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Innovative Breast Massager Tool with 3-Movement Method

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ABSTRACT

Mother's Milk (ASI) is nutritious food for babies up to 6 months, but it is also recommended that breast milk be given to babies up to 2 years old. The benefits of breastfeeding include for antibodies in infants, avoiding allergic diseases, avoiding the risk of diseases of the respiratory tract, reducing diarrhea, reducing diabetes, and others. The problems that occur in Indonesia are several things, namely the limitations of exclusive breastfeeding due to the lack of knowledge of mothers about breast care and the lack of use of breast care in breast care for breastfeeding mothers. This can have a negative impact from not doing breast care or breast care which can have a negative impact, one of which is mastitis or tissue problems in the breast. One of the efforts to get sufficient milk production is that mothers must routinely carry out breast care, namely the use of a Breast Care tool design for the lactation process. Breast massage device or Breast Care for the lactation process can be used when mothers experience breastfeeding problems, with vibrations generated from servo motors and control motors on the device so that it can produce 3 types of vibrations that nursing mothers can use during breastfeeding.

Keywords: Breastcare; Mother's Milk; Breast massager Tool; Servo Motor; Vibrating Motor

INTRODUCTION

Breast milk is a nutritious food for babies up to 6 months, but breast milk is also recommended to be given to babies up to 2 years old (Kurniawan, 2013). The benefits of breast milk include antibodies for babies, avoiding allergic diseases, avoiding the risk of respiratory diseases, reducing diarrhea, reducing diabetes, and others. During the breastfeeding period, mothers often experience difficulties in breastfeeding their babies. If the difficulties faced by the mother cannot be overcome, it will clearly interfere with the implementation of breastfeeding for the baby (Memenuhi et al., 2020). One of the factors to get sufficient breast milk production is that mothers must routinely perform breast care.

The problems that occur in Indonesia are several things, namely exclusive breastfeeding is hampered due to the lack of knowledge of mothers about breast care and the lack of use of breast care in breast care for breastfeeding mothers.(Yuniarti, 2018). This can have an impact on not doing breast care or breast care which can result in negative impacts, one of which is mastitis or tissue problems in the breast.(Maros & Juniar, 2016), breast milk takes longer to come out, limited milk volume, dirty breasts(Yuniarti, 2018).

One of the efforts to get sufficient breast milk production is that mothers must routinely carry out breast care, namely the use of a breast massage tool design for the lactation process. This medical device for breastfeeding mothers has the ultimate goal of stimulating the mother's breasts. In this case, this breast massager is very useful for mothers and children, in addition to avoiding mastitis and pain in the mother, the nutritional needs of breast milk for babies are also met.

Breast Care for the lactation process it can be used when mothers experience breastfeeding problems, with vibrations generated from servo motors and control motors on the device so that they can produce 3 types of vibrations that breastfeeding mothers can use.

In addition, this breast massage tool for the lactation process is equipped with a strap which, if you want to use it, can be attached to the body, right above the mother's stomach. Tool Breast massage for the lactation process can be defined as a treatment tool for the breasts that can facilitate breastfeeding. In this study the authors designed a tool entitled "Innovation of the Breast Massage Tool with the 3 Movement Method".

LITERATURE REVIEW

This research was developed based on information and several previous studies related to the title of this research. Researchers in this case refer to Sri Wulan's journal (Wulan & Gurusinga, 2012) to find out the effect of breast care on increasing breast milk volume in postpartum mothers, one of which is massage. Then the development of a prototype oxytocin massage device is a solution for breastfeeding mothers to be able to carry out oxytocin massage

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therapy independently so that it can facilitate milk secretion by making and analyzing prototypes of oxytocin massage devices in overcoming breastfeeding difficulties (Mustika, 2021). The making of a similar tool entitled "Automatic Oxytocin Massage Tool to Increase Breast Milk Production in Breastfeeding Mothers" is basedmicrocontroller similar to ATMega328(Ardiansyah, 2022). The development of a massage robot prototype was also made by Rohmat Gunawan, et al based on the Arduino Mega 2650 microcontroller in the form of a humanoid using a servo motor as a motor for driving the robot's joints and the selected fingers were used in building the prototype, the mechanism of motion and the shape of the robot are almost human-like(Nurohman et al., n.d.). Followed by therapeutic tools that can help the community to help reduce or eliminate fatigue and aches due to activities carried out every day. The solution given is to build an Arduino Microcontroller-Based Foot Therapy device. Using a DC motor as a vibrator that can be used to massage the feet to reduce or eliminate feelings of soreness and fatigue (Kusrini et al., 2018).

