

# AUTOMATED HAND AND FOOT NAIL POLISH DRYER

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## I. INTRODUCTION

Nail is the most exciting part of the hand and fingers are another implicit standard for appraisers. In fact, the maintenance and decoration of nails and hands has been a symbol of social status since ancient times. No matter the age, people who have slender, gorgeous nail are rich and expensive, and most of them belong to the upper class, and do not have to engage in manual labor. Now, the slim fingertips will also join this colorful fashion trend, the nail art is constantly updated, the manicurists are no longer in love with the kind of dull, dull old manicure, they strive to bring their skills and creativity to the fullest. Therefore, a variety of manicures have emerged as the times require, and they are fashionable, simple, and personalized to the world with their beating, which is in line with the aesthetic appeal of modern people.

Manicure is a work of decorating the nails, also known as the nail art design. Manicure is the process of disinfecting, cleaning, nursing, maintaining, modifying, and beautifying the nail according to the shape, skin and clothing color of the guest. It has the characteristics of diversified expressions.

In performing manicure or pedicure, after cleaning the nails and applying base coat, manicurist must need to wait a long period of time in drying the nail polish applied on the fingernails and toe nails of their customer before applying the desired color/ type of nail polish.

The previous study by Henderson (1974) a nail polish dryer to effect rapid drying of polish on fingernails or toenails and includes a base and a hood defining a drying space with an access opening for insertion of the portion of a person having nails to be dried. The base has walls therein defining an air pas sage through the base. An air moving fan positioned in the air passage is operative to move air around a heater and through an exit defined by one or more apertures in a top wall of the base. The heated air moves toward a rib or flow director extending from a hood in spaced relation to the apertures and operating to direct heated air onto polish on the nails of a user. The fan and heater are controlled by electric circuitry including a switch that is in circuit making position when engaged by the portion of a person extending into the drying space.

With this, the researcher will develop a device that will help the manicurist work faster and produce a quality dryness and durable nail polish. The researcher will not use heater because too much heat can damage the skin of our hand and prolonged exposure to heat will damage the nails. The researcher will develop an automated hand and foot nail polish dryer is a device use to dry nail polish in a short period of time and produce quality dryness and durable nail polish. The device is easy to transport because of its portability. Beauticians and manicurist in parlors and households will use the device conveniently, efficiently, economically, easy to operate and safe.

Automated hand and foot nail polish dryer uses blower to dry various type of nail polish with two compartments intended for hand and foot to maintain proper hygiene. The blower is in upward position so that it will not directly expose the fingernail and toenails to the air blown by the blower. The air blown by the blower is responsible in drying the nail polish and produce quality and durable dryness. It has timer display to determine the time consumed in drying nail polish. The device is chargeable and can be used for four to six hours upon charging and can also be used when connected to alternating current power source. It consists of digital push button that compose of timer and reset. The timer is also used to determine the appropriate time set forth and reset when you want to stop the drying process. Automated hand and foot nail polish dryer had compartments can dry two hands or foot at a time. The device has a control switch for hand compartment and foot compartment respectively. The device is handy for carrying and transporting from parlor and to customer for a home service because of its portability. The device is designed for Alternating and direct current so that can be operated even during power interruption.

The researcher conducted this study to help salon owners and manicurist finish their work faster and dry nail polish in a safe process because according to Stokes (2021) radiation and convection are the two primary processes by which the body gains heat from heaters. In radiation, the body gains heat from the surrounding objects without contact with them, while in convection, the body gains heat from the immediate hot air.

**A. Statement of the Problem/Objective of the Study**

This study was conducted to develop automated hand and foot nail polish dryer. Specifically, it aimed to;

1. describe the different features of automated hand and foot nail polish dryer in terms of portability, power consumption and time monitoring;
2. determine the quality of drying of regular nail polish and gel nail polish in varied time duration in terms of texture, appearance and firmness;
3. determine the acceptability of automated hand and foot nail polish dryer in terms of composition, operating performance, and safety.

**B. Significance**

This study would give information to all users of nail polish that there are options on how to dry nail polish faster and produces quality and durable nail polish that only uses air on the during process. It could help the people make their work faster and have a quality and durable dryness of nail polish. It could create a source of livelihood to the people who realized the opportunities of this product. The success of this study would develop a device that would surely contribute to the cosmetology industry in producing a device that would use in drying nail polish which is affordable, uses minimal amount of energy, chargeable and safe that produces quality and durable dryness. The result of this research would be beneficial to the following:

**Cosmetology Students.** The result of this study would help them to enhance their resourcefulness and use other materials in making nail polish dryer. It also serves as basis for their future studies.

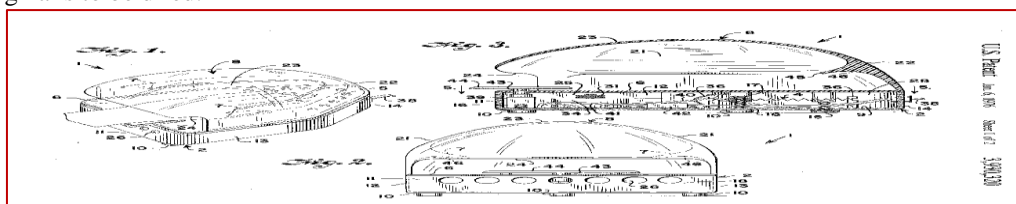
**Cosmetology Instructors/Professors.** The result of this study would help them in their cosmetology laboratory especially in performing manicure/ pedicure. It also provides new concept in the development of new device.

**Parlor Owners.** The result of this study would help them to cater more costumers because they use the device in their parlor shop to serve their consumers.

**Manicurist.** This study would create an awareness that there is a device use to dry nail polish faster and produces quality and durable dryness. They can use it after performing manicure/pedicure for work efficiency, productivity, and durability of nail polish.

