i9MASKS

Cooling System for PDMS Masks

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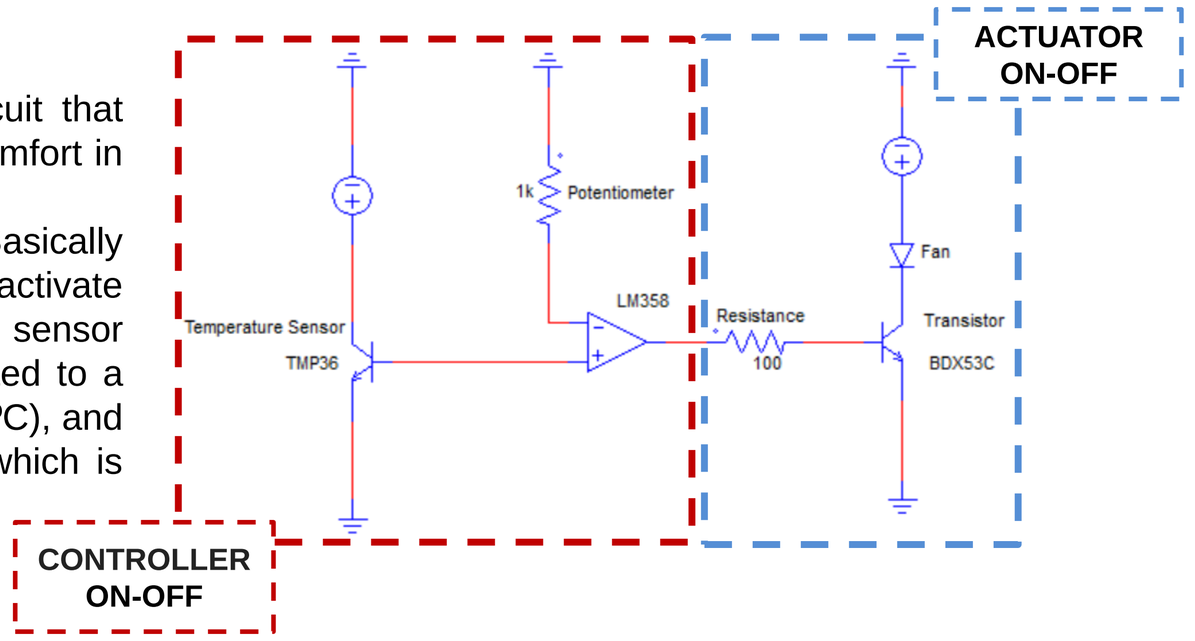
Introduction

Nowadays, the individual protective masks represent a crucial tool in decreasing the spread of high-risk pandemic infection, especially the coronavirus disease (COVID-19). However, its intensive use increases the amount of heat trapped beneath the mask and consequently causes an increase in the facial skin temperature and in some cases cutaneous irritations. Furthermore, a relevant discomfort when wearing protective face masks is reported by many people. Thus, the possibility of creating a system that allow to reduce the heat in the mask is very important for increase the comfort in its use.

Materials and methods

The work that was developed, fell on the development of an electronic circuit that allowed the cooling of an individual protection mask, in order to increase the comfort in the use of this very essential asset in nowadays.

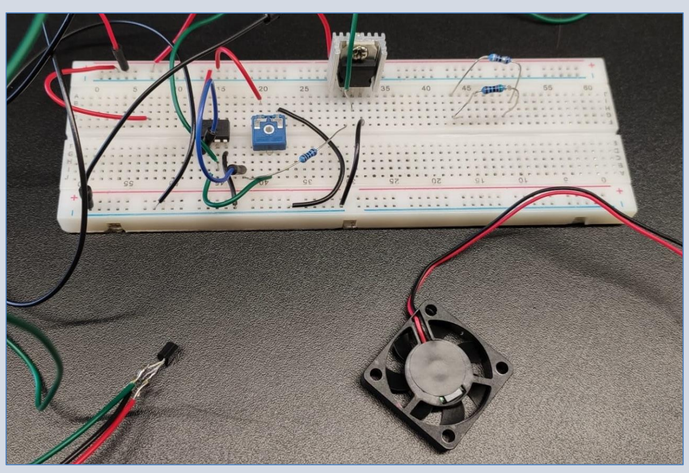
The circuit consists of using an ON-OFF controller and an ON-OFF actuator. Basically the ON-OFF controller, will evaluate the temperature inside the mask and will activate the ON-OFF actuator. The ON-OFF controller consists of a temperature sensor (TMP36) that has an adjustment of 10mV / ºC. The potentiometer was adjusted to a temperature that was already annoying (it was designed for a temperature of 30ºC), and when the temperature sensor sensed that temperature, it activated the fan, which is under the influence of the ON-OFF actuator.



Results

PHASE 1

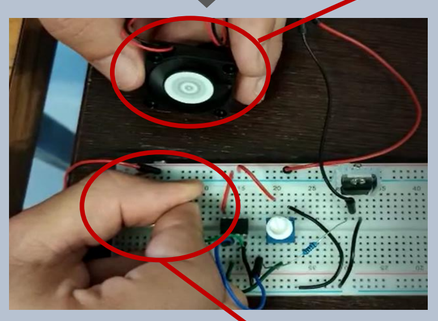
Assembly of the cooling circuit, on a breadboard, to carry out the validation tests.



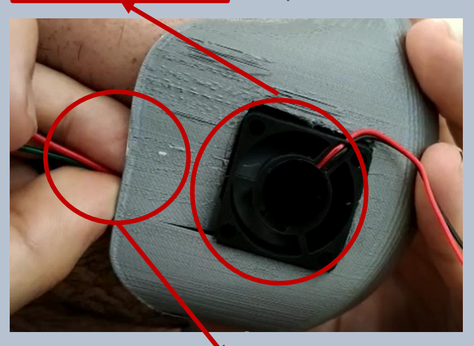
PHASE 2

Validation tests

The first validation was using the sensitivity of the fingers. Two fingers were placed on the temperature sensor, and when it reaches the desired temperature, the fan was activated.

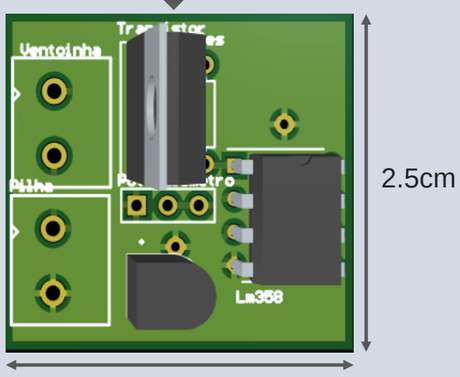


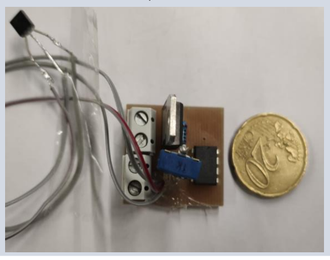
The second validation was carried out within a prototype of a mask, which was under development.



PHASE 3

After validating the circuit, a PCB (Printed Circuit Board) was developed to facilitate the integration of the circuit in the mask.





Conclusions and Future Work

It follows that the cooling system works as intended. In the future, we intend to develop a PCB, even smaller, so that it is as little noticeable as possible in the mask, and to study a way of placing it inside it properly. For this, one of the changes is the replacement of electronic components, with components of SMD character (Surface Mounted Device).

References

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