Oct. 16, 1956 R. B. BLACK 2,766,558

APPARATUS FOR MIXING AN ABRASIVE POWDER WITH A GASEOUS CARRIER UNDER PRESSURE

Filed Dec. 7, 1951

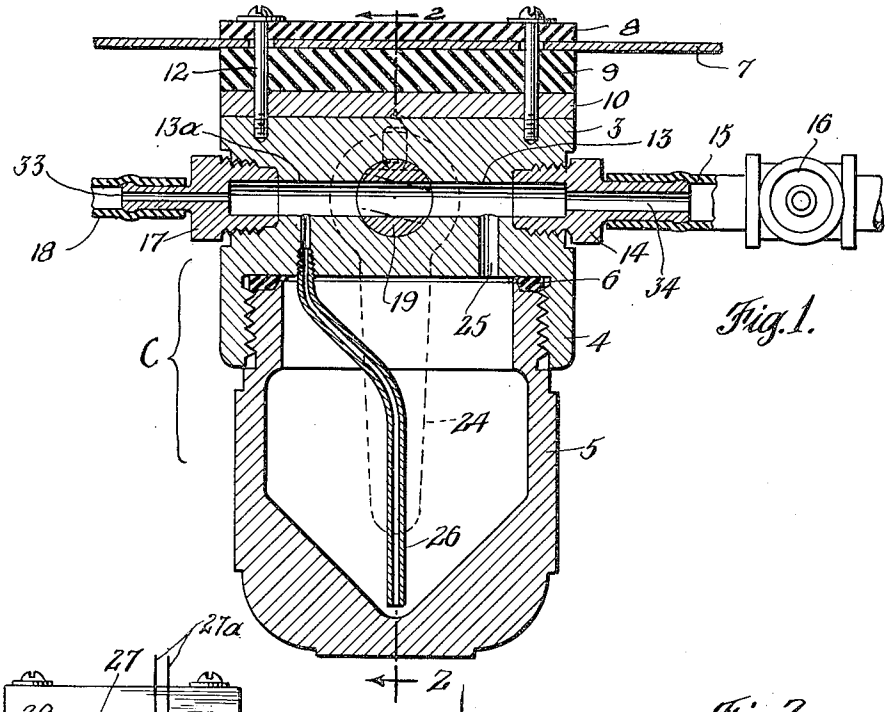


Fig. 1.

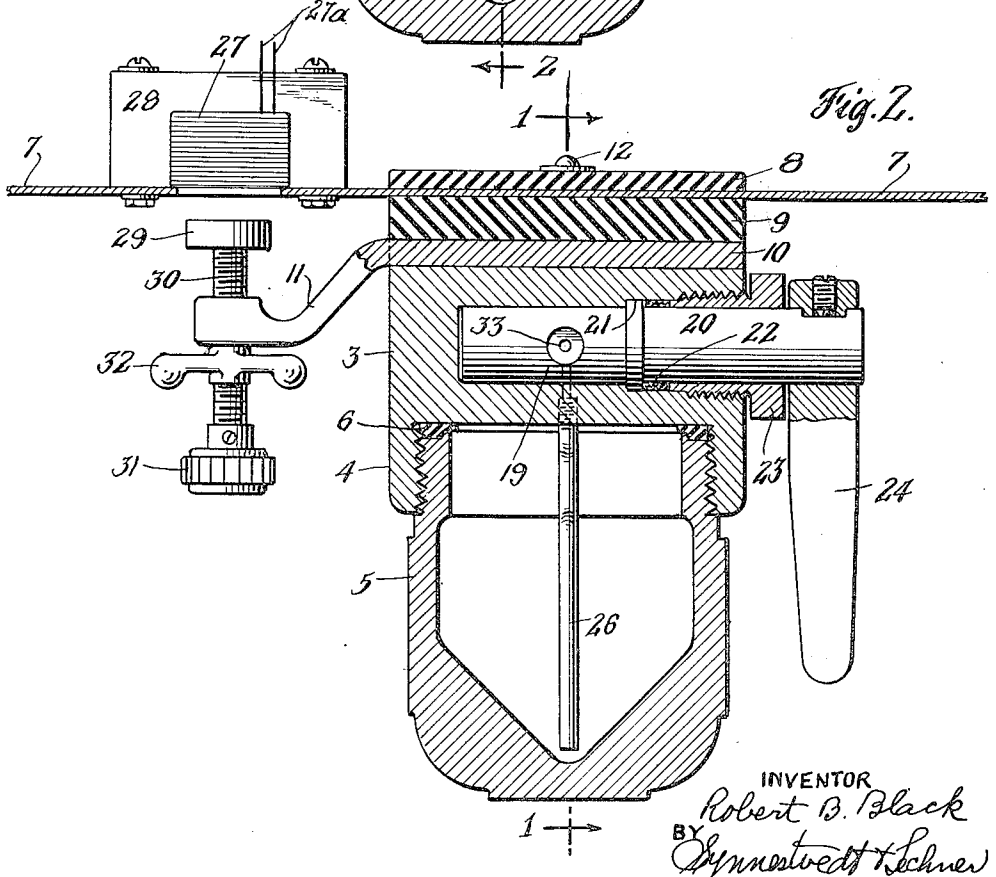


Fig. 2.

