

# **CARBOXY THERAPY**

## **GRADUATION PROJECT REPORT SUBMITTED TO DEPARTMENT OF BIOMEDICAL ENGINEERING OF NEAR EAST UNIVERSITY**

**By  
ABDULLAH SOLIMAN**

**In partial fulfillment of The Requirements For The  
Degree of Bachelor of Science  
in  
Biomedical Engineering Department**

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## **DECLARATION**

I declare that my project and all the information it contains are in accordance to the academic and ethical conduct. I also declare that all articles, journals and various sources of data in relation to my project have been appropriately referenced and cited.

Name, Last name: Abdullah Soliman

Signature:

Date: 01/06/2018

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## **ACKNOWLEDGEMENT**

I sincerely acknowledge the support, guidance and kindness of my honorable supervisor Assist. Prof. Dr. MelisSümengenÖzdenefe. My supervisor has guided me step by step on the graduation research. Only words cannot express my appreciation and gratitude to all those involve directly or indirectly to the completion and success of my project. The memories created during my hard work in preparing this novel project will never be forgotten. Once again thank you very much.

## **ABSTRACT**

Purpose of this project is applying engineering principle on the medical principle to improve the quality of these devices and make the users of these devices more comfortable with the usage of the devices. The original purpose of the project is to use carbon dioxide to induce the blood to flow into the oxygen-requiring substrate. The project is one of the latest engineering modifications that have been used on the carboxy therapy and that there are other modifications can be included. Modifications may include treatment of skin shrinkage after use of the device, Such as a massage device that is connected to the device and acts as a medical product that serves the needs of the doctor and the patient at the same time.

**To my parents...**

## TABLE OF CONTENTS

<b>DECLARATION .....</b>	<b>i</b>
<b>ACKNOWLEDGEMENT .....</b>	<b>ii</b>
<b>ABSTRACT .....</b>	<b>iii</b>
<b>LISTS OF FIGURES .....</b>	<b>vii</b>
<b>CHAPTER 1 INTRODUCTION.....</b>	<b>1</b>
1.1 What Is The Carboxy Therapy? .....	1
1.2 Is the Injection Carboxy Toxic or Not? .....	1
1.3 What Is The Idea of Primitive Work of The Device? .....	1
<b>CHAPTER 2 ENGINEERING MODIFICATION OF THE DEVICE.....</b>	<b>2</b>
2.1 What Is The Structure of The Modifications Will Be Applied To This Device? .....	2
2.2 What Are TheFunctions of Each Modification In The Device? .....	3
<b>CHAPTER 3 STAGES OF THE DEVICE .....</b>	<b>4</b>
<b>CHAPTER 4 MANUFACTURING OF THE CARBOXY DEVICE .....</b>	<b>6</b>
4.1. The Components of Neumatic Circuit and Their Functions: .....	6
4.2. Power Supply Circuit: .....	6
4.3. Control circuit: .....	8
<b>CHAPTER 5 DEVICE INSTALLATION .....</b>	<b>9</b>
5.1 What Are The Stages of Device Installation? .....	9
5.2 What Is The Summary Work of The Device In General? .....	15

<b>CHAPTER 6 DEVICE BENEFITS .....</b>	<b>16</b>
6.1 Treatment for Dark Halos .....	16
6.2 Hair Falling Treatment, Baldness and Alopecia Treatment.....	17
6.3 Treatment for Skin Wrinkles .....	18
 <b>CHAPTER 7 POSSIBLE ENGINEERING MODIFICATION.....</b>	<b>19</b>
 <b>CHAPTER 8 EXPECTED MALFUNCTION DEVICE AND HOW TO Figure IT OUT. ....</b>	<b>20</b>
8.1. In the Neumatic Circuit:.....	20
8.2. In the Control Circuit: .....	20
8.3. In the Power Supply Circuit:.....	20
 <b>CHAPTER 9 THE MAIN PERCAUTIONS OF THE DEVICE .....</b>	<b>21</b>
 <b>CHAPTER 10 CONCLUSION .....</b>	<b>22</b>
 <b>REFERENCES .....</b>	<b>23</b>