**C. REVIEW OF RELATED LITERATURE**

This nail polish dryer served as the basis of the present innovation of the automated hand and foot nail polish dryer. The present invention relates to nail polish dryers and more particularly to a nail polish dryer operative to direct heated air onto the nails of a user for fast drying thereof. The nail polish dryer to effect rapid drying of polish on fingernails or toenails and includes a base and a hood defining a drying space with an access opening for insertion of the portion of a person having nails to be dried.



**Figure 1. Prior Art: Nail polish dryer and automated hand and foot nail polish dryer (Henderson, 1974)**

The base has walls therein defining an air passage through the base. An air moving fan positioned in the air passage is operative to move air around a heater and through an exit defined by one or more apertures in a top wall of the base. The heated air moves toward a rib or flow director extending from a hood in spaced relation to the apertures and operating to direct heated air onto polish on the nails of a user. The fan and heater are controlled by electric circuitry including a switch that is in circuit making position when engaged by the portion of a person extending into the drying space. (Henderson, 1974)

The principal objects of the invention are: to provide a nail polish dryer for home or beauty shop use which is operative for fast drying of polish on nails of fingers and toes; to provide such a dryer operative to quickly provide sufficient drying of nail polish and thereby substantially prevent any damage to polish during normal dressing and the like; to provide such a dryer operative to dry nail cleaner solutions prior to application of polish and to dry protector material placed over polish; to provide such a dryer with a relatively large drying space and easy access whereby the nails are movable to drying position with little danger of contact with other objects; to provide such a dryer having the circuit controlling switch position adjacent the access opening for operation by pressure from the hand of the user; to provide such a dryer using heated air in the range of one hundred fifteen degrees to one hundred thirty degrees Fahrenheit (115°F. - 130°F.)

which is directed onto polish on nails of a user; and to provide such a dryer with a heater and fan that are protected and present no danger of injury to the user; and to provide such a nail polish dryer which is attractive in appearance, durable in construction, positive in operation, and particularly well adapted for the proposed use (Henderson, 1974).

#### D. Research Method

This study used developmental method of research. Developmental method has been defined as systematic study of designing, developing, and evaluating instructional programs, processes, and products that must meet the criteria of internal consistency and effectiveness (Seels and Richey, 1994). An Automated hand and foot nail polish dryer is a device used for drying regular nail polish and gel nail polish.

#### E. Design Criteria

This study was anchored to nail polish dryer invented by Brunis Marie Henderson, (1974) to effect rapid drying of polish on fingernails or toenails and includes a base and a hood defining a drying space with an access opening for insertion of the portion of a person having nails to be dried. The base has walls therein defining an air passage through the base. An air moving fan positioned in the air passage is operative to move air around a heater and through an exit defined by one or more apertures in a top wall of the base. The heated air moves toward a rib or flow director extending from a hood in spaced relation to the apertures and operating to direct heated air onto polish on the nails of a user. The fan and heater are controlled by electric circuitry including a switch that is in circuit making position when engaged by the portion of a person extending into the drying space.

On the other hand, an automated hand and foot nail polish dryer is a device that has two compartments one is for the hand and the other one is for foot nails. The blower is installed in both compartments purposively to produce quality and durable dryness of nail polish. It has timer to determine the time in drying nail polish. The device has a timer display to view the time consumed in drying nail polish. It composes of two compartments; the upper compartment is intended for fingernails and the lower compartment for toenails. The device is automated since it will automatically blow the hand or foot nail polish and shut off once the time set was achieved. The automated hand and foot nail polish dryer was tested the quality drying of regular and gel nail polish in three (3) trials in three varied time duration terms of its texture, appearance, and firmness, describing its different features of automated hand and foot nail polish dryer in terms of portability, power consumption and time monitoring and its acceptability in terms of its composition, operating performance and safety.

#### F. Design Plan Preparation and Fabrication

The design was a product of continuous effort of the researcher to develop a device that dried nail polish quickly and produce a quality and durable dryness of various types of nail polish. In view of the forgoing circumstances, the researcher developed an automated hand and foot nail polish dryer. The components were the power switch, blower, and timer, integrated circuit that are properly mounted and mechanically fastened. The following materials are prepared and used; 2 pieces of blower, 2 pieces of limit switch, 1-meter flat cord # 18, 1 male plug, 1 piece of power supply 12v, 2 digital timer, 8 pieces stove bolt, 1 quart of sealant and plywood.

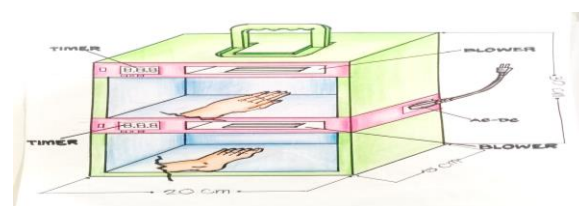


Figure 2. Design plan of automated hand and foot nail polish dryer



Figure 3. Automated hand and foot nail polish dryer and its parts

**G. Parts of automated hand and foot nail polish dryer and its Function**

- **Blower.** To dry various types of nail polish.
- **Power Switch.** To switch on/off the automated hand and toe nail polish dryer.
- **Reset.** To reset the drying time set in drying nail polish.
- **Timer display.** To view the time consumed in drying nail polish
- **Timer.** To determine the time in drying various types of nail polish.
- **Control switch.** To switch the blower; B1 (hand compartment) and B2 (foot compartment).
- **Handle.** This is used for holding the device for mobility.
- **Plug.** To connect the device and the power supply.
- **Lower compartment.** To dry nail polish in toenails.
- **Upper compartment.** To dry nail polish in fingernails.
- **Charger Port.** A port when you want to use the device using alternating current by a charger.
- **Casing.** To protect the electrical parts of the device.