INVENTOR
Robert B. Black
BY
Synnestvedt & Lechner
ATTORNEYS

United States Patent Office

2,766,558

Patented Oct. 16, 1956

2,766,558

APPARATUS FOR MIXING AN ABRASIVE POWDER WITH A GASEOUS CARRIER UNDER PRESSURE

Robert B. Black, Corpus Christi, Tex.

Application December 7, 1951, Serial No. 260,456

2 Claims. (Cl. 51—12)

This invention relates to apparatus for mixing a finely divided abrasive powder with a gaseous carrier medium while the medium is under pressure. It is especially useful in connection with the treatment of teeth by means of a powder suspended in a gaseous carrying medium such as compressed air, carbon dioxide or other suitable gas. This type of treatment for teeth has been very successfully employed during the past few years and the present invention has been developed primarily for use with the method which I have disclosed in my co-pending application, Serial No. 78,068, filed February 24, 1949, which issued on December 7, 1954, as Patent No. 2,696,049.

In the art of excavating or cleaning teeth by means of a very fine high velocity stream of abrasive-laden gas, in order to secure the most satisfactory results, it is extremely important that the equipment employed in carrying out the operation be sensitive and reliable in a high degree. Indeed, accurate and reliable control of the mixture is so important as to be one of the most critical factors involved. Different types of operations require different mixtures as will be readily apparent to those skilled in the art. Furthermore, different phases of a given operation may require changes in the mixture and different types of abrasive must be used for cavity preparation from those which are used for prophylaxis.

The principal objects of my invention are to provide apparatus for mixing the desired powder with the gaseous carrier while the carrier is under pressure in such a way as to insure the greatest possible degree of reliability and uniformity in operation; to simplify the mechanism by which this is accomplished; to keep the bulk and the weight of the equipment to a minimum; and to markedly reduce the cost.

The embodiment of my invention which I prefer at present is illustrated in the accompanying drawing wherein

Figure 1 is a vertical section through the mechanism taken as indicated by the line 1—1 on Figure 2; and

Figure 2 is a vertical section at right angles to that of Figure 1 taken as indicated by the line 2—2 of Figure 1.

As clearly shown in the drawings, my improved mixer, indicated as a whole by the reference character C, includes an upper valve housing or supporting member 3 having a downwardly projecting inwardly threaded flange 4 into which is screwed a powder container or reservoir 5, tightness of fit being secured by means of a suitable gasket 6.

The housing 3 is carried by the supporting plate 7 through the medium of two layers of soft flexible rubber 8 and 9, one on each side of the plate. Between the lower layer of rubber 9 and the top of the housing member 3, I provide a plate member 10 having an extended arm portion 11 projecting outwardly therefrom in relatively close proximity to the under face of the supporting plate 7, as clearly shown in Figure 2. The parts just described are secured to the top of the housing 3 by means of the machine screws 12 and it might be noted that the layers of rubber 8 and 9 afford a certain degree of flexibility in the assembly.

There is a passageway or conduit extending through the housing 3. This is referred to as a whole by the reference character 13, to one end of which the inlet nipple 14 is adapted to deliver the gaseous carrier, the carrier coming in through a suitable flexible tube 15 in which may be located any desired type of bleed-off valve mechanism 16.

The other end of the passageway or conduit 13 as viewed in Figure 1, constitutes a mixing chamber 13*a* and at the outlet end of this mixing chamber another nipple 17 is provided by means of which the mixture is discharged into another section of flexible tubing 18 which leads to other portions of the mechanism employed in the treatment of teeth but the details of which are not included in the present disclosure because they form no part of the present invention.

Flow through the conduit is controlled by the adjustable choke valve 19 which is formed as a part of a rotatable shaft 20 adapted to project inwardly through a suitable opening extending at right angles to the conduit 13—13*a*. The spindle has a shoulder 21 against which the packing 22 is compressed by means of the gland 23 threaded into the outer end of the spindle opening. On the outer end of the spindle is mounted an operating lever 24 by means of which the spindle and, therefore, the valve 19 can be rotated throughout an arc of 90°, the valve being fully open when the operating arm 24 is vertically disposed and fully closed when the arm is horizontally disposed.