## LISTS OF FIGURES

<b>Figure 1.1:</b> Image of carboxy therapy machine.....	1
<b>Figure 2.1:</b> Image of keypad.....	2
<b>Figure 2.2:</b> Image of Arduino device .....	2
<b>Figure 2.3:</b> Image of LCD screen .....	2
<b>Figure 2.4:</b> Image of pedal.....	2
<b>Figure 2.5:</b> Image of relay .....	3
<b>Figure 2.6:</b> Image of air solonide .....	3
<b>Figure 3.1:</b> Image of device diagram.....	4
<b>Figure 3.2:</b> Image of air solonide at off state.....	4
<b>Figure 3.3:</b> Image of diagram of the device .....	5
<b>Figure 4.1:</b> Power supply circuit .....	6
<b>Figure 4.2:</b> Step down transformer.....	7
<b>Figure 4.3:</b> Half wave rectifier .....	7
<b>Figure 4.4:</b> Full wave rectifier .....	8
<b>Figure 4.5:</b> Regulator.....	8
<b>Figure 5.1:</b> Body of the device .....	9
<b>Figure 5.2:</b> The body after painting.....	9
<b>Figure 5.3:</b> The body with the holes for Arduino components.....	10
<b>Figure 5.4:</b> The internal connection between Arduino components inside the body .....	10
<b>Figure 5.5:</b> Existence of potentiometer for controlling the intensity of the light .....	11
<b>Figure 5.6:</b> Flow and on off switch with their leds .....	11
<b>Figure 5.7:</b> The whole diagram of the device.....	12
<b>Figure 5.8:</b> The flow switch.....	12
<b>Figure 5.9:</b> The pedal switch .....	12
<b>Figure 5.10:</b> The push button switch .....	13
<b>Figure 5.11:</b> The gas hose gets out of the internal side of the body .....	13
<b>Figure 5.12:</b> The project of carboxy therapy .....	14



<b>Figure 5.13:</b> The air solonide at close state .....	15
<b>Figure 6.1:</b> Treatment of dark halos .....	16
<b>Figure 6.2:</b> The treatment of dark halos .....	16
<b>Figure 6.3:</b> The treatment of baldness and alopecia.....	17
<b>Figure 6.4:</b> The treatment of baldness .....	17
<b>Figure 6.5:</b> The treatment of skin wrinkles .....	18
<b>Figure 6.6:</b> The treatment of skin wrinkles .....	18
<b>Figure 7.1:</b> The treatment with massage machine .....	19
<b>Figure 7.2:</b> The treatment with massage machine .....	19

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 What Is The Carboxy Therapy?**

The idea of carboxy therapy isn't recent. It has started in Europe in the 1930s in France and it was noticed that the wounds were healed with the use of water saturated with CO<sub>2</sub> gas. In the 1990s it started to be used in the cosmetic surgery and also it has penetrated cosmetic medicine since the discovery of Botox. So the working principle of this therapy depends on the injection of carbon Dioxide under the skin. This makes brain feel that the Injected area doesn't contain sufficient oxygen. So that it sends signals to pump oxygenated blood into that area for increasing the blood flow to the desired area. (Huxley, D. (n.d.). Carboxytherapy)

#### **1.2 Is the Injection Carboxy Toxic or Not?**

The idea is that when the injection of carbon Dioxide will be under the skin so it will not be toxic anymore and also it will not cause any clotting. (Huxley, D. (n.d.). Carboxytherapy)

#### **1.3 What Is The Idea of Primitive Work of The Device?**

The device is made up of CO<sub>2</sub> tube which is connected to pressure regulator which is typically designed to control the pressure of gas outside the tube when the valve is opened. So this CO<sub>2</sub> tube is connected by small pipette with two sides the first side is connected to the surface of the tube and the second side is connected to the medical needle. (Lauren Ingram for Daily Mail Australia)



