

Aug. 11, 1942.

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2,292,474

VACUUM GAUGE

Filed Jan. 9, 1940

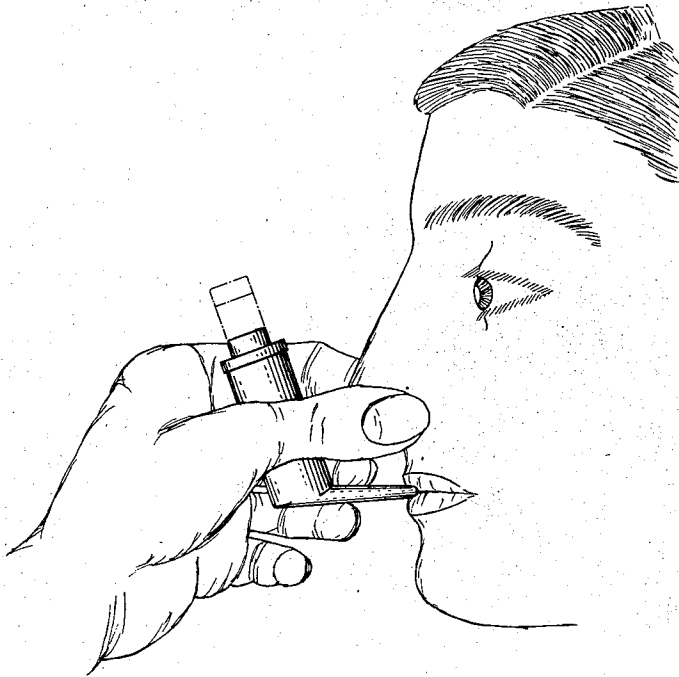


Fig. 1

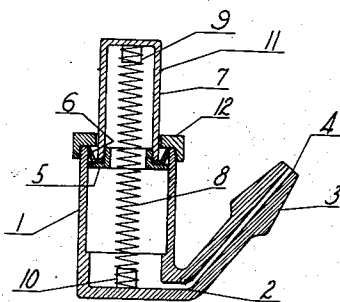


Fig. 2

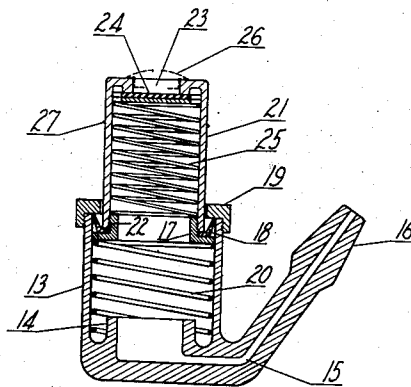


Fig. 3

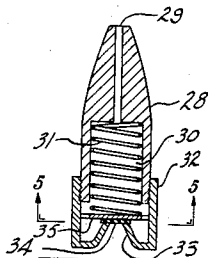


Fig. 4

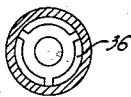


Fig. 5

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2,292,474

VACUUM GAUGE

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Application January 9, 1940, Serial No. 313,082

3 Claims. (Cl. 128-206)

This invention relates to a method of and apparatus for applying, indicating the amount of, and controlling the action of lung-created vacuua in the prevention of, and remedial treatment of, painful conditions resulting from the clogging of various natural drainage and pressure-equalization passages in the human head and neck.

The sinuses or antrums, and the tympanums of the ears are provided with passages that are normally free of obstruction.

Inflammations or irritations of the mucous membranes, such as those due to the common cold, hay fever, and the like cause increased secretion of mucus as a natural protective measure. The consistency of this mucus varies within wide limits during the progress of a cold, and when of heavy consistency it is quite capable of effectively clogging said passages.

Such clogging is usually effected by the necessity of blowing the nose, i. e., creating a pressure in the air passages by means of the lungs, while keeping the mouth closed, and constricting nasal apertures to increase both pressure and velocity of the exhaled air, thus clearing the nose artificially and periodically. The resulting sudden increase of pressure in the air passages, and back pressure into the several cavities of the head which are connected to said air passages by means of tubes or apertures of restricted cross-sectional area, often causes mucus to be forced thereinto by said back pressure.

It is now quite generally conceded that sinus trouble first manifests itself as pain that is due to pressure within sinuses or antrums whose apertures have become so clogged as to have become effectively air tight cavities.

Continued secretion of mucus within them, after they have become thus clogged, creates pressure by displacement. This pressure first causes pain, but if allowed to persist may force infection deeply into the surrounding parts and porous bones, with results that may become both chronic and dangerous.

Probing and surgical methods have been used in opening these passages, but these methods have proven to be conducive to chronic irritation, and formation of scar tissue, and are being abandoned except in extreme or acute cases.

Another method is vacuum applied from an external source, and carefully controlled. This method, while gentle, and usually successful for the time being, requires considerable apparatus, usually to be found only in a practitioner's office. It has the added disadvantage of requiring an office visit for each treatment, while the nose

may be blown many times a day, and the need for an offsetting vacuum may thus arise as many times, or more.