**H. Evaluation Criteria**

This study was evaluated to describe the different features of automated hand and foot nail polish dryer in terms of portability, power consumption and time monitoring, determine the quality of dryness of regular nail polish and gel nail polish in three(3) trials in three varied time duration in terms of its texture, appearance and firmness using observation on the actual performance of the device using the timer and determine the acceptability of the device in terms of composition, operating performance and safety. The evaluators composed of ten (10) electronics experts/ electricians, ten (10) professors in cosmetology, ten (10) from manicurist and salon owners. The researcher used the “Mean” to determine the acceptability of the device. The Five-Point Likert Scale was used to determine the acceptability of the device.

**I. Evaluation Procedure**

The following are procedures in evaluating the device; first, the evaluators rated the different features of automated hand and foot nail polish dryer in terms of portability, power consumption and time monitoring, determine the quality of drying of regular and gel nail polish in time duration in three trials in terms of texture, appearance and firmness and level of acceptability of the automated hand and foot nail polish dryer as to its composition, operating performance, and safety. Second, researcher attached to the evaluation sheet for the result of the observation made for quality of drying of regular and gel nail polish for reference purposes. Third, the details of the device and how it operates were explained to the evaluators. Fourth, the researcher demonstrated to the evaluators the operation of the device. Lastly, the device was tested using regular and gel nail polish.

**J. Parameters for Analysis**

The main function of automated hand and foot nail polish dryer covered in this study was limited on the different features of automated hand and foot nail polish dryer in terms of portability, power consumption and time monitoring, and on the quality of drying of regular nail polish and gel nail polish in terms of its texture, appearance and firmness. The materials used for the evaluation are regular nail polish and gel nail polish.

To ascertain the power consumption of Automated hand and foot nail polish dryer, the following where formula were considered:  $E = P \times 1000 \times \text{Energy}$ .

**K. Instrumentation**

The researcher instrument used was an observation sheet and evaluation sheet prepared by the researcher to evaluate to an automated hand and foot nail polish dryer with five (5) point Likert Scale for the variables and acceptability of the device. The content of evaluation was subject to experts' appraisal of electronics and cosmetology professors of Capiz State University, Main Campus.

**L. Scoring Variables**

To describe different features of automated hand and foot nail polish dryer in terms of portability, power consumption and time monitoring, the evaluation sheet was used.

To evaluate the automated hand and foot nail polish dryer in terms of portability, the quality of being small, and lightness of weight and easy transportation of the device from one place to another, an evaluation sheet was used.

**M. Validation of Instruments**

Before the evaluation of thirty (30) evaluators, the device and evaluation sheet were first submitted to researchers' adviser and English critics for comments, suggestions and for possible changes and revision. It was also presented to the experts in the field of cosmetology and device fabrication for the necessary corrections and changes to be made before giving them to the evaluators as basis for rating the device.

The mean was computed to answer the level of acceptability of automated hand and foot nail polish dryer. The evaluators were asked to encircle each item in the questionnaire to describe the different features of automated hand and foot nail polish dryer in terms of portability, power consumption and time monitoring, to determine the quality drying of regular nail polish and gel of nail polish in time duration in three trials in terms of its texture, appearance and firmness and the level of acceptability as to its composition, operating performance, and safety.

**N. Data Gathering Procedures**

The data gathering was done through a series of actual observation and manipulation in describing different features of automated hand and foot nail polish dryer in terms of portability, power consumption and time monitoring, determining the quality of drying of regular nail polish and gel of nail polish in time duration in three trials in terms of its texture, appearance and firmness and the acceptability of the device as to its composition, operating performance, and safety.

Group of experts were requested for a focus group evaluation of the device on the different features of the device in terms of its portability, power consumption and time monitoring, and quality of drying of regular nail polish and gel of nail polish in time duration in three trials terms of its texture, appearance and firmness and level of acceptability as to its composition, operating performance and safety using researcher made evaluation sheet. The accomplished evaluation sheet was gathered and consolidated for scientific analysis and interpretation purposes. The automated hand and foot nail polish dryer was subjected to evaluation on the description of different features of automated hand and foot nail polish dryer in terms of portability, power consumption and time monitoring, and on determining quality of drying of regular nail polish and gel of nail polish in three (3) trials in three (3) varied time duration terms of its texture, appearance and firmness and level on acceptability of its composition, operating performance, and safety.

The researcher conducted the evaluation at Capiz State University Main campus, Roxas City. The evaluators were purposively selected because they are identified as experts on technology having considerable background on technology and practicing professionals along with electronic and cosmetology studies. The evaluators were composed of ten (10) electronics experts, ten (10) cosmetology professors, ten (10) manicurist and ten (10) salon owners.

**O. Statistical Tools**

The data was tabulated and statistically analyze by the use of mean to determine the acceptability of hand and foot nail polish dryer. (Donnie and health, 1984)

**P. Cost Analysis**

This is the cost of materials including the cost of labor that the researcher used in developing the product.

**Table 1. Cost of materials and parts of the product**

Qty	Unit	Materials	Remarks	Cost
2	pcs	Blower (12 V)	Purchased	₱700
2	pcs	Digital timer	Purchased	₱500
8	pcs	Wood screw	Purchased	₱50
1	pcs	Power supply	Purchased	₱1000
1	pc	Male plug	Purchased	₱65
2	pcs	Control Switch	Purchased	₱80
3	meter	Flat cord (# 18)	Purchased	₱135
8	pcs	Stove bolt	Purchased	₱40
1	pc	plywood	Purchased	₱500
1	Quart	Sealant	Purchased	₱100
½	liter	Paint	purchased	₱100
1	kilo	Skim coat	Purchased	₱80
Total Amount of materials				₱3,350
Labor cost is 45% of the total cost of materials				₱1,507.00
<b>Total Cost</b>				<b>₱4, 857.00</b>

**Q. RESULTS AND DISCUSSION**

**Description of Different Features of Automated Hand and Foot Nail Polish Dryer in Terms of its Portability**

Table 2 shows that the overall mean on the descriptions of different features of automated hand and foot nail polish dryer in terms of its portability was 4.55. This overall mean implies that automated hand and foot nail polish dryer was very light as to evaluators. The means of five (5) statements on the description of different features of automated hand and foot nail polish dryer in terms of its portability ranging from 4.27 to 4.81, all of which had quality description of “Very light”. The highest mean of 4.81 was on the statement, “The device is manageable to operate since it can be replaced in table or any suitable surfaces”. This was followed by a mean of 4.72 on the statement “The device possesses a light weight to all types of manicurists”. The lowest mean of 4.27 was on the statement “The device can be charge anywhere provided there is a convenient outlet with electricity”. This conforms to the result of the study of Garcia (2016) that the CGP Poly-Asher machine was very acceptable in terms of its portability.

