Engineer's Conclave

Low-Prep Event (150 Points)

Project Report

Project Name:

Automatic Eyeglass Cleaner

Institute Name:

Indian Institute of Technology Roorkee

Team:

Serial No.	Team Member Name	Enrollment No.
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Problem addressed:

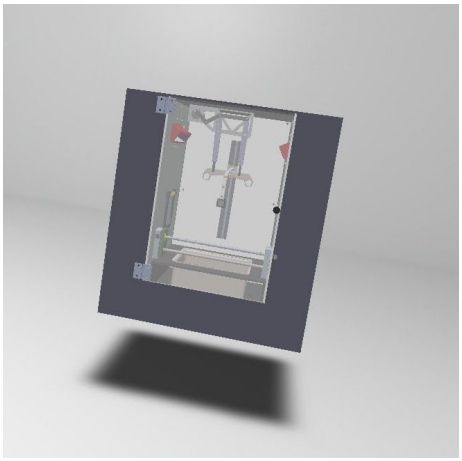
Eyeglasses cleaners available presently in the market are costly but are not versatile. They either do ultrasonic cleaning or splashing water and drying. But still, it leaves smudges on the lenses. And also they might take much time for this simple task and majorly nowhere automatic wiping is available. This process is clumsy and can be automated which would give the user complete hands-free experience.

So we planned on designing a machine that can clean, rinse, dry and wipe the eye-glass in less time.

Proposed Solution:

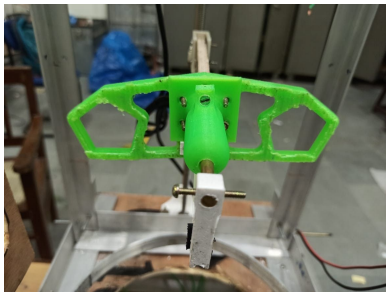
We have designed and manufactured a machine which cleans the eyeglasses automatically by combining four processes-

1. Ultrasonic cleaning
2. Rinsing
3. Drying
4. Wiping



It cleans the eyeglass with ultrasonic waves which helps it to clean the nook and corner. Then it is rinsed with water by splashing water jet on lenses which helps in removing smudges and fingerprints. Then it is dried by blowing mild hot air to remove wetness on the frame and then wiped with specially designed wiping material wrapped with a microfiber cloth which gives crystal clear appearance to the glasses.

Mounting the Eye-Glasses



We have designed a special holder for mounting the eyeglasses. Eyeglasses comes in different shapes and sizes. So we have made a holder that can adjust itself to hold all types of eyeglasses.

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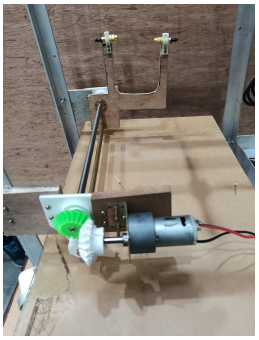
Movement of Eyeglasses to different levels

The eyeglass holder is connected to a vertical lead screw which helps the eye-glass to move to different levels for different processes. This vertical lead screw is operated by a 900 rpm DC motor which is placed perpendicular to the lead screw and both are coupled with a pair of bevel gear. Its feedback is taken with the help of a rotary encoder which again placed in the same fashion as the motor.

Ultrasonic Cleaning

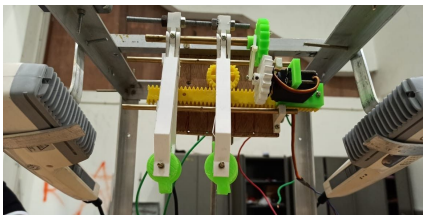
There is a vessel at the bottom which is connected with an ultrasonic transducer which produces ultrasonic waves in the liquid filled inside the vessel by changing electrical signals to mechanical waves. The waves create cavitation in the liquid. These cavitations collapse with enormous energy due to which high temperature and pressure are generated and thus help in cleaning the glasses.

Rinsing



After ultrasonic cleaning, eye-glass is lifted to the middle of the machine where it is rinsed with water with the help of a ‘U’ shaped structure with two nozzles placed in front and back of the lenses. This rinser runs perpendicular to the eyeglass splashing water on the eyeglasses.

Drying and Wiping



After rinsing, eyeglasses move to the last level, to the top of the machine, where it is dried and wiped. There are hot air blowers on the two side walls of the machine which blows hot air on the spectacle which helps in removing wetness from the frame. Then it is wiped with a sponge wrapped with a microfiber cloth. There are 4 circular disks with this kind of wiping material covering both sides of both the lenses. This wiper works on the rack and pinion mechanism.

After wiping is done holder is again brought back down from where it is taken out by the user.

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Summary:

• Test Results:

We tried wiping with wiper working on a double scotch yoke mechanism in which one actuator is used to do two motions in the perpendicular direction(moving wiper parallel and the open wiper). It was not much efficient. The required force was not acquired. So we changed it to rack and pinion mechanism in which we use one actuator for sliding the wiper along spectacles and one servo motor for sweep action of the wiper.
We tried drying the spectacle with two normal hair dryers. It was taking more time than expected. So we have attached one more blower on the top.
We tried ultrasonic cleaning with one transducer to transmit ultrasonic waves. Each transducer has some range of area coverable. Expectations were not met as our area of the vessel was more than that of the allowed range of the transducer. So we added one more transducer. Now the whole surface is covered and expectations are met.

• Surveys:

We made surveys on the sizes of lenses. The average range of temple length came out to be 120mm to 150mm. The average bridge length ranges from 14mm to 24mm and the width of lenses ranges from 40mm to 62mm.

We made a survey to find approximately how much time one person would wish to spend to clean his eye-glass. Results came out to be 1-2 mins.

• References:

- https://techblog.ctgclean.com/2012/01/ultrasonics-transducers-resonance/
- https://www.americanpiezo.com/standard-products/ultrasonic-power-transducers.html
- https://www.allaboutvision.com/en-in/eyeglasses/faq/eyeglass-frame-size/
- https://www.svce.ac.in/departments/physics/ph16151/UNIT%204%20Ultrasonics%20.new.pdf

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- Video Links*:

(* = Optional)

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