Nebulizer, Indicator Device and Container

The present invention relates to a nebulizer according to the preamble of claim 1. Also disclosed is an indicator device and a container.

WO 2012/162305 A1 discloses a nebulizer. A container can be inserted into a housing of the nebulizer. The housing is closed by a lower housing part. By rotating the housing part the drive spring can be put under tension and fluid can be sucked into a compression chamber of the pressure generator. Simultaneously, the container is moved into the lower housing part in a stroke movement within the nebulizer and when tensioned for the first time the container may be pierced through its base by a piercing element in the lower housing part to allow venting of the container. After manual pressing a button, the drive spring is released and moves the delivery tube into the pressure chamber so that the fluid is put under pressure by the drive spring and is delivered or atomized through a nozzle into a mouthpiece as an aerosol, without the use of propellant gas. Thus, the container is moving axially forth and back during conveying of the fluid to be nebulized, and during pressure generation and nebulization.

The container may be connected inseparably with the housing part by a securing device forming a transportation lock for holding the container unmovable in a delivery state.

The nebulizer comprises an indicator device for counting and/or indicating a number of uses performed or still possible. The indicator device blocks further use in a locked state when a predetermined number of uses has been reached or exceeded with the current container. Then, the container can be replaced together with a housing part and the nebulizer can be used further with the new container.

US 7,823,584 B2 discloses a similar nebulizer, wherein a counter device can be integrated into a housing part that is exchangeable or replaceable together with the container, which is inseparable from the housing part.

WO 2007/104694 A1 discloses an inhaler for powdery substances with an indicator device which may comprise a worm gear for driving an indicator element.

Object of the present invention is to provide a nebulizer as well as an indicator device and a container for a nebulizer allowing easy and/or secure operation and handling and/or a compact and/or reliable construction, preferably while allowing replacement of the container without replacement of any housing part of the nebulizer.

The above object is achieved by a nebulizer according to claim 1 by an indicator device disclosed herein or by a container disclosed herein. Preferred embodiments are subject of the subclaims.

According to an aspect of the invention as defined in claim 1, there is provided a nebulizer for a fluid, comprising: a replaceable container containing the fluid; a nebulizer housing for receiving the container; a housing part which can be detached from the nebulizer or opened for replacing the container; and an indicator device for counting and/or indicating a number of uses performed or still possible with the container; characterized in that the indicator device is adapted to initiate at least partial opening of the nebulizer housing and/or housing part in a locked state when a predetermined number of uses has been reached or exceeded with this container.

The present invention relates to a nebulizer for nebulizing a fluid, preferably liquid medicament, from a preferably replaceable container containing the fluid, and relates to the container. Preferably, an indicator device is provided for counting and/or indicating the number of uses already performed or still possible with the container.

In particular, the indicator device or an associated locking device can lock the container and/or nebulizer or can cause the locking of the container and/or nebulizer against further use in a locked state when a predetermined number of uses has been reached or exceeded with the respective container.

Preferably, the nebulizer comprises a housing part which can be detached from the nebulizer or opened for replacing the container.

The indicator device is preferably adapted to at least partially open or to cause at least partial opening of the nebulizer and/or housing part in the locked state and/or when the locked state is reached and/or the indicator device is adapted to prevent the complete closure of the nebulizer and/or housing part in the locked state. In particular, this allows a very compact and simple construction and/or secure operation. Preferably, the number of necessary parts and components can be minimized. In particular, this supports an intuitive handling.

According to one embodiment of the present invention, the indicator device blocks complete assembly of the container with the nebulizer or with the nebulizer housing and/or housing part in the locked state. In particular, this allows a very compact and simple construction and/or secure operation. Preferably, the

number of necessary parts and components can be minimized. In particular, this supports an intuitive handling.

The indicator device is preferably adapted to block complete inserting of the container into the nebulizer and/or housing part in the locked state. This allows a very compact and simple construction and/or secure operation. Preferably, this supports an intuitive handling. Preferably, this prevents re-use or re-insertion of an already used container and, thus, allows a very simple and secure construction.

