

Designing and Manufacturing Digital Absolang

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Abstract: One of the items that are commonly used in medical examinations by doctors is a tongue depressor. Commonly a tongue depressor is a blade made of polished and sterile wood used for oral examinations. There are a number of other devices that are designed for facilitating the use of tongue depression, but because of limitations and difficulties of these devices simply, a tongue depressor is still the device of choice for medical examinations. Hygienic as well as many other technical flaws and limitations of previous devices are the underlying motive for making a device named Digital Absolang. This device is resolving disadvantages of previous devices and brings new features. Using replaceable blades resolve the health related problems of previous devices. Using a camera mounted on the device will provide transferring the pictures and recorded videos to the computer during the examination. By using a light source with adjustable light intensity in this device, there would be no need for further use of flashlights by the doctors in their examinations. Using a three-axis rotation of the tongue blade with 360 degrees range can further facilitate the examination.

Key words: Clinical examination and diagnosis • Tongue blades • Medical equipment

INTRODUCTION

With the advancement of science and technology in the field of biomedical engineering, new and improved devices are manufactured and marketed every day to help the diagnosis by the doctors. One of the everyday, widely used medical devices by doctors worldwide is the tongue blade (tongue depressor). A tongue depressor is a blade made of polished and sterile wood used for oral examinations by the doctors [1]. Medical examination is performed with two hands. In this method the physician keeps a flashlight in one hand and a tongue blade in the other hand. It is not possible to change the status of the patient's head and it lowers the quality and speed of the examination. The examination of a patient can hurt and frustrate the patient. In some cases, it make it difficult to further examine the patient. Lack of a device that drives adjustable sufficient light to be used for the examination of the pharynx and throat and rapid depletion of the traditional flashlight batteries sometimes troubles the examination of the doctors [2].

In the year 2002, a camera was mounted on the tongue blade [3] to facilitate capturing data from the

examination. In the year 2008, by using a magnifying glass on a tongue blade, the vision of the doctor in the examination of the mouth and throat increased [4]. In 2010, by placing a camera on a plastic blade the images of the examination were transferred to a computer [5]. In 2011, the curvature of the plastic blade increased maneuverability in the examination [6]. Because of hygienic problems of the unchangeable blades of previously designed devices, high construction costs of such devices and incompleteness of the design, simple wooden tongue depressor blades are still used for oral examinations.

The disadvantages and problems that exist in using simple wooden tongue blades are:

- Available tongue blades that are used by physicians are simple and have no other accessories.
- Because of the absence of a light source, the physicians must hold a torch in the other hand.
- Bimanual examination cause both hands of the doctor to be occupied while examining the patient.
- No record of the patient's treatment are available for future references.

- Only one physician may view the patient's throat and mouth at a time.
- Repeated examination may irritate the patient.
- There is no possibility of maneuvering of the blade in the examination with a simple wooden blade.
- There is an inability to adjust the light by the physician since different examination rooms requires different light intensities and a simple torch does not offer this option.
- The inability to record the medical examination processes.
- There is no ability of reporting special cases to journals.
- The inability of the physician to consult physicians that are away from clinic or hospital.

The purpose of designing and manufacturing Digital Absolang is to provide a digital device with a camera and adjustable light source that can rotate 360 degrees. This device resolves the problems of using a simple tongue blade due to its design and construction and has the following benefits:

- Replaceable tongue blade to examine each patient individually and hygienically.
- Presence of four sources of light on the body of the device.
- Lights sources with adjustable intensity.
- Rotatable head to obtain a good angle of wooden blade for convenient examination.
- Ability to examine each patient with one hand.
- To see a clear picture of the examination on the computer.
- The possibility of taking pictures during the examination of the patient.
- Recording patient information during the examination.

MATERIALS AND METHODS

To design and manufacture the Digital Absolang, connection between the camera, computer, light sources and circuits must be provided. To make the device, we have to provide a mobile part allowing the physician to examine the patient. The other part of the device is the designed circuits. The overall functional block diagram of the device can be seen in the Figure 1.