I have discovered and have successfully practiced the art of using lung-induced vacuua for offsetting the bad effects of nose blowing, and for preventing the clogging of said passages, from whatever cause. The art may be called lung-vacuum therapy.

The ordinary sinus sufferer already has developed a condition of some duration, and is therefore in need of effective use of this art to obtain relief. In attempting to instruct such, I have found that it is a difficult matter to get the sufferer to practice the art properly, the tendency being to employ an inadequate amount of vacuum for an ineffective length of time. This seems to be on account of the head and ear noises experienced, coupled with the already painfully irritated condition of the cavities, such that any change in the pressure equilibrium which may have been set up against the obstructions will be sufficient to cause momentary stabs of pain. Whenever the art has been properly practiced and persisted in, however, prompt and lasting relief have been gained.

Since the same causes may result in bealed ears, on account of the clogging of the Eustachian tubes, often with resulting impairment of hearing which may even become permanent, or in mastoiditis, the practice of this art has also shown itself to be effective in preventing and relieving what gave every painful indication of becoming cases of bealed ears.

The lungs are capable of producing both pressures and vacuua in excess of what may be needful or desirable, both for blowing the nose, and for offsetting the results of same. Said vacuua may be measured and controlled, and means for accomplishing same would permit of extending the benefits of the practice of said art to many sufferers who could not or would not otherwise practice it effectively.

In seeking to evaluate effective vacuua, I have found, by manometric measurement, that safe and effective practice of the art may be accomplished by the development of lung-induced vacuua of about eight ounces per square inch. Conversely, and as might have been expected, the pressures developed in the air passages of the head during a strong blowing of the nose were also around eight ounces per square inch. Higher pressures could be developed, but they caused unpleasant sensations in the ears, and even dizziness, and satisfactory nose blowing

could be accomplished at eight ounces per square inch or somewhat less.

Since the mouth or the nostrils are the only natural openings for transmitting the lung-induced vacuum to indicating or controlling means, it will be evident that such means must be used in connection with the mouth or nostrils. It will also be evident that any means may be used that will serve the purpose of causing the user to develop effective vacuua, and to know that said vacuua have been developed to the desired magnitude. This knowledge may be best imparted through the senses of hearing, or sight, or the tactile sense.

Thus, it will be evident that a simple spring-loaded vacuum relief valve may be used in one nostril, while holding the other closed, preferably keeping the mouth closed, and making an inhaling effort sufficient to open the valve, which would be loaded to open when the desired or suitable vacuum had been developed. This form is preferred, as its use requires no light or sight, and one full breath drawn through it constitutes one treatment.

Different types of vacuum indicating or vacuum release gauges or manometers may be employed, and same may be combined with the relief valve principle, to prevent the development of excessive vacuua. Double relief valves may be used, to maintain the vacuua within narrow limits, such as to have one valve open at $7\frac{1}{2}$ ounces per square inch, and another at 8 ounces per square inch, their inlet and outlet areas being proportioned to normal lung power so that the vacuua produced could not exceed the values given, to any appreciable degree, by any normal effort.

The use of indicating or controlling means by connection to one or both of the nostrils is preferred for the reason that by such application there is no chance of misuse. When used by mouth, careful instructions must be given, since it is easily possible to develop much greater pressures and vacuua by means of the cheek muscles than by means of the lungs, and, moreover, this can easily be done without transmitting said pressures or vacuua either to the nasal air passages, or to the lungs. This is exemplified as regards pressures in the arts of bugling, and glass blowing, and manometric measurements by the inventor have confirmed this with respect to vacuua. By this means, two pounds per square inch vacuua could easily be attained.

Thus, while indicating or controlling means may be properly and effectively used by mouth, and while they are intended to be covered by this invention, they may also be improperly and ineffectively used, by employing only the cheek muscles as just described.

My preferred devices for use in the mouth or nostrils are shown in the accompanying drawing constituting a part hereof in which:

Fig. 1 is a side elevational view of one form of vacuum-indicating device and the manner of its application embodying the principle of this invention;

Fig. 2 a vertical cross-sectional view of such device, with stem at an angle suitable for nostril use;

Fig. 3 a vertical cross-sectional view of a modified form of the device, also for nostril use;

Fig. 4 a vertical cross-sectional view of a vacuum release device for use in the nostril; and

Fig. 5 a cross-sectional view thereof taken along the line 5-5, Fig. 4.

Briefly, the implement shown in Fig. 2 comprises a cylindrical chamber 1 terminating in a constricted passage 2 at the base, which passage extends through a stem 3 and opens to the atmosphere at 4. Within the cylinder 1 is a piston 5 having a packing ring 6 to prevent the leakage of air therearound. Mounted on piston 5 is a sleeve 7 which in effect constitutes an extension of the piston element 5. A coil spring 8 abuts the end of the extension 7 and the base of the cylinder 1, spring guides 9 and 10 being provided to retain the spring in its central position. A peripheral notch or mark 11 is provided adjacent the top of the piston extension 7 to indicate that a certain amount of vacuum has been produced in the chamber cylinder 1 when the extension 7 has thereby been caused to retract to the position where the notch 11 is in register with the end surface 12 of the ring nut forming one end wall of the cylinder 1.