**Table 2. Description of different features of automated hand and foot nail polish dryer in terms of its portability**

STATEMENT	MEAN	VERBAL INTERPRETATION
The device is handy so it is easy to transport.	4.36	<b>Very Light</b>
The device can be charge anywhere provided there is a convenient outlet with electricity.	4.27	<b>Very Light</b>
The device possesses a light weight to all types of manicurists.	4.72	<b>Very Light</b>
The device is manageable to operate since it can be replaced in table or any suitable surfaces.	4.81	<b>Very Light</b>
The device control system installed properly on its compartment for easy operation	4.54	<b>Very Light</b>
<b>OVERALL MEAN</b>	<b>4.55</b>	<b>Very Light</b>

**Legend**

<b>Scoring</b>	<b>Quality</b>
<b>Intervals</b>	<b>Description</b>
4.21 – 5.00	Very Light
3.41 – 4.20	Light
2.61 – 3.40	Moderately Light
1.81-2.60	Less Light
1.0-1.80	Least Light

**Description of Different Features of Automated Hand and Foot Nail Polish Dryer in terms of its Power Consumption**

Table 3.1 shows that automated hand and foot nail polish dryer when use in drying nail polish for three (3) minutes had a kilowatt hour of 0.000025 multiplied to the energy rate of ₱14.19 got a billing rate of ₱0.00035475. On drying nail polish in five (5) minutes had consumed a kilowatt hour of 0.00041165 multiplied to the energy rate of ₱14.19 got a billing rate of ₱0.0058413135 and in Seven (7) minutes had consume a kilowatt hour of 0.000585 multiplied to the energy rate of ₱14.19 got a billing rate of ₱0.00830115.

This reveals that the energy consumption of automated hand and foot nail polish dryer had low power consumption depending on the time consumed in the drying process. This implies that the longer the time of drying nail polish, the more power consumed. It also conforms to the Energy Efficiency and Conversation Act or Republic Act No. 11285 series of 2018. The product power consumption is less than the minimum energy performance or MEP as such this research may not still being tested by the Department of Energy as stated in the said law for Energy Performance and labeling requirements but under the pilot testing for the research which is partially practical, and it is recommended for further review and testing by the authorized agency so that it can abide the RA 11285.

**Table 3.1. Description of automated hand and foot nail polish dryer in terms of its power consumption**

<b>Drying Regular and Gel nail polish</b>	<b>Power in Watts</b>	<b>Time in Hour</b>	<b>Kilowatt Hour</b>	<b>Kilowatt Hour/ CAPELCO rate</b>	<b>Energy Cost</b>
Trial 1 (3) minutes	5	0.05	0.000025	₱14.19	₱ 0.00035475
Trial 2 (5) minutes	5	0.0833	0.00041165	₱14.19	₱0.0058413135
Trial 3 (7) minutes	5	0.117	0.000585	₱14.19	₱0.00830115

For the evaluation results, Table 3.2 shows that the overall mean on the descriptions of different features of Automated hand and foot nail polish dryer in terms of its power consumption was 4.37. This overall mean reveals that the automated hand and foot nail polish dryer was “Strongly Agree” on the description of different features in terms power consumption. The mean of five (5) statements on the description of different features of automated hand and foot nail polish dryer in terms of its power consumption ranging from 4.21 to 4.63.

The highest mean of 4.63 was on the statement, “The power consumption of the device is very efficient in its drying operation”. This was followed by a mean of 4.36 on the statement “The main parts of the device which is the blower requires only low amount of power” and “The supporting components of the device such as timer system and light indicator consumes only minimal amount of electrical energy “respectively. The lowest mean of 4.21 was on the statement “The power consumption of the device is very efficient in its drying operation”, all of which had a verbal interpretation of “Strongly Agree” This implies that automated hand and foot nail polish dryer is very acceptable to evaluators in terms of its power consumption.

This reveals that the energy consumption of automated hand and foot nail polish dryer had a low power consumption depending on the time consumed in the drying process. This implies that the longer the time of drying nail polish, the more power consumed.

According to Department of Energy (DoE) (2019) the lower power consumption can reduce energy demand, lessen the environmental stress due to energy production and use, and will lead to competitive yet affordable production cost of goods and services. This type of product is being fostered by the department to product for the development and deployment of energy-efficient technologies and enhancement of energy conservation and management practices through its Energy Efficient Program (EEP) under the Republic Act No. 11285 series of 2018.