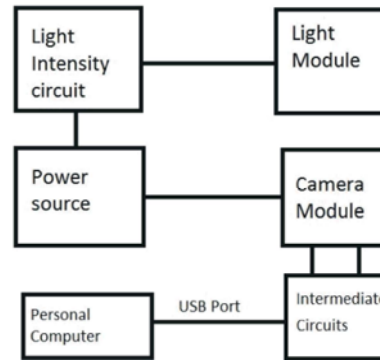


Fig. 1: Block diagram of Digital Absolang

RESULTS

Digital Absolang consists of three main part. The first part is the head of the device the camera and light sources are mounted on. It also contain a part that has a hanger for a wooden blade. The second part is the handle of the device. The light sources adjustment keys are placed in this part. Head and the handle can be adjusted according to each other. These two parts can be seen in the Figure 2.

The third Part is the power and control circuits. This part also contains data transmitting modules that transfers data from camera to the personal computer. All three parts are connected to each other with data wires. All these three parts in details are:

- Digital Camera: the 8 megapixels camera along with a built-in microphone is used to record pictures and videos of the mouth and throat of the patient and voice of the physician that explains possible related examination information.
- Light sources: four small but powerful light LEDs are placed around the camera.
- Blade hanger: a blade hanger is placed under the camera and light sources to enable the physician to change the wooden blade for hygienic examination of each patient.
- Adjustable axes are placed between head and the body of the device to give the physician 360 degrees maneuverability of the examination (Figure 3).
- Two keys to turn the lights on or off, each allocated to a couple of LEDs.
- A volume to adjust the intensity of outgoing light.
- USB port to establish a connection between the device and a personal computer.



