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INHALATION DEVICE

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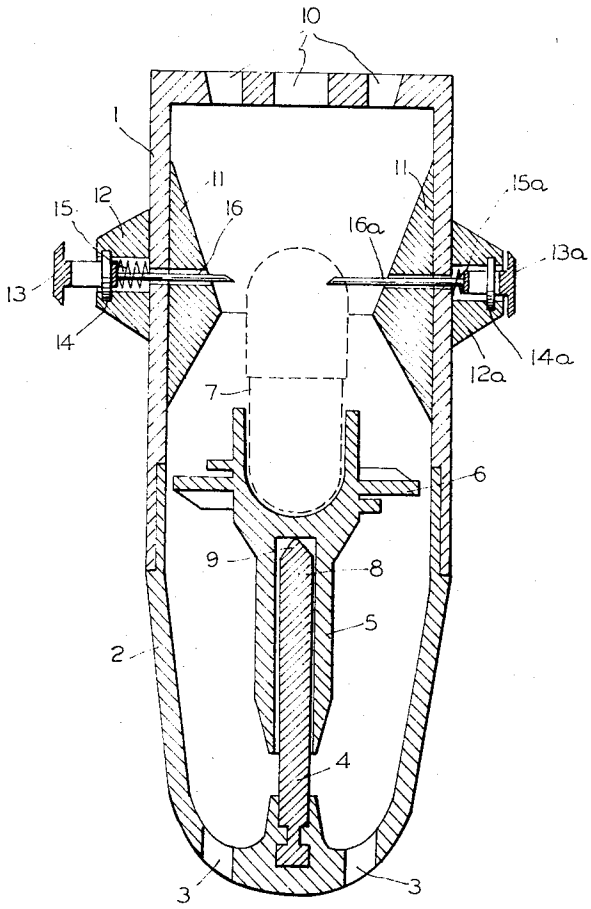


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# INHALATION DEVICE

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U.S. Cl. 128—208 6 Claims

## ABSTRACT OF THE DISCLOSURE

A device for the oral inhalation of medicaments in finely divided form which comprises a hollow elongate housing having at both ends thereof one or more passageways to permit the passage of air and having one end thereof adapted for insertion into the mouth; and a propeller-like device rotatably mounted in the said housing on a rigid shaft mounted in said housing and co-axial with the longitudinal axis of the housing, said propeller-like device having, on the end thereof furthest from the end of the housing adapted for insertion in the mouth, mounting means adapted to receive a container for the finely divided medicament; which device is provided with means for perforating the container of medicament in situ in the device.

This invention is concerned with improvements in or relating to a device for the application of medicaments in finely divided form by oral inhalation.

More particularly the invention is concerned with a device for the oral inhalation of medicaments in finely divided form which comprises a hollow elongate housing, suitably a tubular housing, having at both ends thereof one or more passageways to permit the passage of air and having one end thereof adapted for insertion into the mouth; and a propeller-like device rotatably mounted in the said housing on a rigid shaft mounted in said housing and co-axial with the longitudinal axis of the housing, said propeller-like device having, on the part thereof furtherest from the end of the housing adapted for insertion in the mouth, mounting means adapted to receive a container for the finely divided medicament such as a gelatine or like capsule. (By the term "propeller-like device" is meant a device having two or more blades or vanes disposed about a central axis or hub, such that impingement of an air stream on the said vanes or blades tends to cause rotation of the device about said axis or hub.)

In order to dispense its contents the container of the finely powdered medicament must be perforated and it has been found very convenient to perforate the container in situ in the dispensing device.

According to the invention, therefore, there is provided a dispensing device of the type described provided with means for perforating the container of the finely powdered medicament in situ in the device.

The device according to the invention is particularly convenient since it may be carried by the user with the closed container already in place in the device and is simply used by actuating the container perforating means and then inhaling the contents of the container by inspiration through the device. Since the container is closed or sealed until it is desired to use the device there is no risk of contamination of the contents of the container and, in the case of medicament powders showing hydroscopic tendencies, there is no risk of caking of the medicament prior to use.



Suitably the container used in the device is a capsule, for example a gelatin capsule, and conveniently the capsule perforating means is so arranged to provide one or more holes, suitably of about 0.6–0.65 mm. in diameter, desirably in the part of the capsule furthest from the propeller-like device, advantageously in the shoulders of the capsule. Where the perforating means is so arranged as to provide two or more holes in the container, these are conveniently positioned symmetrically around the container.

Suitably, the container perforating means may take the form of one or more spring-loaded piercing pins mounted in the housing so that they are normally urged, by the springs, away from the container but which may be pressed inwards to perforate the container by the action of push buttons located on the exterior of the housing.

It has been found that, in order to obtain optimum perforation of a gelatin capsule, the perforating ends of the piercing pins should not be sharpened to a conventional conical point but should be sharpened with a plane face at an acute angle. Further, the acute angled plane face should desirably face away from propeller-like device.

It is desirable that the propeller-like device be so mounted upon the shaft that the passage of an air stream causes not only rotational movement of the propeller-like device but also a vibrational component of motion. This vibrational component of the motion has been found to contribute to the release of the powdered medicament from the capsule.

