# 3D PRINTING AN ACCORDION

*How can additive manufacturing technologies be used to simplify the production of a small accordion?*

*Pigini Nederland sells a small accordion for 999 euros. They want to lower the threshold of becoming familiar with the accordion by reducing the production cost of an entry-level instrument. To do so, the right hand side of the accordion has been redesigned to be produced using a Fused Deposition Modeling printer, combined with several conventional components.*

## ACCORDION CONSTRUCTION

The sound of an accordion is produced by a reed: a piece of spring steel that vibrates when air flows past. When a button is pressed, a reed valve is opened, allowing the air flow to pass the reed. A mechanical structure of aluminium bars connects the buttons to the reed valves, using torsion springs to create resilience.

## TIMBRE DESIGN

The sound chamber dimensions are determined by analysing sound samples of different reeds and chambers, and comparing them in a user test. In the most preferred sound chambers, the higher partials have a relatively low resonance.

## CONCLUSION

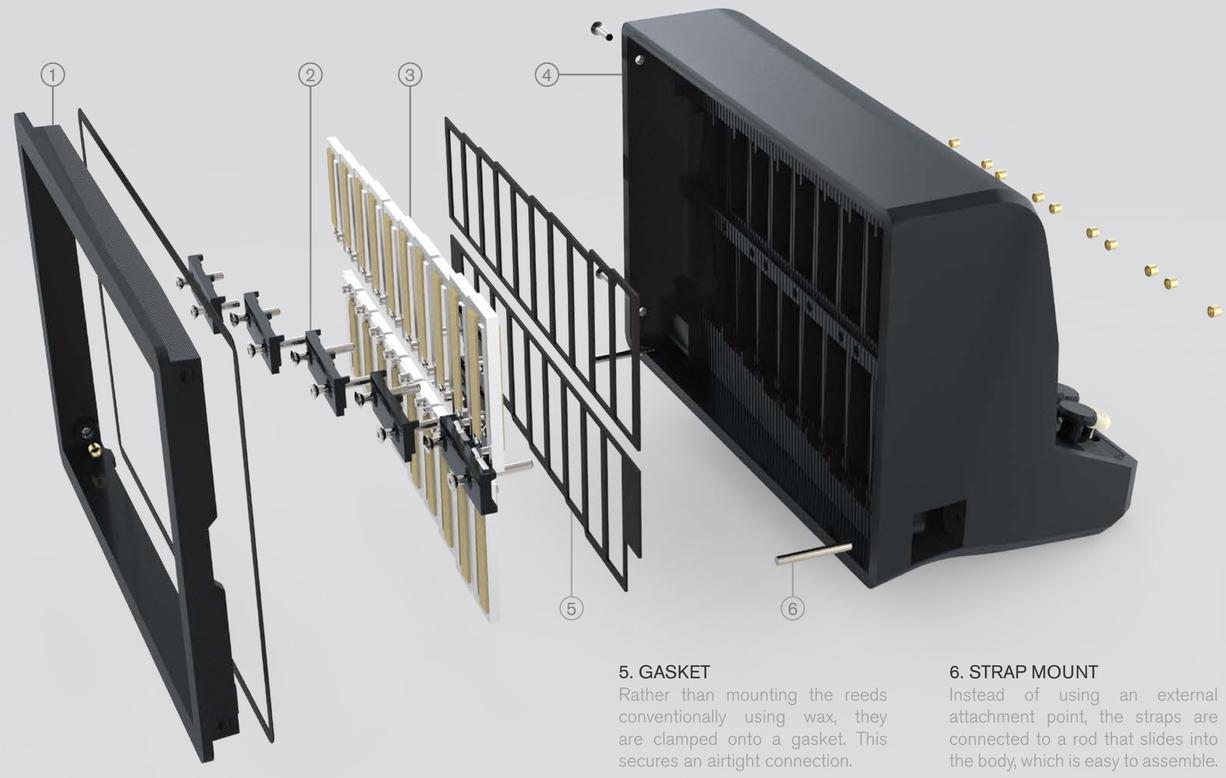
A functional proof of concept is printed and presented to users with an interest in the accordion. They consider its sound to be pleasant. The current redesign of the accordion's right hand side allows for a cost reduction of 15% for the full instrument. This clearly indicates that additive manufacturing processes can be a valuable tool in lowering the engagement threshold for future accordionists.

1. BELLOW FLANGE
The bellow flange connects the body to the bellow. It is secured airtight onto the body using bolts and a form closure.

2. REED CLAMPS
Five clamps are used to secure all the reeds onto the gasket. They are attached using bolts and inserts in the body front.

