AUTOMATING THE OPENING AND CLOSING MECHANISM OF A FUNCTIONAL TEST FIXTURE

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When manufacturing printed circuit boards (PCB), end of line testing needs to be done to assure good quality and reliability before the product reaches the customer. This is often done with a functional test fixture (FCT-fixture) manually opened and closed by operators. Automating the opening and closing mechanism of a FCT-fixture can save a lot of time and money.

A FCT-fixture is a fixture that is designed for testing one specific PCB. The PCB is put inside the FCT-fixture and when the lid is closed there are needles pressing on different test points on the PCB. The needles are connected to a computer that can perform several tests on the PCB automatically. Figure 1 shows how a typical FCT-fixture looks.

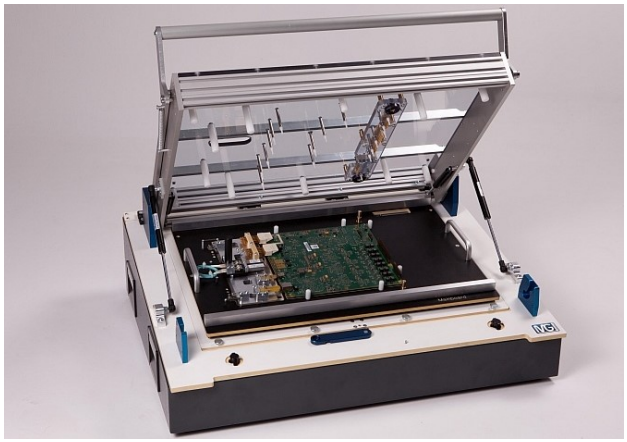

Figure 1: A typical FCT-fixture made by MG with a PCB placed inside.

So, how difficult is it to open and close a FCT-fixture manually. It is just a lid mounted to a box that need to be opened and closed, right? Unfortunately, it is much harder than that. Firstly, the mechanism for opening and closing is complicated. The brand MG manufactures FCT-fixtures for manual operation. The mechanism used in their FCT-fixtures is common among other brands as well and consists of two parts: opening/closing and locking/unlocking. The opening/closing works the same way as is the lid would be attached to hinges, and the locking/unlocking works by rotating the handle. Figure 2 illustrates the two states of the mechanism.

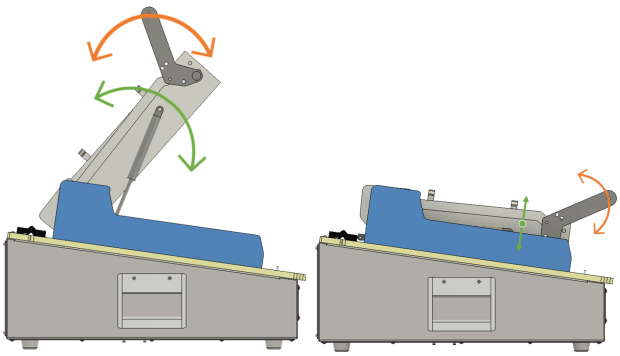

Figure 2: The left figure shows the opening/closing and the right picture show the locking/unlocking.

Secondly, there are a lot of safety needed to be taken into consideration; when the lid is closing or locking there is a big risk of pinching fingers or other parts of the body. To know what is safe and how to implement all necessary safety features there are standards that needs to be followed. It is very hard to implement all required standards perfectly, but reading through them and get a good overview of what is important is beneficial to not make a completely faulty design.

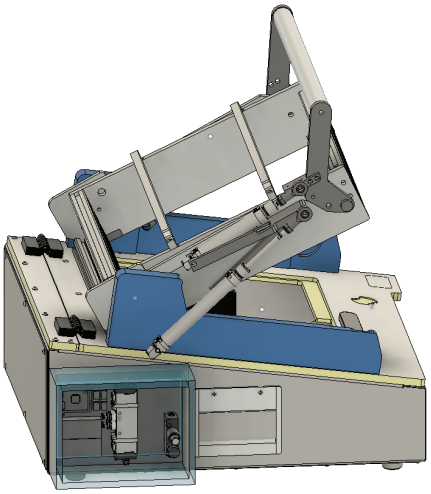

Figure 3: A way of automating the mechanism.

Figure 3 illustrates a way to automate the mechanism. The upper cylinder locks and unlocks the FCT-fixture and the lower cylinder opens and closes the lid. To control the mechanism an electric and pneumatic circuit is used and placed in a box on the side of the FCT-fixture. What is not shown in figure 3 is the safety solution. Light curtains surrounding the FCT-fixture sends a signal to the electrical circuit if a hand or other object goes through the light curtains. This will prevent pinching as the ongoing motion of the lid is stopped.

This solution has been implemented and tested resulting in both pros and cons. To have a fully working model that can be used in factories more iterations of the concept need to be made, but the work done so far is a good starting point both regarding the design and safety standards.