METHOD

Diagram Blog Sistem

The design of this breast massage tool utilizes a servo motor and a vibrating motor. The battery is the main supply for this Breast Massage series with the system starting from turning on the on/off switch.

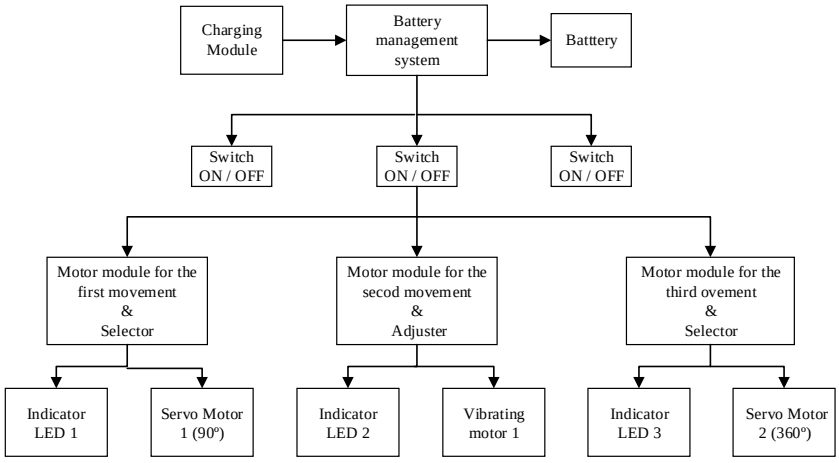

Fig 1. System Block Diagram

When operating the tool, place the tool on the object in the breast area to be massaged, with 3 different types of movement controlled by each motor.

Furthermore, the breast massager will electrically move the motor to massage the breasts, especially to relax the breasts of nursing mothers so that mastitis does not occur. This tool is controlled to adjust the speed, current and electrical resistance in the circuit by a potentiometer or adjuster by rotating, then this tool can be used according to the user's wishes.

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Systems Flowchart

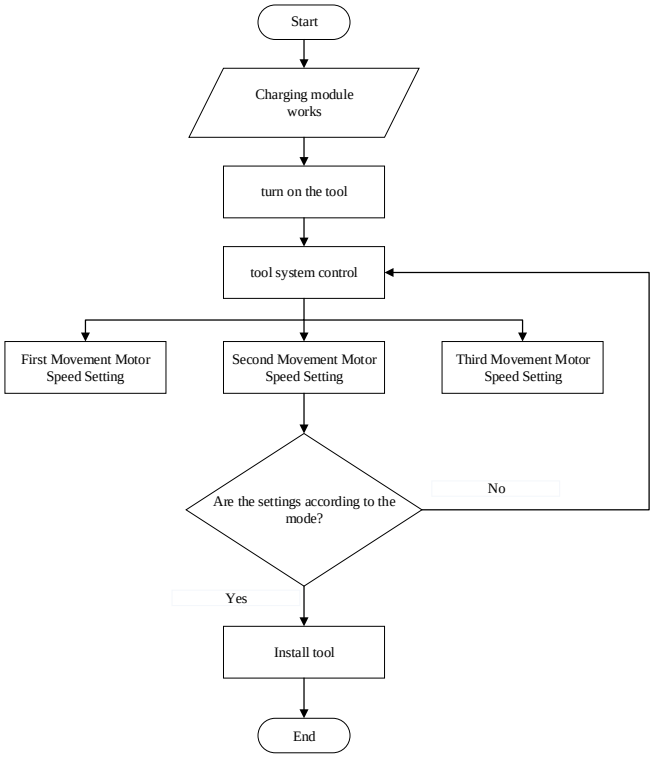

Fig 2 Flowchart Sistem

Breast Massage Tool Innovation Design With 3 Movement Methods

In this study, the tool design is described as follows in the image below:

