and tip portions provides an even flow of air over the entire portion of the hand, on the back, front and palm portions thereof.

In FIGS. 2a and 3, sectional views of the device of FIG. 1, particularly illustrate the manner in which the air passage tubes and the manifold may be formed on the back of the glove 10 to provide a simple and compact structure. As seen in FIG. 3 the passage tube 18 for example, may be integral with the back of the glove 10 and molded thereto providing a small fluid passage along the outer surface of the glove 10. The tube 18 may be constructed of the same material as the glove 10 which may be flexible rubber molded to the top of the glove 10. Thus a compact and integral circulating system is provided which does not interfere with the front part of the glove.

Referring now to FIG. 4, there is shown a feature of applicant's forced ventilating system wherein a more complete flexible glove system is provided for operation in a sealed chamber. FIG. 4 is a view of a typical sealed box or chamber 35 showing the location of a rubber glove such as the glove of FIG. 1 in a sealed chamber. The glove is inserted through an opening in a side 37 of the chamber which is shown covered by cover 39 in FIG. 4.

For many operations inside the sealed chamber, it is desired to move the glove fore and aft and up and down to provide more flexible movement therein. As shown in the sectional view of FIG. 5, flexibility of movement of the entire glove 10 shown in FIG. 4 is provided by means of a flexible diaphragm or convolution 31 which circumferentially seals the glove 10 at an inner circumference 32 of the convolution 31 and circumferentially seals the glove 10 at an outer circumference 36 to the side 37 of the chamber 35. The flexible diaphragm or convolution 31 may be constructed of rubber or other flexible material and is movable in all directions limited only by the stretched out length of the rubber diaphragm.

Additionally, as shown in FIG. 5 and particularly in an enlarged view of FIG. 6 to provide for removal of the glove 10 from the chamber, the inner circumference 32 of the diaphragm 31 has a circumferentially round snap-on clamp, which engages a mating clamp 34 on the periphery of glove 10, which rigidly seals the rubber glove 10 to the inner circumference 32 of the convolution 31. In order to remove the glove, the operator merely compresses the clamp 34 removing the glove from the chamber. If desired, a snap-on rubber cover 39 having snap-on features similar to the clamp 34 may be inserted to protect the chamber until another glove replaces the glove 10. Inclusion of a rubber diaphragm connecting the glove to the side of the chamber allows flexibility of operation whereby the operator may move the glove inside the chamber in all directions as desired.

The forced ventilated system of this device is particularly advantageous for operations wherein it is desired to have the operator work with gloves over an extended

period of time, for example, several hours. Forced air may be inserted through the glove as desired without removal of the glove or in any way hindering the operation of the glove. For example, a foot pedal may be the control means 17 shown in FIG. 1 and may be operated at any time by the operator without interfering with the operation of the glove. This application would be particularly advantageous in precision instrument manufacturing whereby the operator stands an entire day working with gloves. The efficiency and reliability of parts assembled by the operator utilizing the glove of this invention is greatly increased. Additionally, the provision of pressurized air at the finger tips of the glove facilitates the insertion and removal of the hand in the glove thereby increasing efficiency in operation.

Flexibility of the device illustrated in FIGS. 4 and 5 has particular advantage in sealed chambers wherein it is desired to move the glove about in the chamber in assembling parts or doing laboratory work. The combination of a forced ventilating system with flexibility provisions as shown, provides a glove system whose efficiency and operability is vastly superior to known glove systems.

Although the invention has been described and illustrated in detail, it is to be clearly understood that the same is by way of illustration and example only and is not to be taken by way of limitation, the spirit and scope of this invention being limited only by the terms of the appended claims.

I claim:

1. In combination: a rubber glove having finger and thumb portions for receiving a hand, means for circulating air through said glove comprising a plurality of air passage tubes extending along the back of and on the outside of each of said finger and thumb portions, each of said finger and thumb portions having an inlet opening at its tip connected to a respective passage tube whereby air may enter each of said finger and thumb portions, outlet means spaced from said inlet openings and on the inside of said glove for venting said air to the exterior of said glove, and means for providing air under pressure to said air passages to effect a continuous flow of air through said glove.

2. A forcibly ventilated glove comprising:

separate elongated gas-tight finger portions forming finger enclosures for receiving each of the fingers and thumb of the hand;

a gas-tight hand portion forming a hand enclosure for receiving the body of the hand, said finger portions being attached by gas-tight attachment to said hand portion;

a sleeve portion forming an arm and wrist enclosure for receiving the arm and wrist, said hand portion being attached by gas-tight attachment to said sleeve portion, said sleeve portion being open to the atmosphere;

and gas inlet openings in the tip of each of said finger portions adapted to be connected to a source of pressurized gas and to deliver said gas into contact with the skin of a wearer.

3. A forcibly ventilated glove comprising:

separate elongated gas-tight finger portions forming

enclosures for receiving each of the fingers and thumb of the hand;

a gas-tight hand portion forming an enclosure for receiving the body of the hand, said finger portions being attached by gas-tight attachment to said hand portion;

a sleeve portion forming an enclosure for receiving the arm and wrist, said hand portion being attached by gas-tight attachment to said sleeve portion, said sleeve portion being open to the atmosphere;

gas inlet openings in the tip of each of said finger portions adapted to be connected to a source of pressurized gas and to deliver said gas into contact with the skin of a wearer;

gas-tight conduits attached to the exterior of said finger portions and the exterior of said hand portion, connected to deliver gas to said inlet openings; and

a gas manifold attached to the back of said hand portion, adapted to be connected to a source of pressurized gas, and connected to deliver pressurized gas to said conduits.

4. A forcibly ventilated glove comprising:

separate elongated gas-tight finger portions for enclosing and receiving each of the fingers and thumb of the hand;

a gas-tight hand portion for enclosing and receiving the body of the hand, said finger portions being attached by gas-tight attachment to said hand portions;

a sleeve portion for enclosing and receiving the arm and wrist, said hand portion being attached by gas-tight attachment to said sleeve portion, the upper arm part of said sleeve portion being open to the atmosphere;

gas inlet openings in the tip of each of said finger portions adapted to deliver gas against the skin of a wearer;

gas-tight conduits attached to the exterior of said finger portions and the exterior of said hand portion, connected to deliver gas to said inlet openings;

a gas manifold attached to the back of said hand portion, connected to deliver pressurized gas to said conduits;

and gas-tight conduit means adapted to receive gas under pressure and connected to deliver gas to said manifold, said last named conduit means extending from said manifold through the wall of said glove into the interior thereof, thence along the interior thereof at least to said upper arm part of said sleeve portion.

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