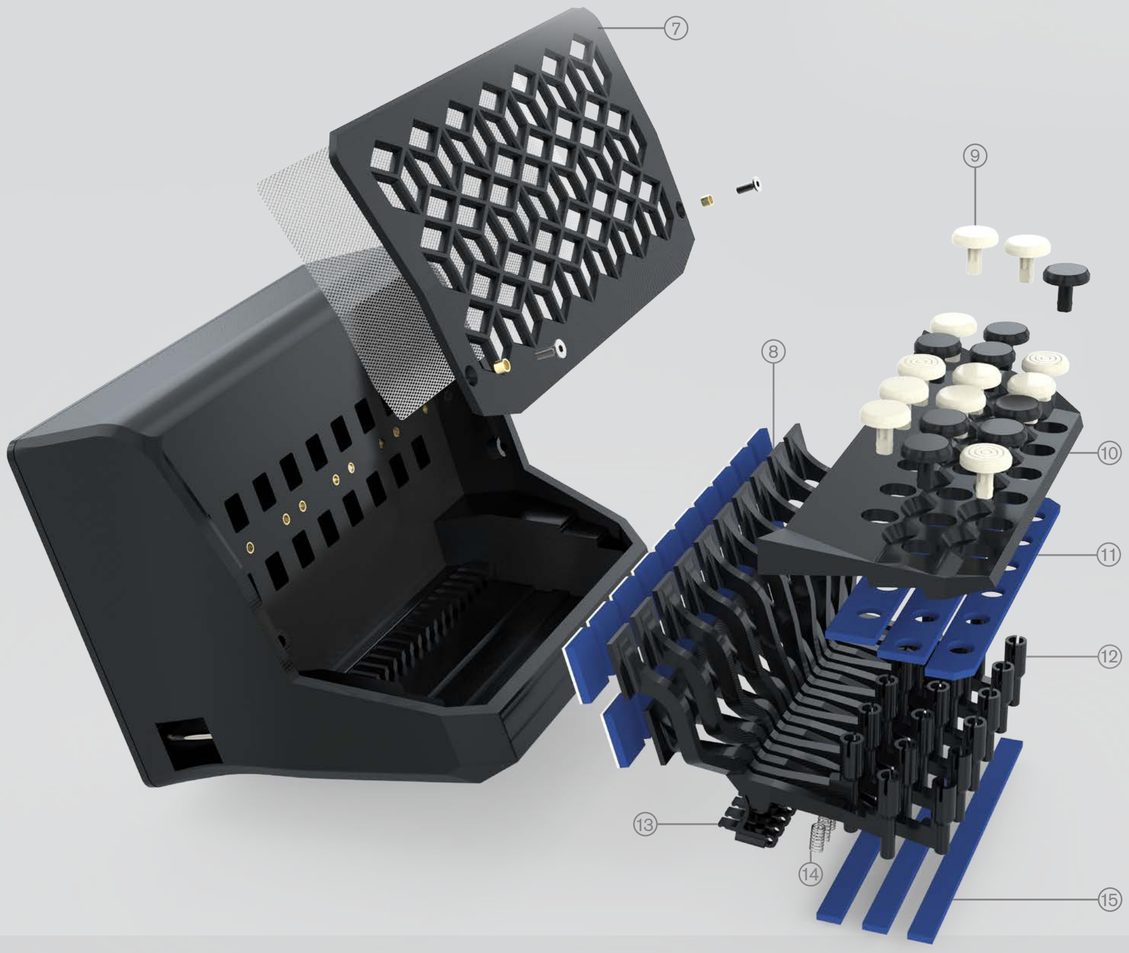
3. REEDS
These 19 reeds are the same as in a conventional instrument and range from A#3 to E5. They define the typical accordion sound.

4. BODY
The right hand side body of the instrument incorporates the sound chamber and attachment points for multiple parts.




5. GASKET
Rather than mounting the reeds conventionally using wax, they are clamped onto a gasket. This secures an airtight connection.

6. STRAP MOUNT
Instead of using an external attachment point, the straps are connected to a rod that slides into the body, which is easy to assemble.




7. GRILLE
The sound of the instrument reaches the user via the holes in the grille. A gauze is glued onto its back, covering the holes.

8. REED VALVES
Valves open when a button is pressed, so that air can flow through the reed. The closure is created using conventional felt and leather.

9. BUTTONS
A snap fit system that connects the buttons to the inner mechanics makes them easy to attach and detach.

10. BUTTON COVER
Under the buttons, there is a cover that ensures that the mechanical parts are closed off and holds the buttons in place.

11. BUTTON FELT
This felt keeps the buttons in place and makes sure that no interference between parts takes place when pressing a button.

12. FEMALE SNAP FIT
The button connects to the female part of the snap fit, that is attached to the inner mechanics. This part is guided by the button felt.

13. MECHANICS SNAP FIT
These snap fits make it easy to position the parts of the inner mechanics, and create a durable attachment.

14. SPRINGS
The springs create button resilience and press the button valves onto the body. This is necessary to form an airtight connection.

15. LANDING FELT
The felt here ensures a smooth button landing. When a button is pressed, a cylindrical part on the beam lands onto the felt.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Utilising additive manufacturing techniques to simplify the accordion production process
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Integrated Product Design

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