**Table 3.2. Description of different features of automated hand and foot nail polish dryer in terms of its power consumption**

<b>STATEMENT</b>	<b>MEAN</b>	<b>VERBAL INTERPRETATION</b>
The power consumption of the device is very efficient in its drying operation	4.19	Strongly Agree
The device can be recharge by an AC or DC power source when it used in longer operation	4.27	Strongly Agree
The main parts of the device which is the blower requires only low amount of power	4.36	Strongly Agree
The device can run continuously up to six hours of operation	4.63	Strongly Agree

The supporting components of the device such as timer system and light indicator consumes only minimal amount of electrical energy	4.36	Strongly Agree
<b>OVERALL MEAN</b>	<b>4.36</b>	<b>Strongly Agree</b>

**Legend**

<i>Scoring Intervals</i>	<i>Quality Description</i>
4.21 – 5.00	Very Acceptable
3.41 – 4.20	Acceptable
2.61 – 3.40	Moderately Acceptable
1.81-2.60	Less Acceptable
1.0-1.80	Least Acceptable

**Description of Different Features of Automated Hand and Foot Nail Polish Dryer in terms of its Time Monitoring**

Table 4 shows that the overall mean on the descriptions of different features of Automated hand and foot nail polish dryer in terms of its time monitoring was 4.86 interpreted as “Very Accurate.” This overall mean reveals that the Automated hand and foot nail polish dryer was very accurate on the description of different features in terms of its time monitoring. The mean of five (5) statements on the description of different features of automated hand and foot nail polish dryer in terms of its time monitoring ranging from 4.78 to 4.93, all of which had verbal interpretation of “Very Accurate”. The highest mean of 4.93 was on the statement, “The device possesses a timer to monitor the desired time of drying nail polish”. This was followed by a mean of 4.80 on the statement “The power consumption of the device is very efficient in nail polish drying operation”. The lowest mean of 4.87 was on the statement “The device has an alarm system to alert the operator for the remaining time set forth”. This implies that automated hand and foot nail polish dryer is very accurate in terms of time monitoring because it uses an electronic timer module as this method and parts is very safe, convenient, cost-effective, and very accurate since the components works in microscopic scale of electron movement within the circuit and the timer module has an accuracy of ± 0.01 seconds. Moreover, the electronic timer was installed to achieve the minimal energy consumption. This timer is only accessible to authorized person for configuration to avoid overheating of the heating elements in the device. This electronic timer module was also used in many different devices and conforms to the study of Ledesma (2020) in which the timer performs as very accurate for an intended period as expected.

**Table 4. Description of different features of automated hand and foot nail polish dryer in terms of its time monitoring**

STATEMENT	MEAN	VERBAL INTERPRETATION
The timer of the device possesses accurate time monitoring on drying nail polish.	4.93	Very Accurate
The device automatically starts upon setting the timer and automatically stops when the drying process is already done.	4.90	Very Accurate
The timer display of the device shows the precise time consumed in drying nail polish.	4.87	Very Accurate
The device has a reset button to stop the operation immediately.	4.80	Very Accurate
The device has an alarm system to alert the operator for the remaining time set forth	4.78	Very Accurate



**OVERALL MEAN** **4.86** **Very Accurate**

<b>Legend</b>	
<i>Scoring Intervals</i>	<i>Quality Description</i>
4.21 – 5.00	Very Accurate
3.41 – 4.20	Accurate
2.61 – 3.40	Moderate Accurate
1.81-2.60	Less Accurate
1.0-1.80	Least Accurate

**Quality Drying of Regular Nail Polish of Three (3) Varied Time Duration in terms of its Texture based on the Mean of the Three (3) Trials**

Table 5 showed the result on the quality drying of regular nail polish in both fingernails and toenails in three (3) trials in three varied time duration in terms of its texture had a mean ranged from 3.67 to 4.80. The highest mean was on the trial three (3) in seven (7) minutes with a quality description of “Very Fine”. Followed by trial two (2) in five (5) minutes with a quality description of “Very Fine”. While on Trial 1 in three(3) minutes was “Fine” with the mean score of 3.67. The results shows that when the drying time increases, the quality of drying of regular nail polish in terms of its texture also improved. According to Dr. Draelos (2013) since the basic nail polish has changed very little since its first introduction, except for the use of polymers that increase the flexibility of the film over the nail to resist peeling and chipping. Nail polish consists of pigments suspended in a volatile solvent to which film formers have been added and its additives adheres and dry in heating surface it quickly dries up and adhere in the surface of the nails in accordance with the method of drying and depending on the nail polish used. The used of drying machine was much faster than not using one.

**Table 5. Quality drying of regular nail polish of three (3) varied time duration in terms of its texture based on the mean of the three (3) trials**

Time	Trials		
	3 Minutes	5 Minutes	7 Minutes
Mean	3.67	4.30	4.80
Verbal Interpretation	Fine	Very Fine	Very Fine

<b>Legend</b>	
<i>Scoring Intervals</i>	<i>Quality Description</i>
4.21 – 5.00	Very fine
3.41 – 4.20	Fine
2.61 – 3.40	Moderately Fine

**Quality Drying of Regular Nail Polish in Three (3) Varied Time Duration in terms of its Appearance Based on the Mean of the Three (3) Trials**

Table 6 discloses that the quality of drying regular nail polish in fingernails and toenails in terms of its appearance had a mean ranged from 4.07 to 4.87. The highest mean score of 4.87 was on trial 3 in seven (7) minutes with a quality description of “Excellent”. Followed by Trial 2 in five (5) minutes with a mean of 4.63 with a quality description of “Excellent” and the lowest mean score of 4.07 was on trial 1 in three (3) minutes with a quality description of “Very Good.” According to Braeburn (2022) the nail polish may be feel dry for 15 minutes of normal drying process, but it takes 24 hours for nail polish to completely harden. There were many options for drying nail which are cool or warm air in which the cool air is perfectly for regular nail varnish and warm air is good for drying acrylic and it does not affect the appearance of the nail polish, however, it is also needed to have much space for the hands or toe to put without bumping them into the device or drying element and this device is perfectly design for that recommendation.

**Table 6. Quality drying of regular nail polish in three (3) varied time duration in terms of its appearance based on the mean of the three (3) trials**

Time	Trials		
	3 Minutes	5 Minutes	7 Minutes
Mean	4.07	4.63	4.87
Verbal Interpretation	Very Good	Excellent	Excellent

**Legend**

<b>Scoring Intervals</b>	<b>Quality Description</b>
4.21 – 5.00	Excellent
3.41 – 4.20	Very Good
2.61 – 3.40	Good

**Quality Drying of Regular Nail Polish in Three (3) Varied Time Duration in terms of its Firmness Based on the Mean**

**of the Three (3) Trials**

Table 7 reflects the result automated hand and foot nail polish dryer in quality of drying regular nail polish in fingernails and toenails terms of its firmness had a mean ranged from 3.53 to 4.83. The highest mean of 4.81 was on trial 3 in seven (7) minutes with a quality description of “Perfectly Firm”, followed by the mean of 4.27 on trial 2 in Five (5) minutes with a quality description of “Perfectly firm” and the lowest mean of 3.73 with a quality description of “Firm” was on trial 1 in three (3) minutes.

