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[54] MEDICAMENT INHALATION DEVICE  
WITH AUDIBLE INDICATING MEANS

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[56]

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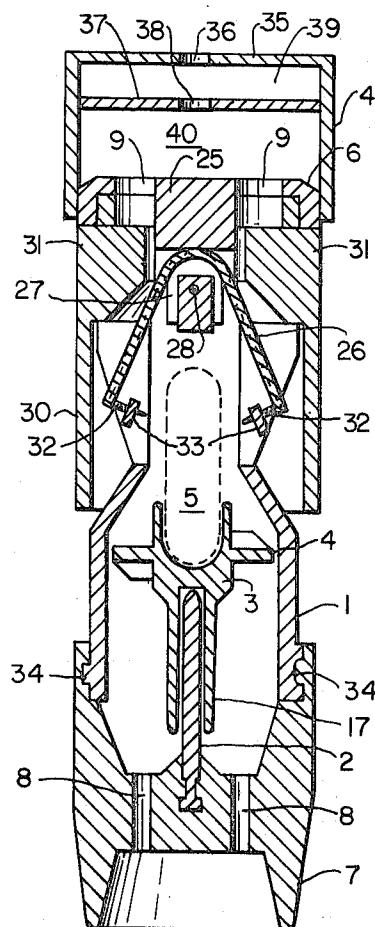
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[57]

ABSTRACT

There is described an inhalation device, which is adapted to administer a medicament to the lungs and to be activated by the inspiration of the user, in combination with means adapted to indicate audibly when a desired air flow through the device is achieved.

12 Claims, 1 Drawing Figure



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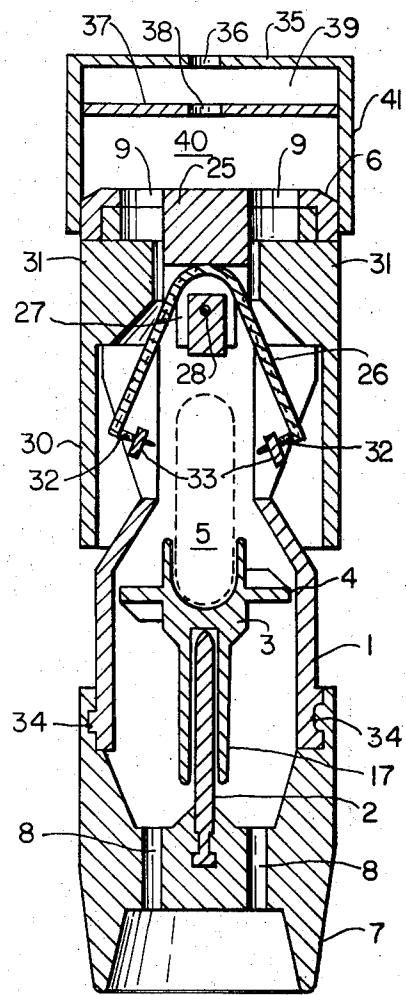


FIG. 1

## MEDICAMENT INHALATION DEVICE WITH AUDIBLE INDICATING MEANS

### BACKGROUND OF THE INVENTION

This invention relates to a new form of device for the inhalation of medicaments and the like.

In British Patent Specifications Nos. 1,122,284 and 1,182,779 there are described devices for the inhalation of medicaments in finely divided form, which comprise a hollow elongate housing having at both ends thereof an air passageway and having one end adapted for insertion into the mouth; and a propeller-like member rotatably mounted in the housing on a rigid shaft mounted in the housing and coaxial with the longitudinal axis of the housing, said propeller-like device having on the part thereof furthest from the end of the housing adapted for insertion into the mouth, mounting means adapted to receive a container, such as a gelatine or like capsule for the medicament to be inhaled and said propeller-like device being so mounted on said shaft that the passage of a stream of air through the device causes not only rotational movement of the propeller-like device, but also a vibrational movement of the propeller-like device. The device may be provided with means for piercing the container in situ in the device.