At a point between the choke valve 19 and the inlet nipple 14 the conduit 13 is connected to the top of the reservoir 5 through a passageway 25. At the other side of the choke valve the mixing chamber 13*a* is connected to the bottom of the reservoir by means of a passageway in the form of a pipe or tube 26.

Vibration of the mechanism is accomplished by means of an electromagnetic device which includes the coil 27 with its soft iron yoke 28, both of which are mounted on the plate 7 to one side of the housing member 3, as shown in Figure 2. The armature 29 of this electromagnetic device is carried on the extended arm 11 of the plate 10 by means of the screw 30 having the knurled head 31 and the locking wing nut 32. The coil is supplied either with alternating current or with a suitably pulsating direct current the frequency of which, of course, depends upon the number of cycles or pulsations in the current. The parts can be vibrated in this manner and proper adjustment can be made by turning the screw 30 so as to bring the soft iron armature 29 either closer to or farther away from the coil 27.

A summary of the operation is as follows. When the choke valve 19 is wide open so that there is an uninterrupted flow through the conduit 13—13*a* there is no resistance offered to the flow of the gaseous carrier passing therethrough. As the operating arm 24 is turned say, for instance, to a position which will move the valve 19 to the dot and dash line position shown in Figure 1, the available cross-sectional area of the conduit 13—13*a* is reduced so that the gas flow diminishes proportionately. This causes increased resistance to the flow and tends to build up the pressure in the reservoir through the connecting passageway 25. This results in a greater flow of powder coming up through the tube 26 which delivers to the mixing chamber 13*a*. It will be obvious that the more the choke valve is closed the greater will be the flow of powder into the mixing chamber and the heavier will be the mixture. The vibration causes the fine particles of the powder to move freely over one another and to behave much in the same manner as a liquid. This avoids undesirable spurting or unevenness of flow. However, I might mention that it is possible to employ my improved mixing device without using the vibrating mech-

anism, especially in situations where some unevenness in flow is not too serious. Nonetheless, vibration is preferable and can be provided for in the manner described although other vibrating mechanisms might well be designed to accomplish the same purpose. It will also be understood that the choke valve **19** is merely representative since other types of chokes may be employed to fulfill this function.

I wish to call particular attention to an important factor of the apparatus which I have disclosed. It will be noted that the reservoir **5** is located below the mixing chamber **13***a* so that all abrasive powder which is mixed with the gaseous carrier must be carried upwardly by the gaseous medium itself. There is no gravity feed of the powder as has been characteristic of the mixing devices previously employed in treating teeth according to this technique. I should also like to point out that the passage **33** through the discharge nipple **17** is smaller than the incoming passage **34** in the nipple **14**. This is important because it helps to maintain uniformity of flow on the discharge side. Finally, by making the reservoir **5** readily detachable from the unit it is very easy to change the type of powder to satisfy the requirements of the operation or treatment which the dentist is performing. When changing reservoirs the interior pressure is first relieved through the bleed-off valve **16**.

I claim:

1. A device for mixing an abrasive powder with a gaseous carrier under pressure comprising a valve housing member having a conduit extending therethrough; an adjustable choke in the conduit; a connection for supplying the gaseous carrier to one end of the conduit; a connection for discharging the mixture from the other end of the conduit; an abrasive powder reservoir carried by said valve housing member; a passageway connecting the reservoir with the conduit on the inlet side of said choke; a passageway connecting the bottom portion of the reservoir with the conduit on the discharge side of said choke; all of said parts being constructed and arranged for movement as a unit; a plate flexibly supporting said unit; said valve housing member being provided with an arm extending outwardly in proximity to said plate; and means for vibrating the unit, said last means including a coil and a cooperating armature, one of which is carried by the arm and the other by the plate, together with means for supplying a pulsating current to the coil.

2. A device according to claim 1 wherein the plate is clamped between pads of resilient material in the area where it is attached to said unit.

References Cited in the file of this patent

UNITED STATES PATENTS

794,122	Rosengarten	July 4, 1905
1,704,025	Wahl	Mar. 5, 1929
1,704,026	Wahl	Mar. 5, 1929
1,705,162	Wahl	Mar. 12, 1929
1,712,804	Wytcherley	May 14, 1929
1,739,349	Blain	Dec. 10, 1929
2,161,131	Burger	June 6, 1939
2,323,864	Weyandt	July 6, 1943
2,496,194	Bennett	Jan. 31, 1950
2,525,641	Bouska	Oct. 10, 1950
2,549,033	Tyrner	Apr. 17, 1951