This implies that the longer the time of using automated hand and foot nail polish dryer proves that the result was perfectly firm, and it satisfies the customers/clientele.

The nail polish firmness may depend on the product ingredients, but the machine helps to reduce waiting time and doesn’t affect the whole appearance of the nail polish being used during testing. Since women are sometime impatient in waiting for their nail polish to dry and they swear to have a quick drying method, machine drying gives the best result but not affecting the overall appearance and help minimizing waiting time and a quick drying method helps the firmness of nail polish and can reduce working time of worker (Romanowski, 2012).

**Table 7. Quality drying of regular nail polish in three (3) varied time duration in terms of its firmness based on the mean of the three (3) trials**

Time	Trials		
	3 Minutes	5 Minutes	7 Minutes
Mean	3.53	4.27	4.83
Verbal Interpretation	Firm	Perfectly Firm	Perfectly Firm

**Legend**

<b>Scoring Intervals</b>	<b>Quality Description</b>
4.21 – 5.00	Perfectly Firm
3.41 – 4.20	Firm
2.61 – 3.40	Neutral
1.81-2.60	Slightly Firm
1.0-1.80	Totally Not Firm

**Quality Drying of Gel Nail Polish of Three (3) Varied Time Duration in terms of its Texture based on the Mean of the Three (3) Trials**

Table 8 reveals that the mean score of three (3) trials using gel nail polish in fingernails and toenails in three (3) varied time in terms of its texture ranged from 3.73 to 4.83. The highest mean of 4.83 on Trial 3 in seven (7) minutes, followed by Trial 2 in five (5) minutes with the mean of 4.10 which was interpreted as “Fine”, and the lowest mean of 3.73 was on trial 1 in three (3) minutes which is interpreted as “Fine”. This reveals that automated hand and foot nail polish dryer was very fine in drying nail polish on fingernails and toenails as to the evaluators in terms of its texture. The nail polishes were matte and have a noticeable rough texture you can feel once they dry and expected to work harder as it dried by this device.

This result also conformed to the statement of Claire (2022) which says that a good nail dryer is best and efficient way to dry nail but does not affect the texture of the nail polish whatever brand the user used. It can also save time to carefully decorating the nails if the nail polish quickly dry and applying decorations and other nail art design including top layer nail polish and the dryer saves time. The air movements remove moisture from the nail polish and dries it up to hard finish. The budget determines what type of dryer to be used and since the product is automated it also saves power consumption but does not affect the texture.

**Table 8. Quality drying of gel nail polish of three (3) varied time duration in terms of its texture based on the mean of the three (3) trials**

	Trials		
Time	3 Minutes	5 Minutes	7 Minutes
Mean	3.73	4.10	4.83
Verbal Interpretation	Fine	Very Fine	Very Fine

**Legend**

*Scoring*                      *Quality Description*

**Intervals**

4.21 – 5.00                  *Very fine*

3.41 – 4.20                  *Fine*

2.61 – 3.40                  *Moderately fine*

**Quality Drying of Gel Nail Polish in Three (3) Varied Time Duration in terms of its Appearance Based on the Mean**

**of the Three (3) Trials**

Table 9 displays that the mean of the three (3) trials of automated hand and foot nail polish dryer in quality of drying of gel nail polish in fingernails and toe nails in terms of its appearance ranged from 3.80 to 4.90. The highest mean of 4.90 was on trial 3 in seven (7) minutes with quality description of “Excellent”, followed by the mean of 4.33 on trial 2 in five (5) minutes with a quality description of “Excellent” and the lowest mean of 3.80 with a quality description of “Very Good” was on trial 1 in three (3) minutes. This implies that automated hand and foot nail polish dryer was excellent in drying both fingernails and toe nails in terms of its appearance. This result also conforms with the study entitled Factors that May Affect Female Consumers’ Buying Decision on Nail Polish Dryer that appearance of the nail polish was not affected when the dryer was been used to quickly dry the nail polish whatever may the brand, but the female consumers much prefer a better and safer brand for their health issues (Sun, et al., 2015).

**Table 9. Quality drying of gel nail polish in three (3) varied time duration in terms of its appearance based on the mean of the three (3) trials**

	Trials		
Time	3 Minutes	5 Minutes	7 Minutes
Mean	3.80	4.33	4.90
Verbal Interpretation	Very Good	Excellent	Excellent

**Legend**

*Scoring*                      *Quality Description*

**Intervals**

4.21 – 5.00                  *Excellent*

3.41 – 4.20                  *Very Good*

2.61 – 3.40                  *Good*

**Quality Drying of Gel Nail Polish in Three (3) Varied Time Duration in terms of its Firmness Based on the Mean of the Three (3) Trials**

Table 10 reflects the result of automated hand and foot nail polish dryer in quality of drying Gel nail polish in both fingernails and toenails in terms of its firmness had a mean ranged from 3.67 to 4.87, the highest mean of 4.87 was on trial 3 in seven (7) minutes with a quality description of “Perfectly Firm”, followed by the mean of 4.30 on trial 2 in Five (5) minutes with a quality description of “Perfectly firm” and the lowest mean of 3.67 with a quality description of “Firm” was on trial 1 in three (3) minutes.

