

Summary

People with lung diseases such as asthma and COPD inhale their medication with the help of inhalers. There is a fixed number of doses of medication in each inhaler, after which it must be discarded. Many inhalers have a built-in counting function to inform the user when this number of doses has been reached. A significant group, the metered-dose inhalers, often does not have this function.

Metered-dose inhalers are inhalers that administer the medication as a spray upon pressing, in a combination of propellant and medicine. Users of metered-dose inhalers without counting function are now being told to tally their uses, other methods to test whether there is still medication in a used metered-dose inhalers are unreliable.

The Lung Foundation Netherlands, patient organization for lung patients, has seen that problems arise due to the use of counterless metered-dose inhalers. Because it is not possible to enforce all metered-dose inhalers to have a built-in counter, the foundation chooses to make a design for an external counter to help their target group. The aim is a promising design proposal of what such a counter should be.

To understand the problem well, there has been looked into and discussed with the most important stakeholders, pharmaceutical companies, inhalation medication manufacturers, and patients, users. Medical expertise has also been called to better understand the process of inhaling medication in the lungs. This has resulted in a description of the nature of metered-dose inhalers, and a description of the target group, people with COPD and/or asthma. Important findings are.

- The problem of counterless metered-dose inhalers is common to all types of users, COPD or asthma, regular or sporadic users.
- Users often have to take their medication with them.
- Inhalation with metered-dose inhalers is ideally done with a spacer, a relatively long object between mouth and metered-dose inhalers.
- The regularity with which the medication is used varies greatly, from daily at regular intervals to sporadic in an emergency situation.
- Other types of inhalers, and also some metered-dose inhalers, show that a built-in counter is easy to make. The lack seems to be because the metered-dose inhalers for many makers is an older product that is no longer developed.
- Each inhaler has a predetermined maximum number of doses, existing counters count from this maximum to 0.
- After a metered-dose inhalers is empty, it is completely discarded and replaced with a new one.
- Metered-dose inhalers have an L-shape as standard, with limited variation in design and dimensions.
- There are special metered-dose inhalers, breath-actuated, which are not activated by pressing, but by inhalation. Because this group is rare and differs strongly in use, compatibility with these products will not be a requirement but a wish.
- What's needed is a simple and affordable product to help the target group as effectively as possible.



A metered-dose inhaler and a metered-dose inhaler with spacer

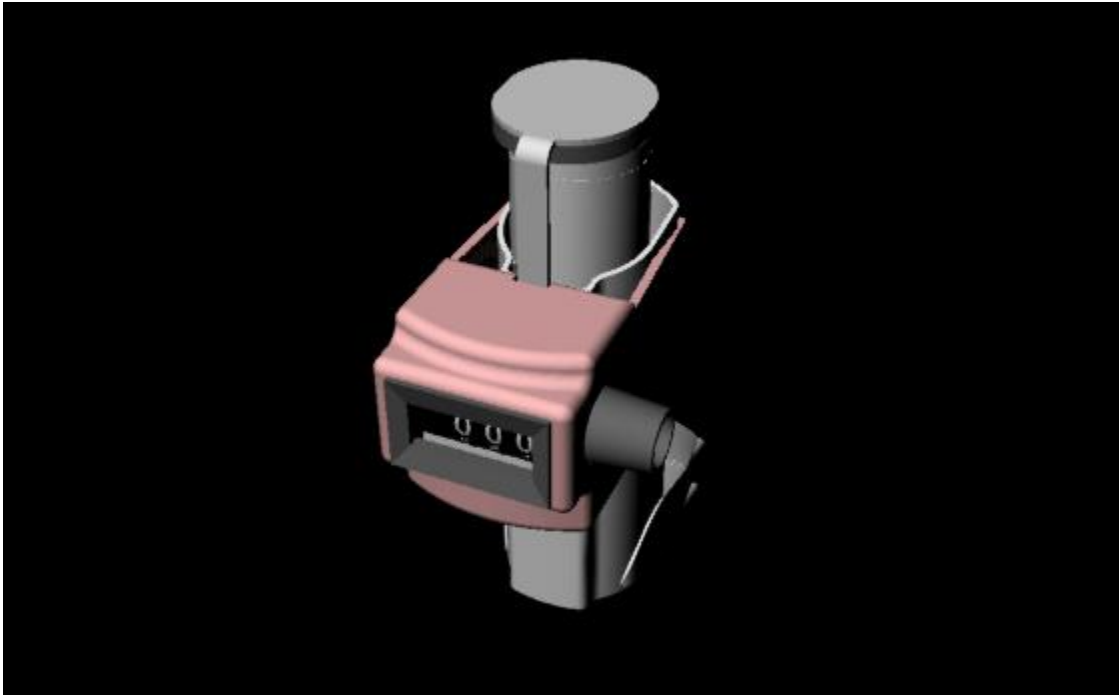
A program of requirements has been made with as main features ease of use, easy handling and correct use of medication. This was the basis for designing multiple ideas. By describing the product abstractly early, four topics were set up for this generation of ideas, attaching the counter to metered-dose inhalers, counting technique, dose display, and a reset for use on a new metered-dose inhaler.

3 Promising concepts have been worked out.

- A "sock" with digital counter that automatically counts each inhalation.
- A clamp placed around the neck of the inhaler that mechanically automatically counts each inhalation.
- A mechanical counter that can be hung around the inhaler, where the user must manually count each inhalation.

Through cross-pollination, attachment methods and counting methods have been combined differently to achieve the most promising design. After reviewing the program of requirements, the clamp with automatic mechanical counter is chosen as the most promising concept. This concept is then mirrored with the target group.

Aspect of this concept is that the counting mechanism is based on existing mechanical counters. In order to keep the price down, and keep manufacturing as easy as possible, focus was on how the components of these existing counters can be taken over directly for the dose counter. The detailing focused on the housing around this mechanism. The result is a plastic housing with U-clamp that can clamp around the neck of various metered-dose inhalers, with a metal push button that extends above the canister of the inhaler, so that each inhalation is automatically counted. A dial on the side provides a reset to 0. Two prototypes have been made of this design, one with representative shape, and a working prototype with built-in counter, both are presented to users and the product seems to achieve its goals.



The counter attached to a metered dose inhaler

2 Aspects of this design deserve closer consideration. First of all, the fact that the design counts up from 0, instead of counting down a fixed value as do built-in dose counters. This has been chosen so that the design can be applied to different types of metered-dose inhalers, with different maximum doses. Simple interrogations suggest that users understand this, a more thorough use test can be considered to test this.

The second aspect is that the counting mechanism, and with it the entire product, can be smaller. This has not been done so that existing parts can be used, but when a manufacturer is found who wants to build this product from the ground up, it is certainly recommended to revise the sizes.