The indicator device is preferably adapted to block full axial or stroke-like movability of the container within in the nebulizer in the locked state. This allows very compact and simple construction. Preferably, the number of necessary parts and components can be minimized. Further, this allows secure operation.

Preferably the nebulizer and/or container cannot be used anymore in the locked state when the indicator device has detected that a predetermined number of uses has been reached or exceeded, in particular with the respective container.

The indicator device may either directly or indirectly lock or initiate or trigger locking of the nebulizer and/or container against further use. In particular, the indicator device may directly actuate the locking device or indirectly initiate actuation of the locking device. Preferably, the indirect actuation is realized by means or via at least partial opening of the nebulizer or its housing or housing part in order to lock the nebulizer against further use with the current container.

Preferably, the nebulizer is blocked (automatically) against further use or tensioning if the nebulizer housing or housing part is at least partially open or opened or if, with other words, when the nebulizer or its housing is not (completely) closed.

It is also possible that the nebulizer is not immediately blocked against further use when the indicator device enters the locked state. Instead, the indicator device may initiate or cause or trigger in its locked state that the locking device is going to block the nebulizer against further use, e.g. during the next actuation or tensioning or the like. Thus, the locking device may enter its locking state later, e.g. after at least partial opening of the nebulizer and/or at least partial tension-

ing of the nebulizer or rotation of the housing part or inner part of the nebulizer or the like.

Therefore, the blocking of the nebulizer can be initiated or caused by the indicator device not only indirectly, but alternatively or additionally also later during further handling, operation, actuation or the like. In the latter case, the indicator device blocks or initiates or causes blocking of the nebulizer and/or container against further use also preferably in the sense of the present invention.

Preferably, the locking of the nebulizer against further use can be overcome by replacing the container, in particular including the indicator device, against one not yet used.

The indicator device is preferably inseparably connected with the container or with a container housing of the container, but separable from the nebulizer or its housing and from the housing part, so that the indicator device is replaceable together with the container. This allows reuse of the nebulizer and the housing part with another container including another indicator device. Thus the overall size of the components to be exchanged is kept small, so that the replacement packages are size reduced, so that transport of a large number of packages is facilitated.

Preferably, the indicator device is fixedly arranged at a bottom of the container and/or opposite to an outlet of the container. This allows a very compact construction. Further, the indicator device does not interfere with the fluidic connection of the container to the nebulizer or vice versa.

The indicator device comprises preferably an insertion opening for a driving part for driving, actuating or triggering the counting or indicating of the indicator device, wherein the indicator device is adapted to block or close the insertion opening in a locked state when a predetermined number of uses has been reached or exceeded. In particular, this allows a very compact or simple construction and/or supports secure operation.

Preferably, the indicator device comprises an indicator element and an actuation element for indexing the indicator element. In particular, the indicator element

displays an indication of the number of uses already performed or still possible with the respective container.

Preferably, a linear movement of the actuation element causes a rotational movement of the indicator element.

Even more preferably, the actuation element is set in motion by a relative longitudinal movement between the container with the indicator device and the housing and/or housing part of the nebulizer.

The actuation element in the indicator device is preferably constructed to also block further use of the container in the locked state. In particular, this allows a very compact and simple construction and/or secure operation. Preferably, the number of necessary parts and components can be minimized.

The actuation element is preferably moveable back and forth between a first and second position for indexing the indicator element and is moveable – at least or only once – into a third position to block further use of the container in the locked state. In particular, this allows a very compact and simple construction and/or secure operation. Preferably, the number of necessary parts and components can be minimized.

The actuation element is preferably moveable transversally to a longitudinal or dispensing direction of the container or nebulizer. In particular, this allows a very compact and simple construction and/or secure operation. Preferably, the number of necessary parts and components can be minimized.

Preferably, the indicator device comprises a blocking part which blocks further use of the container and/or nebulizer in the locked state.

The blocking part is preferably formed by or made integral with the actuation element. In particular, this allows a very compact and simple construction and/or secure operation. Preferably, the number of necessary parts and components can be minimized.

The blocking part is preferably integrated into a housing of the indicator device. In particular, this allows a very compact and simple construction and/or secure operation. Preferably, the number of necessary parts and components can be minimized.