According to Saslow (2012) gel manicures curing in UV made dryer reportedly develop skin cancer in the back of their hands and so the stop using the UV dryers and skip to other methods of drying such as heat blower which the firmness of the gel nail polish does not get affected and the longer the time exposure to the better the result

**Table 10. Quality drying of gel nail polish in three (3) varied time duration in terms of its firmness based on the mean of the three (3) trials.**

	Trials		
Time	3 Minutes	5 Minutes	7 Minutes
Mean	3.67	4.30	4.87

<b>Verbal Interpretation</b>	<b>Firm</b>	<b>Perfectly Firm</b>	<b>Perfectly Firm</b>
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**Legend**

<b>Scoring</b>	<b>Quality</b>
<b>Intervals</b>	<b>Description</b>
4.21 – 5.00	Perfectly Firm
3.41 – 4.20	Firm
2.61 – 3.40	Neutral

**Level of Acceptability of Automated Hand and Foot Nail Polish Dryer in terms of its Composition**

Table 11 shows that the overall mean the level of acceptability of automated hand and foot nail polish dryer in terms of its composition was 4.62 and interpreted as “Very Acceptable.” This overall mean implies that automated hand and foot nail polish dryer was very acceptable in terms of its composition. The mean of five (5) statements on the level of acceptability of automated hand and foot nail polish dryer in terms of its composition ranging from 4.22 to 4.77, all of which had verbal interpretation of “Very Acceptable.” This was also means that the components used were commonly available in the market, inexpensive easy to replace during troubleshooting and maintenance. The highest mean of 4.77 was on the statement, “the component parts of the device are replaceable when damaged”. This was followed by a mean of 4.76 on the statement “the component parts are easy to assemble”. The lowest mean of 4.22 was on the statement “The device can produce quality of drying all types of nail polish. This conforms to the result of the study of Apolinario (2013), Electromagnetic Energy Booster; the level of acceptability in terms of composition was very acceptable to the evaluators. Moreover, the quality of the component uses was in the highest quality, and it works perfectly fine and functions according to its intended purpose. This study was also used as reference in selection of materials and designing of the product.

**Table 11. Level of acceptability of automated hand and foot nail polish dryer in terms of its composition**

STATEMENT	MEAN	VERBAL INTERPRETATION
The component parts of the device are minimal.	4.70	Very acceptable
The component parts are easy to assemble.	4.76	Very acceptable
The component parts of the device are replaceable when damaged.	4.77	Very Acceptable
The quality of the component parts conforms to the drying requirements of the device.	4.66	Very acceptable
The device can produce quality drying of all types of nail polish.	4.22	Very acceptable
<b>OVERALL MEAN</b>	<b>4.62</b>	<b>Very acceptable</b>

**Legend**

<b>Scoring</b>	<b>Quality Description</b>
<b>Intervals</b>	
4.21 – 5.00	Very Acceptable
3.41 – 4.20	Acceptable
2.61 – 3.40	Moderately Acceptable

**Level of Acceptability of Automated Hand and Foot Nail polish Dryer in terms of its Operating Performance**

Table 12 reveals the overall mean of 4.67 in the level of acceptability of automated hand and foot nail polish dryer was very acceptable to evaluators in terms of its operating performance.

The five (5) statements on the level of acceptability of automated hand and foot nail polish dryer in terms of its operating performance had means ranging from 4.23 to 4.83, all of which had verbal interpretation of very acceptable. The highest mean was 4.83 on the statement “The device has a protecting guard against electric shock and other incidents” this was followed by Mean of 4.80 on the statement “The device has a switch to shut off when the set time had been reached”, followed by mean of 4.77 on the statement “The device has less maintenance in changing its accessories”. The lowest mean of 4.23 was on the statement “The device can efficiently dry various types of nail polish”.

The result of testing also conforms under the Republic Act No. 7394 otherwise known as “Consumer Act of the Philippines” which entails the protection against hazards to safety and health. Since the product does not emit any

hazardous chemicals and/or substances and automatically turn off depending on the desires set time it means the product consumes less power. This device was also made as a user’s friendly and directly comply the requirements with the order issued under Article 11 relating to the notification of substantial product hazard. It also has a protection against electric shock and component protection for overvoltage in both user and machine while doing the task effectively and efficiently.

**Table 12. Level of acceptability of automated hand and foot nail polish dryer in terms of its operating performance**

STATEMENT	MEAN	VERBAL INTERPRETATION
The device can efficiently dry various types of nail polish.	4.23	Very acceptable
The device is equipped with digital timer to determine the desired time in drying nail polish.	4.73	Very acceptable
The device has a switch to shut off when the set time had been reached.	4.80	Very Acceptable
The device has a protecting guard against electric shock and other incidents.	4.83	Very acceptable
The device has less maintenance in changing its accessories.	4.77	Very acceptable
<b>OVERALL MEAN</b>	<b>4.67</b>	<b>Very acceptable</b>

**Legend**

**Scoring**

**Intervals**

4.21 – 5.00

3.41 – 4.20

2.61 – 3.40

**Quality Description**

Very Acceptable

Acceptable

Moderately Acceptable

**Level of Acceptability of Automated Hand and Foot Nail polish Dryer in terms of its Safety**

Table 13 discloses that the overall mean of 4.65 on the level of acceptability of automated hand and foot nail polish dryer in terms of its safety. This overall mean implies that automated hand and foot nail polish dryer was very acceptable to the evaluators in terms of its safety.

The five (5) statement on the level of acceptability of automated hand and foot nail polish dryer in terms of its safety had mean ranged from 4.23 to 4.80, all of which had verbal interpretation of very acceptable.

The highest mean of 4.80 was on the statement “The device is equipped with exhaust fan to suck fumes from the nail polish and expelled outside the device”, followed by a mean of 4.77 on statement “The device has a timer switch to automatically shut off when the quality of drying is obtained”, and the lowest mean of 4.23 was on the statement “The electrical components are properly insulated to avoid electrical shock”. This reveals that the device is very acceptable in terms of its safety.