In the construction shown in Fig. 3, the cylinder 13 having a boss-like extension 14 is provided with an outlet passage 15 extending through a stem 16, piston 17 having a packing ring 18 disposed in the cylinder 13 and being held therein by a ring nut 19. The coil spring 20 seats at the base in the groove surrounding the boss 14 and abuts against the underside of the piston 17. An extension sleeve 21 is attached to the piston 17 at its threaded portion 12. The upper end of the extension 21 is opened, as shown at 23. A disk valve 24 is normally disposed against the opening 23 and is so held by a coil spring 25. A partially enclosing housing 26 which is designed to make a whistling sound when relief disc valve 24 opens may be disposed in the opening 23, if desired. The mark or peripheral notch 27 on sleeve 21 indicates the point in the downward travel of the extension sleeve 21 which, when in alignment with the outer face of the ring nut 19, has developed a predetermined vacuum. The relief valve 24 is loaded to open at a slightly greater vacuum.

When designed for use by mouth, the device is placed in one hand of the user with the stem or mouthpiece held between the lips and an attempt is made to inhale while the mouth and nasal passages are kept closed, the latter by means of the thumb and forefinger, as shown in Fig. 1, and without movement of the mouth or cheek muscles vacuum tends to be produced in the head cavities, such as the sinuses and tympanums of the ears, and will be produced therein if and when their drain canals and pressure equalizing passages are unobstructed.

The degree of vacuum desirable for freeing the passages of mucus obstructions is somewhat around eight ounces and is reached when the indicator notch 11 or 27 is in register with the end face of the respective ring nut 12, 19. In the device shown in Fig. 3, the spring 25 which is calibrated to release the disk valve 24 will be displaced by the disk valve 24 after a slightly greater vacuum is obtained. The vacuum will automatically break by air passing through the opening 23 into the cylindrical chamber of the device, so that no unnecessarily high degree of vacuum can be created. Since air may be admitted to the lungs by this device, it may also act to limit and determine the length of time during which the lung-induced vacuum can be maintained by the user. This can be accomplished by so constructing the device that the two springs cause the indication to be given and the

relief valve 24 to open at or very near the same degree of vacuum.

With reference to Figs. 4 and 5, the structure therein shown comprises a bullet-shaped housing 28 which may be made of a molding composition or other lightweight non-absorbing materials having a central opening 29 terminating a counterbore 30 for housing a spring 31. The lower end of the member 28 is threaded to receive a cap 32 having an indented portion 33 constituting an air inlet passage which is normally closed by a yieldable sealing substance 34 that is attached to a disk 35. Disk 35 constitutes an end abutment for the coil spring 31, the other end of which abuts the base of the counterbore 30. Disk 35 is of a spider-shape to form air passages 36 for the free admission of air through passage 33 into the counterbore chamber, and thence through passage 29.

The tip of the bullet-shaped member 28 is placed in the nostril of the user firmly enough to prevent air leakage around it, and the other nostril is pressed closed by the finger or thumb. By inhaling to produce the lung-induced vacuum in the head passages, the degree of vacuum thus produced is established in the counterbore chamber 30. Spring 31 is calibrated to compress at a desired pressure, corresponding to the degree of vacuum it is desired to attain, such as from seven to eight and one-half ounces per square inch, and when that predetermined degree of vacuum is attained, the external atmospheric pressure will cause the disk 35 to compress spring 31, thereby unseating valve 34 to break the vacuum, and at the same time to control and limit the degree of vacuum attainable.

Advantages of the types with relief valves, as shown in Figs. 3 and 4, are that they may be used in the dark, visible indication being augmented, as in Fig. 3, or supplanted, as in Fig. 4, by opening of the valve, which serves as an audible indicator, while the inrush of air is also

definitely sensed in the respiratory passages as an additional indicator that the intended degree of vacuum has been reached, and is being maintained. The degree of vacuum is controlled as the device automatically limits the vacuum to the tension of the coil spring, and the duration of each treatment is determined by the length of time required to draw a full breath therethrough.

By the use of the gauge, the proper amount of vacuum to be effective to open the drain passages is at all times obtained so that the treatment is effectually applied to give relief in a minimum of time.

It is, of course, evident to those skilled in the art that other forms of indicating or controlling means may be utilized.

I claim:

1. A lung breathing valve for indicating the degree of lung-induced vacuum, actuated solely thereby, comprising an air chamber having an oral or nasal connection and having a movable pressure responsive element for establishing communication with the atmosphere, and means normally biasing said element to closed position, said element being operable to open said chamber to the atmosphere in response to a predetermined negative pressure at the oral or nasal connection.

2. A device for indicating the degree of lung-induced vacuum, actuated solely thereby, comprising a chamber having an oral or nasal connection, a part of said chamber being a calibrated movable element responsive to said lung-induced vacuum.

3. A device for indicating and controlling the degree of lung-induced vacuum actuated solely thereby, comprising a chamber having an oral or nasal connection and having a valved connection with the atmosphere, part of said chamber being a calibrated movable element responsive to said lung-induced vacuum.

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