The blocking part is preferably moveable transversally to a longitudinal or dispensing direction of the container or nebulizer. In particular, this allows a very compact and simple construction and/or secure operation. Preferably, the number of necessary parts and components can be minimized.

The blocking part preferably closes an insertion opening of the indicator device or its housing in the locked state. In particular, in the unlocked state, the insertion opening is for receiving a driving part attached to the housing or the housing part of the nebulizer, so that upon a relative movement between the indicator housing and/or the container and the nebulizer housing, the driving part actuates the indicator device in particular such that a use of the nebulizer is counted and/or indicated in the indicator device. In particular, this allows a very compact and simple construction and/or secure operation. Preferably, the number of necessary parts and components can be minimized.

The blocking part preferably actuates a locking device or its locking element of the nebulizer in the locked state. This actuation can be realized directly by respective cooperation of the blocking part if the locking device or its locking element or, alternatively, indirectly, in particular by opening the nebulizer or closing an insertion opening of the indicator device or the like which results in an actuation of the locking device or its locking element. Thus, further use, in particular further dispensing or nebulization of fluid can be prevented or blocked in the locked state.

The above configurations and the further configurations described below can be realized independently from each other, and in any combination.

Further advantages, features, characteristics and aspects of the present invention will become apparent from the claims and the following description of a preferred embodiment with reference to the drawings. It shows:

Claims

1. Nebulizer for a fluid, comprising:

a replaceable container containing the fluid;

a nebulizer housing for receiving the container;

a housing part which can be detached from the nebulizer or opened for replacing the container; and

an indicator device for counting and/or indicating a number of uses performed or still possible with the container;

characterized in

that the indicator device is adapted to initiate at least partial opening of the nebulizer housing and/or housing part in a locked state when a predetermined number of uses has been reached or exceeded with this container.

2. Nebulizer according to claim 1, characterized in that the nebulizer is adapted to block further use or tensioning if the nebulizer housing or housing part is at least partially open.

3. Nebulizer according to any one of the preceding claims, characterized in that the indicator device comprises an indicator element and an actuation element for indexing the indicator element.

4. Nebulizer according to claim 3, characterized in that the actuation element is constructed to block further use of the container in the nebulizer in the locked state, preferably wherein the actuation element is moveable back and forth between a first and second position for indexing the

indicator element and is moveable into a third position to block further use of the container in the locked state.

5. Nebulizer according to any one of claims 3 or 4, characterized in that the actuation element comprises or is formed by a sliding carriage.

6. Nebulizer according to any one of claims 3 to 5, characterized in that the actuation element blocks or closes an insertion opening of the indicator device in the locked state.

7. Nebulizer according to any one of the preceding claims, characterized in that the indicator device comprises a blocking part which blocks further use of the container in the nebulizer in the locked state, wherein the blocking part is integrated into a housing of the indicator device.

8. Nebulizer according to claim 6 or 7, characterized in that the blocking part blocks or closes an insertion opening of the indicator device in the locked state.

9. Nebulizer according to claim 7 or 8, characterized in that the blocking part is connected with or forms an actuation arm for indexing an indicator element of the indicator device.

10. Nebulizer according to claim 8 or 9, characterized in that the blocking part comprises or is formed by a sliding carriage.

11. Nebulizer according to claim 6 or 8, characterized in that the insertion opening allows insertion of a preferably stationary driving part of the nebulizer when the insertion opening is not blocked or closed.

12. Nebulizer according to any one of the preceding claims, characterized in that the nebulizer comprises a preferably stationary driving part for driving or actuating or triggering the indicator device and/or for opening or piercing the container, preferably by relative movement of container or indicator device to the nebulizer housing or driving part.

13. Nebulizer according to any one of the preceding claims, characterized in that the indicator device is inseparably connected with of the container, but separable from the nebulizer housing and housing part, so that it is replaceable together with the container.

14. Nebulizer according to any one of the preceding claims, characterized in that the indicator device is moveable axially or back and forth together with the container within the nebulizer, preferably during supplying or nebulizing the fluid and/or tensioning the nebulizer.