Fig. 2: Head and handle of Digital Absolang



Fig. 3: Adjustable axes of Digital Absolang



Fig. 4: Circuit Box of the Digital Absolang

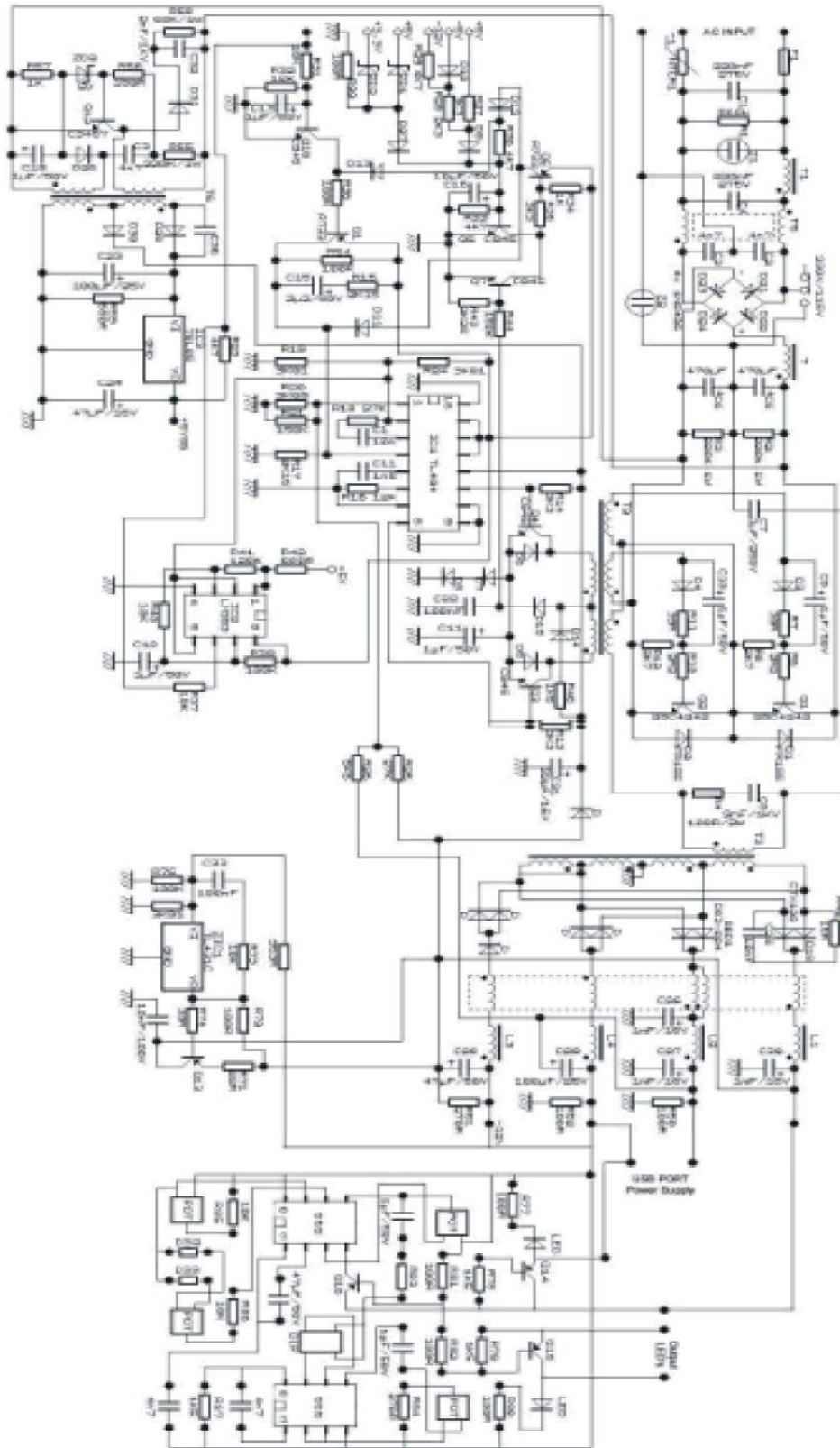


Fig. 5: Technical map of Digital Absolang's circuits

- The on/off lamp to indicate whether the device is on or off.
- The circuits: these circuits connect all the parts of the device together, transfer 220 volts city electricity and adjust it for all the parts, adjust the light intensity (Figure 4).

Digital Absolang device is registered in the State Organization for Registration of Deeds and Properties, Industrial Property General Office of Iran with the patent number 85025. Technical map of Digital Absolang's circuits can be seen in Figure 5.

DISCUSSION

Designing and manufacturing the devices for mouth and throat examination dated back to 1992. Since that time, these kinds of devices improved enormously and made the examination easier, but flaws and limitation of these devices remained and physicians still have to use plain wooden tongue blades. Examples of designed devices can be found in 2006-2011 [2-6]. Each designed device has specific limitations. The 1992 patent was only a wooden blade with a flashlight attached. That has no specific feature like recording and the physician cannot change the wooden blade for each patient [2]. Unlike this device, the device that was designed and registered in 2002 [3] had a mounted camera on a plastic blade. Unchangeable blades and a fixed device head that could not offer the maneuverability was the limitation of this device. In 2008, a magnifier mounted on a blade could magnify the visual field of the physician [4] but the physician needed to have a flashlight in the other hand to examine the patient's mouth. The magnifier was so big that they were not able to examine sick children. In 2010 by curving the blade the physician could see a larger field [5], but this device was designed for intubation not the usual physician's examinations. The most developed device manufactured in 2011 was that a small camera was placed at the end of a plastic blade [6]. The place of the camera at the end of the blade does not give the physician the holistic view and the unchangeable blade was still the hygienic problem of this device. Our device has the mentioned advantages and offers a better option for the physical examination of the patient's mouth and throat.

CONCLUSION

Our designed device named Digital Absolang solves these flaws and brings new features for the examination of mouth and throat: changeable wooden blade, four light sources, one hand examination of the patient by the physician, taking pictures and recording videos of the examination for further reference, 360 degrees maneuverability of the examination and adjustable light for examination.

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