Proposal for the design of a future proof door lock

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Client: Themans Hang- en Sluitwerk B.V.
Topic: designing a new door lock.

Themans is a dealer and producer of builder's hardware brands. They are looking for a new door lock that can be added to their assortment, for which they have two reasons: current door locks are too complex and there are developments going on in which they are only involved to a limited extent. The current generation of door locks has a traditional basis, upon which developments have been made for new functions that have resulted in several complex constructions. Themans wishes for a new lock that has a simple basis and a broad range of application. For the latter, the lock needs to provide functionality that is desired for the future. Themans strives after own innovation, so a future proof door lock can help them reinforce their market position on the long term. The assignment description hence states:

> *The aim of the assignment is to make a design proposal for the door lock of the future; suitable for current building requirements, but especially for new usability.*

The available time for the assignment allows for two phases of a classical design process to be completed: the research and the concept phase. The research phase yields conclusions about what a future proof door lock is, which leads to a set of requirements that form the basis for the concept development.

Research is started with analysing the assortment of Themans and extending it with other locks offered on the market. This allows for differentiation between types of door locks and their functions. From this research follows that the door lock should be aimed at residential construction for a broad range of application. For that setting, multi-point locks are the current safety standard. Therefore, the design will be one, which is consistent with Themans' assortment.

The majority of current multi-point locks is manually operated by the user. For greater ease of use the user will need to do less actions. The market research shows that improved ease of use is often realised by electrification nowadays. This is the trend in which Themans is involved to a small extent by offering Ansa-e electromechanical locks. In addition, integration of electronics enables new usability in the form of access control. So, greater ease of use can be provided by a self-locking function and unlocking can be made easier by use of electronics. That is the direction for the future proof door lock.

Figuur 1: example of an existing multi-point lock (Themans, 2017)

However, the use of electrical energy should be limited. A stakeholder analysis makes clear that door locks are part of a greater whole: the door. For construction of doors, there are many involved parties, forming an industry unable of quick adaptation to changes. The energy source should thus be located in the currently allowed space for a door lock. Batteries prove to be the best option, regarding cost price. The replacement frequency should be low to maintain user comfort, underlining that the energy consumption has to be as low as possible.

For the lock to be applicable in the near future, it has to comply with current regulations. The SKG quality mark is analysed for this and set as requirement for the lock to meet (SKG-IKOB, 2017). A future proof door lock is still meant for security of property. Therefore, well-known burglary methods are selected (Politiekeurmerk.nl, z.j.), so that the design protects against them.

In full, the resulting design is a mechanically self-locking multi-point lock. The base operates mechanically, so the user can always use a traditional key to open the door. While closing the door, the lock stores energy mechanically. This potential energy can be used for easy unlocking while avoiding use of electrical energy. An electronic module can optionally be added to the lock to create new possibilities for operation. The module includes an electromagnet that unlocks the door by releasing the stored energy. An electromagnet is chosen, because it can be actuated by an electric pulse in an energy efficient way. This pulse can be the output of several electronic operating systems that can all be connected to the lock. A broad range of possibilities exists, such as card identification, finger print scanners and smart phone connection. The advantage of making the electronic module optional is that the starting price can be lowered, but users can eventually upgrade their lock.

So, the door lock of the future has a mechanical basis that can always be operated, with a broad potential for application of electronic operating systems.

References

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