A number of other devices are also known and used for the inhalation of powder and other medicaments, and a number of these devices also depend upon the inspirational power of the user to actuate them or to disperse the medicament into the air stream to be inhaled (see for example Belgium Pat. No. 781,102 in which there is described a device comprising a chamber in which a perforated capsule containing a powdered medicament can be freely tumbled by tangential jets of incoming air and the air into which the medicament is dispersed passes from the chamber to the inhaler's mouth). Indeed in certain devices and using certain medicament formulations it is desirable that a given minimum air speed be achieved (or maximum air speed avoided) to produce a satisfactory operation of the device (e.g. dispersion of the medicament). In some instances notably with children and old people, it can be difficult to teach the user to inhale in such a manner as to operate the device satisfactorily. Furthermore inhalation devices are often used by people who have reduced inspiratory power, e.g. those suffering from respiratory diseases, and children. Therefore when people having reduced inspiratory power use inhalation devices it is not always possible to determine whether the flow of air through the device has been sufficient to actuate the device satisfactorily. Thus some such users may be receiving variable or insufficient medication.

### SUMMARY OF THE INVENTION

According to our invention we provide an inhalation device, which is adapted to administer a medicament to the lungs and to be activated by the inspiration of the user, in combination with means adapted to indicate audibly when a desired air flow through the device is achieved.

The inhalation device may be any of those conventionally used, but is preferably a device which is designed to administer a powdered medicament, e.g. the device described in either of British Patent Specifications Nos. 1,122,284 or 1,182,779.

The means adapted to indicate audibly when the desired air flow through the device (indicating means) is achieved may be, for example a whistle (Robert C Chanaud, Scientific American, January 1970 pages 40 to 46), such as an aerodynamic whistle. Aerodynamic whistles may be roughly classified into three groups (a) hydrodynamic whistles, (b) acoustic whistles and (c) reflected whistles. Many conventional whistles combine characteristics of more than one of these groups.

5 46) As hydrodynamic whistles there may be mentioned aeolian tone generators (e.g. a thin cylinder placed in an air stream), and vortex whistles in which latter a swirling flow of air encounters the open end of a pipe. Acoustic whistles include those generated by the impingement of a jet of air on an edge, a ring or a hole to produce respectively an edge tone, a ring tone or a hole tone. We particularly prefer to use a hole tone generated by the passage of air through a double orifice hole with an intervening chamber, as in the whistle of a 10 whistling kettle. Acoustic whistles comprise those in which a resonant or reflecting structure is involved, as in a flute or organ pipe. For the purposes of the present invention an acoustic whistle similar to the type used by English policemen (simple flute type) or by American policemen (comprising a solid object, e.g. a pea or the like, loosely trapped in a sounding chamber) may be used. A reed whistle may also be used. Other indicating means include a propeller like device in which the blades are designed to emit a noise on reaching a given 15 speed; or may be a siren. Any of the above indicating means may be used in conjunction with an air by-pass, the air by-pass being of such a size that the indicating means will only commence to sound or will change the sound at the desired air-flow rate.

20 25 30 35 40 45 50 55 60

The indicating means may be such that the sound emitted changes at more than one rate of air flow through the device. Thus the indicating means may be adapted to indicate a minimum and a maximum desirable air flow, or a minimum and a desirable average air flow.

The change of sound should be such as to be easily noticed and may be, for example a change of volume, pitch, quality, frequency, tone etc. We prefer the change to be from not sounding to sounding, or vice versa.

We prefer that the indicating means should be actuatable when the user inhales through the device, but not when the user exhales through the device.

The indicating means may be made integrally with the inhalation device, or may be made separately, the two parts being made in such a way that they may be fitted together, for example by a screw thread, a bayonet fit or a simple push fit.

The indicating means may be positioned downstream of the point at which medicament is dispersed into the air stream, but, in order to avoid contamination of the indicating means, it is preferably positioned upstream of this point, e.g. at the point of entry of the air stream into the device.

The device according to the invention is particularly useful when it incorporates an inhalation device as described in British Patent Specification No. 1,182,779 and is used to disperse a powder composition as described in British Patent Specification No. 1,242,211, i.e., a mixture of a solid finely divided medicament having a particle size in the range 0.01 to 10 microns and a solid pharmaceutically acceptable water soluble car-

rier having an effective particle size in the range 30 to 80 microns, e.g. a mixture of fine particles of sodium cromoglycate and coarse particles of lactose.

The indicating means may be made of any suitable material, for example metal or plastics materials, e.g. PVC, polypropylene, polyethylene or nylon.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The invention is illustrated by the attached drawing, which is not to scale and in which FIG. 1 is a longitudinal section through a device according to the invention, which incorporates a device according to British Patent Specification No. 1,182,779.

#### DETAILED DESCRIPTION OF THE INVENTION

In FIG. 1 an inhalation device comprises a housing of approximately circular cross-section comprising two engaging housing members 6 and 7, housing member 7 being adapted for insertion into the mouth and having passageways 8 therein to permit the passage of air. Mounted rigidly in and co-axially with housing member 7 is shaft 2 upon which is loosely and rotateably mounted by means of bearing 17 propeller-like member 3 having blades 4.