**Table 13. Level of acceptability of automated hand and foot nail polish dryer in terms of its safety**

STATEMENT	MEAN	VERBAL INTERPRETATION
The composition of the device is scholarly planned and fabricated to ensure safety to both customer and manicurist.	4.73	Very acceptable
The electrical components are properly insulated to avoid electrical shock.	4.23	Very acceptable
The device has manual switch to shut off when hazard occurs.	4.75	Very Acceptable

The device has a timer switch to automatically shut off when the quality of drying is obtained.	4.77	Very acceptable
The device is equipped with exhaust fan to suck fumes from the nail polish and expelled outside the device.	4.80	Very acceptable
<b>OVERALL MEAN</b>	<b>4.65</b>	<b>Very acceptable</b>

**Legend**

<i>Scoring Intervals</i>	<i>Quality Description</i>
4.21 – 5.00	Very Acceptable
3.41 – 4.20	Acceptable
2.61 – 3.40	Moderately Acceptable
1.81-2.60	Less Acceptable
1.0-1.80	Least Acceptable

**R. Outputs and Deliverable  
Summary of Findings**

The main purpose of the study was to develop automated hand and foot nail polish dryer. Specifically, it aimed to: 1.) Describe the different features of automated hand and foot nail polish dryer in terms of portability, power consumption and time monitoring; 2.) Determine the quality of drying of regular nail polish and gel nail polish in time duration in terms of its texture, appearance, and firmness; and 3.) Determine the acceptability of automated hand and foot nail polish dryer in terms of composition, operating performance, and safety. The study employed evaluation sheet and five-point Likert scales was used to rate the product in terms of portability, power consumption and time monitoring, determine the quality of drying of regular and gel nail polish in time duration in three trials in terms of texture, appearance and firmness and level of acceptability of the automated hand and foot nail polish dryer as to its composition, operating performance, and safety. Second, researcher attached to the evaluation sheet for the result of the observation made for quality of drying of regular and gel nail polish for reference purposes. Third, the details of the device and how it operates were explained to the evaluators. Fourth, the researcher demonstrated to fifty (50) evaluators the operation of the device. Lastly, the device was tested using regular and gel nail polish. The findings of the study were:

The different features of automated hand and foot nail polish dryer in terms of portability had a quality description of “Very Light”. In terms of power consumption, the automated hand and foot nail polish dryer was “Very Acceptable” and in time monitoring, the result yielded with “Very Accurate” by the evaluators. The result on the quality of drying regular nail polish in both fingernails and toenails three (3) trials in three (3) varied time duration in terms of its texture was “Fine” and “Very fine” respectively. This shows that when the drying time increases, the quality of drying of regular nail polish in terms of its texture also improved. The quality drying of regular nail polish in both fingernails and toenails in terms of its appearance was verbally interpreted as “Very Good” and “Excellent” respectively. This implies that the appearance is pleasing to eyes of the customer and gives a feeling of confidence. The result of automated hand and foot nail polish dryer in quality drying of regular nail polish in both fingernails and toenails in terms of its firmness had a quality description of “Firm” and “Perfectly Firm” respectively. This implies that the longer the time of using automated hand and foot nail polish dryer proves that the result was perfectly firm, and it satisfies the customers/clientele. The quality of drying of automated hand and foot nail polish dryer in quality drying of regular and gel nail polish in both fingernails and toenails in terms of its firmness had a quality description of “Firm” and “Perfectly Firm” respectively. This implies that the longer the time of exposure to device proves that the result was perfectly firm. The quality of drying regular and gel nail polish in both fingernails and toenails in terms of its texture, appearance and firmness was “Very Acceptable” to the evaluators. This implies that the longer the time of using automated hand and foot nail polish dryer proves that the result was perfectly firm and is pleasing to the eyes of the customers. The level of acceptability of automated hand and foot nail polish dryer in terms of its composition was “Very acceptable. This implies that automated hand and foot nail polish dryer was very acceptable in terms of its composition by the evaluators. The level of acceptability of automated hand and foot nail polish dryer was “Very Acceptable” to evaluators in terms of its operating performance. The level of acceptability of automated hand and foot nail polish dryer in terms of its safety was “Very Acceptable”. This reveals that automated hand and foot nail polish dryer was very acceptable to the evaluators in terms of its safety.

**CONCLUSIONS**

Based on the findings of the study, the conclusions below were formulated: The automated hand and foot nail polish dryer comply with the intended design, since it is very light it can be easily transported with a feature of plug and play device and it is also consuming less power and rechargeable. Thus, it is cost saver, safe, environmentally friendly and decreases time of waiting for drying nail polishes.



The automated hand and foot nail polish dryer produce quality drying of regular nail polish and gel nail polish in both fingernails and toenails since the device has a positive feedback in terms of its texture, appearance and firmness it has a big advantage over any method of drying nail polish as it improves the quality of nail polishing and when the nail polish quickly dries the manicurist/pedicurist has a time for more decoration and nail art designing and can add up to their income since the job finish quickly. The automated hand and foot nail polish dryer is very acceptable in terms of composition, operating performance, and safety as it complies with the safety standard

### **RECOMMENDATIONS**

Based on the findings and conclusions of the study, herewith are the recommendations:

The device is strongly recommended to be used in drying nail polish since it is portable, effectively perform the intended job, low and efficient power consumption and it has an automated time monitoring to avoid overheating. The automated hand and foot nail polish dryer may be used in drying regular nail polish and gel nail polish in both fingernails and toenails. It may be used in drying other types of nail polish.

The device is highly recommended to the manicurist and salon owners, because of its quality in drying nail polish in both fingernails and toenails. Students in the field of cosmetology may use the output of this study as a reference for other innovations and for upgrading existing device. The chassis should be made into fire, moisture and cold retardant or ABS plastic for much safer alternative and it can be waterproof. Other researchers may conduct further studies related to hand and foot nail polish dryer for innovations and development of new inventions. Finally, a wider dissemination of the results of this study is highly recommended to inform the market of the benefits derived from this automated hand and foot nail polish dryer.

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