In order that the propeller-like device should be capable of undergoing vibrational movement, it has been found desirable that the bearing in the propeller-like device in which the shaft engages should have certain dimensional characteristics. Thus the bearing takes the form of an elongate cavity of circular cross-section and the shaft is, of course, also of circular cross-section.

The internal diameter of the bearing at its inner end, i.e. the end housing the free end of the shaft, is desirably from 1.5% to 6% preferably 2.5 to 5%, e.g. 3.75% greater than the diameter of the shaft and the diameter of the bearing at its outer end is equal to the diameter of the shaft plus from 1.3 to 3.5% e.g. about 2.5% of the total length of the bearing. The actual length of the bearing is not critical but may be, for example, from 4 to 10 times the diameter of the shaft.

The inner end wall of the bearing is preferably flat and the end of the shaft which engages with it is suitably of frusto conical shape, preferably terminating in a hemispherical portion e.g. of a radius of about half that of the shaft.

The shaft itself should be rigidly mounted since we have found that undue flexibility of the shaft and mounting causes malfunctioning of the device.

The device according to the invention is suitable for the administration of medicaments for the alleviation of ailments of the bronchial tract and of the lungs. The device may also be used for the administration of medicaments having systemic action, for example it may be used for the administration of antidotes to poisonous substances such as nerve gases as it provides a very simple method of carrying medicaments which have to be used rapidly or in emergency.

In order that the invention may be well understood, one embodiment thereof will now be described with reference to the accompanying drawing which is a longitudinal cross-section through the device.

Referring now to the drawing, an inhalation device comprises a housing of approximately circular cross-section comprising two engaging members 1 and 2, housing 2 being adapted for insertion into the mouth and having passage-

ways 3 therein to permit the passage of air. Mounted rigidly in and co-axially with housing member 2 is shaft 4 upon which is loosely and rotatably mounted propeller-like device 5 having blades 6.

Propeller-like device 5 has a cup shaped member adapted to receive and hold a capsule or container of finely powdered medicament 7.

Shaft 4 engages in bearing 8 in propeller 5. The diameter at the inner end of bearing 8 is about 3.75% greater than the diameter of shaft 4 and the diameter at the outer end of bearing 8 is equal to the diameter of shaft 4 plus about 2.5% of the total length of the bearing, which is about 7 times the diameter of shaft 4.

The tip 9 of shaft 4 is conical in shape, having a cone angle of about 30°, and terminates in a substantially hemispherical portion having a diameter of about half the diameter of shaft 4.

Housing member 1 has in its end wall air passages 10 to permit the passage of air and constricting member 11 which serves to constrict the air stream through the device and thus increase its velocity past the capsule.

Mounted on the outside of housing member 1 are two hollow projections 12 and 12*a* having slidably engaged therein push buttons 13 and 13*a*. Push buttons 13 and 13*a* are retained in projections 12 and 12*a* by means of pins 14 and 14*a* engaging in slots in the push buttons, and are urged outwardly from housing member 1 by means of springs 15 and 15*a*. Attached to push buttons 13 and 13*a* are piercing pins 16 and 16*a*. For purposes of illustration, one assembly is shown in the non-piercing position whereas the other assembly is shown with the tip of pin 16*a* having pierced capsule 7, push button 13*a* having been depressed against the action of spring 15*a*.

In operation, housing members 1 and 2 are separated and capsule 7 is loaded into propeller-like device 5. Housing members 1 and 2 are then clipped together again and the device is ready for use. In use, the user first depresses buttons 13 and 13*a* to cause pins 16 and 16*a* to pierce capsule 7. He then releases buttons 13 and 13*a* to remove pins 16 and 16*a* from the capsule and subsequently inhales through the device to obtain, by inhalation, the contents of capsule 7.

We claim:

1. A device for the oral inhalation of medicaments in finely divided form which comprises a hollow elongate housing having at both ends thereof at least one passageway to permit passage of air and one of said ends being adapted for insertion into the mouth of the user; a propeller means rotatably mounted in said housing on a rigid shaft secured in said housing and co-axial with the longitudinal axis of said housing, said propeller means having on its end furthest from said one end of said housing a mounting means for receiving a container of said finely divided medicaments; and means mounted on said housing for perforating said container while said container is mounted on said mounting means, said perforating means comprising at least one spring loaded piercing member mounted in said housing and having push button means attached thereto for pressing said piercing members into said container.

2. An inhalation device according to claim 1, further comprising a bearing engaging said shaft, said bearing having an internal diameter at its inner end from 1.5 to 6% greater than the diameter of said shaft and an internal diameter at its outer end equal to the diameter of said shaft plus from 1.3 to 3.5% of the total length of said bearing.

3. An inhalation device according to claim 1 in which the piercing members are provided with piercing points taking the form of a plane face at an acute angle to the axis of said member.

4. An inhalation device according to claim 2 in which the internal diameter of the bearing at its inner end is from 2.5 to 5% greater than said diameter of said shaft.

5. An inhalation device according to claim 2 in which the internal diameter of said bearing at its inner end is about 3.75% greater than the diameter of said shaft and said internal diameter of said bearing at its outer end is equal to the diameter of said shaft plus about 2.5% of the length of said bearing.

6. An inhalation device according to claim 1, further comprising a bearing engaging said shaft, the length of said bearing being from 4 to 10 times the diameter of said shaft.


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