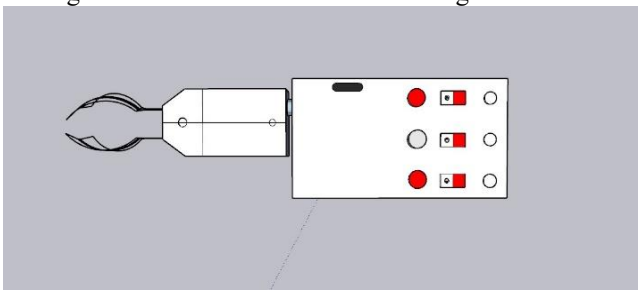

Fig 3.Front look

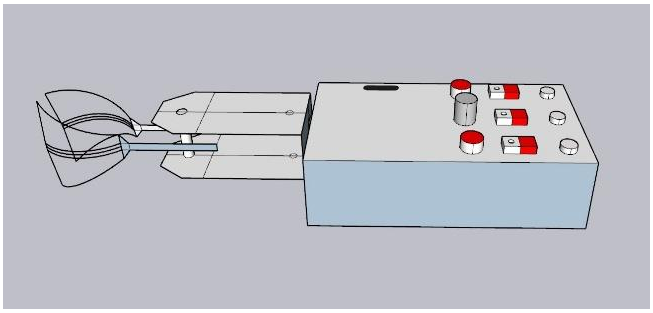

Fig 4.Side view

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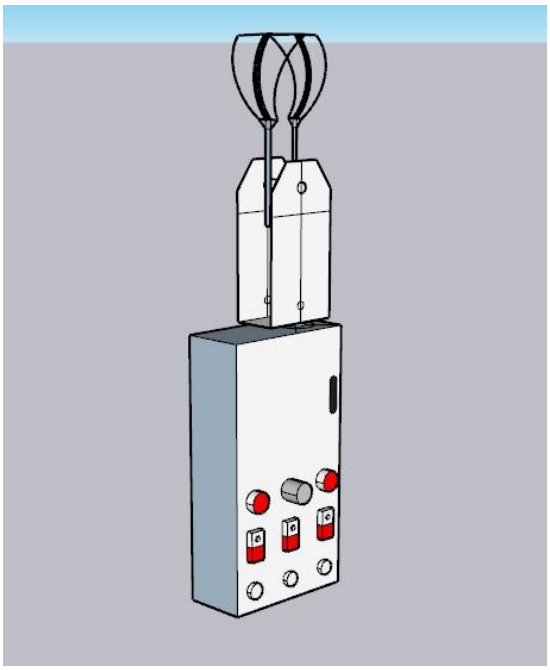

Fig 5.Reverse Front View

Tool Planning

Vibrating Motor, in general, this electromagnetic component has a way of working like an electric motor, namely working to convert electrical energy into mechanical energy. This motor works with a direct voltage (DC) supply, the magnetic field winding is converted into mechanical energy. Vibrating or what is called vibration comes from the mass centrifugal force of the stator which produces a rotating magnetic field. Vibration is a movement back and forth within a certain time interval. Vibration is related to the oscillatory motion of objects and the forces associated with this motion. All bodies that have mass and elasticity are capable of vibrating, so most machines and engineering structures are subject to vibration to some degree and their design usually requires consideration of the nature of the oscillations.(Tangdiongan et al., 2017).

Servo Motor is a motor with a closed feedback system where the position of the motor will inform back to the control circuit inside the motor. This motor consists of a motor, gear, potentiometer and control circuit(Hilal & Manan, 2015). Servo motors are controlled by providing a pulse width modulation (PWM) signal via a control cable. The width of the given control signal pulse will determine the rotational angular position of the servo motor shaft(Mata et al., 2016).

DC Motor PWM Module

The pulse width modulation (PWM) method is a fairly effective method for controlling the speed of a DC motor. This PWM works by creating a square wave that has a certain set ratio of high pulses to low pulses, usually scaled from 0 to 100%. Comparison of high pulses to low pulses. PWM is called the duty cycle. The ratio of high to low pulses will determine the amount of power supplied to the DC motor(Mata et al., 2016).

Charger Module

The charger module has a working voltage from 4.5v to 5v. This charger module is also equipped with 2 LED indicators. Each LED shows current status charging mode (charging) and when the battery is fully charged (fully charged).The charger module has a protection circuit, so when the battery is fully charged, the power supply for the circuit is directly supplied from the 5 V voltage coming from the charger module. When the battery voltage drops below 2.4V, the protection IC will switch the load to protect the cell from running on that voltage too low and also protects against over-voltage and reverse polarity connection (Teknologi et al., 2022).

Servo Module

The servo module or servo drive is an automatic device that gets the signal from the command and then compares it

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with the feedback from the servo motor mechanism to provide the required voltage to the servo motor to correct any deviation from the command.

Polymer Lithium Battery

Lithium Polymer battery is a liquid battery(Perdana, 2020). Almost the same as the Li-Ion battery, but the Li-Po battery does not use liquid as an electrolyte but uses a dry polymer electrolyte which is shaped like a thin plastic film layer. This film layer is arranged in layers between the anode and cathode resulting in ion exchange. With this method LiPo batteries can be made in various shapes and sizes. Despite the advantages of the LiPo battery architecture, there are also disadvantages, namely the weak flow of ion exchange that occurs through the dry polymer electrolyte(Afif et al., 2015).