Propeller-like member 3 has a cup shaped member 25 adapted to receive and hold a capsule or container 5 of finely powdered medicament.

Shaft 2 engages in bearing 17 on propeller-like member 3. The diameter at the inner end of bearing 17 is about 3.75 percent greater than the diameter of shaft 2 and the diameter at the outer end of bearing 17 is equal to the diameter of shaft 2 plus about 2.5 percent of the total length of the bearing, which is about 7 times the diameter of shaft 2.

Housing member 6 has in its end wall air passages 9 35 to permit the passage of air. Housing 6 is firmly attached to body member 1, for example it may be glued thereto, and mouthpiece 7 is removably attached to body member 1 by means of co-operating screw threads 34 in body member 1 and mouthpiece 7.

Housing member 6 has a central projection 25 with a slot in which is mounted resilient piercing member 26. Piercing member 26 is retained in the slot in projection 25 by means of retaining block 27 which is, in turn, held in position in the slot by means of pin 28. The arms of resilient piercing member 26 are located in slots in the walls of body member 1 and in guideways formed by guide members (not shown) extending inwardly from the inner surface of body member 1.

Slidably mounted on body member 1 is tubular member 30 having cam-like projections 31 extending inwardly through the slots in body member 1. When member 30 is slid downwards from the position shown in FIG. 1 cam-like projections 31 engage with the arms of resilient piercing member 26 to force them inwards and thus to force piercing projections 32 into contact with the surface of capsule 5 and finally to pierce capsule 5, the depth of piercing being limited by stops 33. When the member 30 is slid back to the position shown in FIG. 1 the resilience of member 26 causes the arms to spring apart and to resume the position shown in FIG. 1.

Mounted on housing member 6 by means of a push fit is a double orifice whistle 41 comprising a first orifice plate 35 having central orifice 36, a second orifice plate 37 having a central orifice 38, a primary sound

chamber 39 and a secondary sound chamber 40.

In operation, the device is first loaded with capsule 5 by unscrewing mouthpiece 7 from body member 1 and placing capsule 5 in the cup-like depression in propeller-like device 3. Mouthpiece 7 is then screwed back into body member 1, and capsule 5 pierced by sliding member 30 downwards from the position shown in FIG. 1 and then back to the position shown in FIG. 1.

10 The user then places mouthpiece 7 in the mouth and inhales through the device causing rotation and vibration of the propeller-like member 3, (and, when the desired air speed is achieved causing the whistle 41 to sound) thus administering powdered medicament contained in capsule 5.

I claim

1. An inhalation device, for administering and dispensing a medicament to the lungs comprising a movable means activated by the air inspiration of the user, in combination with a means for indicating the operation of the device comprising an audible means operated by said inspired air when a desired air flow through the device is achieved.

2. A device according to claim 1, wherein the device has a means for administering a powdered medicament.

3. A device according to claim 1, further comprising a hollow elongate housing having at both ends thereof an air passageway and having one end adapted for insertion into the mouth; and said movable means comprises a propeller-like member rotatably mounted in the housing on a rigid shaft mounted in the housing and coaxial with the longitudinal axis of the housing, said propeller-like device having on the part thereof furthest from the end of the housing adapted for insertion into the mouth, mounting means adapted to receive a container, such as a gelatine or like capsule for the medicament to be inhaled and said propeller-like device being so mounted on said shaft that the passage of a stream of air through the device causes not only rotational movement of the propeller-like device, but also a vibrational movement of the propeller-like device.

4. A device according to claim 1, wherein said audible means is an acoustic whistle.

5. A device according to claim 1, wherein said audible means is a siren.

6. A device according to claim 4, wherein said acoustic whistle is an edge-type tone generator.

7. A device according to claim 4, wherein said acoustic whistle is a hole-type tone generator.

8. A device according to claim 1, wherein said audible means is a double orifice whistle.

9. A device according to claim 1, wherein said audible means includes means operable to produce a change from not sounding to sounding.

10. A device according to claim 1, wherein said audible means is operable when the user inhales through the device, but not when the user exhales through the device.

11. A device according to claim 1, wherein said audible means is a propeller-like device in which the blades are designed to emit a noise when reaching a given speed.

12. A device according to claim 4 wherein said acoustic whistle is a ring-type tone generator.

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