Realization of Making a Breast Massage Tool With 3 Movement Methods

Making a Breast Massage Tool with 3 Movement Methods includes the following stages: (a) Making the framework of the breast cup based on the design results, (b) Manufacture of hardware by assembling electronic components, (c) Setting the amount of output and time

RESULTS

Tool Testing

Tool testing includes:

Battery Voltage Testing (Charging and Discharging) Battery Voltage Testing is done by measuring the voltage before installation and after installation of the resulting battery, whether it is in accordance with the expected specifications. Measurement Point Testing in each Module is Measurement Point Testing on each is done so that it can work as needed. Servo and Dynamo motor testing and drivers is Stepper motor and driver testing is done by programming and providing input voltage so that the stepper motor and driver can run.Skeletal Motion Testing is The frame motion test is carried out by determining the designed cup frame motion. Overall System Testing then Testing of the entire system is carried out to check the reliability of the tool before use.

Measurement Testing

After measuring, the following results were obtained:

Table 1. Measurement Results

Measurement Point	Measurement results	Measurement Image
V Battery	4.01 Volts 	

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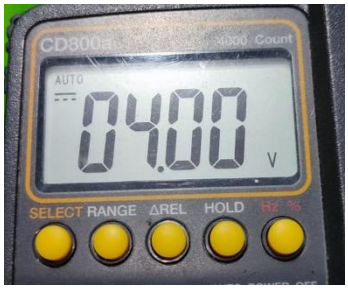
VMotor Movement 1 at Servo 90º	4.05 Volts 	
V Motor Movement 2 on the vibrator motor with minimum speed	1.05 Volts 	
V Motor Movement 2 on the vibrator motor with maximum speed	4 Volts 	

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V on the 3rd Movement motor on the 360º servo	3.97 Volts 	

DISCUSSIONS

Tool Experiment Results

Experiment resultsBreast Massage Tool Innovation With 3 Movement Methods.The tool has been tested, the following is a picture of the results:

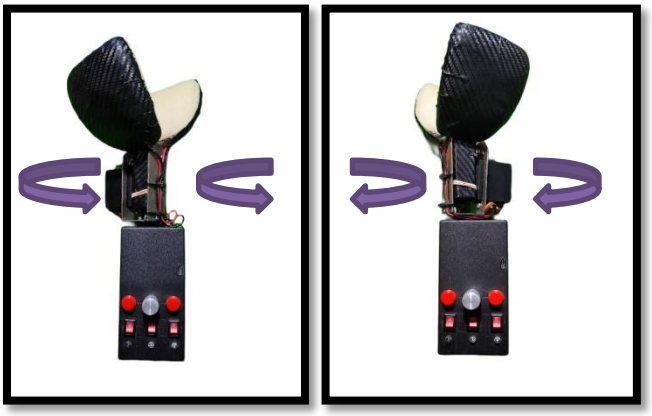

Fig 6 Movement 1 on Servo Motor with 90 º Movement (Rotating right to left)

Fig 7 Movement 1 of the Vibrator Motor with Vibrating Movement

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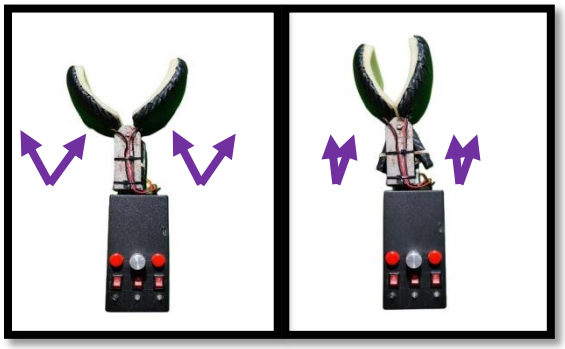

Fig 8 on a Servo Motor with 360 º Movement (Bloom and Collapse)

CONCLUSION

After carrying out the process of making and studying literature planning, testing tools and data collection, the authors can conclude as follows: (a) The breast massage tool with the 3-movement method is a tool to assist mothers in breastfeeding by engineering conventional massage movements using a vibrating motor system, electrically controlled servo motors using, specifically to relax the breasts of nursing mothers so that mastitis does not occur. (b) The performance of the tool has obtained good results and is also one of the supporting tools for mothers and children.

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