**Figure 1.1:** Image of carboxy therapy machine (RioBlush Carboxy therapy, 2018)

## CHAPTER 2

### ENGINEERING MODIFICATION OF THE DEVICE

#### 2.1 What Is The Structure of The Modifications Will Be Applied To This Device?

##### 1. Arduino keypad



**Figure 2.1:** Image of keypad(Instructables, 2014)

##### 2. The Arduino device



**Figure 3.2:** Image of Arduino device(Instructables, 2014)

##### 3. The Arduino screen



**Figure 4.3:** Image of LCD screen(Instructables, 2015)

##### 4. Foot pedal: Used as an on-off switch.



**Figure 5.4:** Image of pedal(Ebay, 2018)

## 5. Relay



**Figure 6.5:** Image of relay(Addicore, 2018)

## 6. The air valve

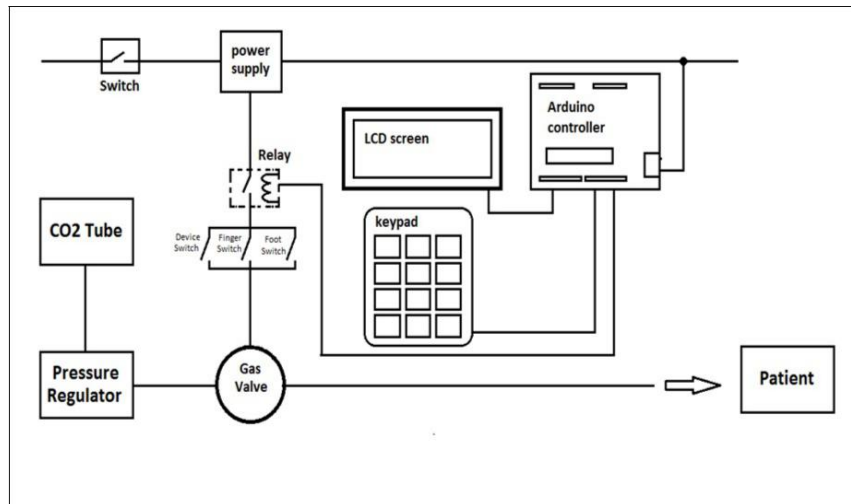


**Figure 7.6:** Image of air solonide(Dhgate, 2013)

## 2.2 What Are TheFunctions of Each Modification In The Device?

- 1.The Arduino device is added to the overall control at the time when the gas is discharging from the tube to the medical needle through air valve.
2. Arduino keypad that adjusts the time for the session.
- 3.The Arduino screen displays the countdown timer for the session time by setting the specific time by the keypad.
4. Foot pedal: Used as an on-off switch.
- 5.Power cable for power supply.
- 6.Relay is controlled through the Arduino at the beginning and end of the session.
7. The air valve is also controlled through the arduino at the beginning and the end of the session.

## CHAPTER 3 STAGES OF THE DEVICE



**Figure 8.1:** Image of device diagram

### 3.1 What are The Stages of The Device?

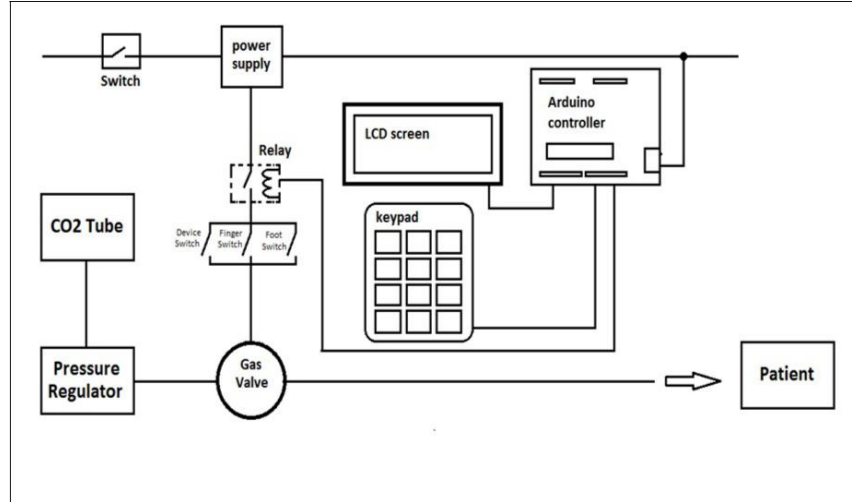
1. As we know every medical device contains many stages and every stage contain many elements to make the device work properly . So the first stage in this device is the stage of first modification that is Solneide valve it is used as air valve and then also it is considered as on or off switch and the working of this switch whether it is open or close will depend on the upper components in the diagram.

So we want to how does this solenoid air valve work?

Firstly we have to know that the solenoid air valve is electrical valve.



**Figure 9.2:** Image of air solonide at off state(Solenoid Valves, 2017)



**Figure 10.3:** Image of diagram of the device

2. The second stage is the stage of second modification that is Arduino Controller which is composed of Arduinodevice, Keypad and LCD screen of Arduino Controller so the Arduino device which is connected to power supply to provide the current flow and this current flows from the beginning to the end of specific time that is written by keypad and is displayed on the LCD screen with counting down.

3. The third stage is the stage of the third modification. It consists of electric circuit with series connection between relay with foot pedal and both of them acts as on or off switch and this electric circuit is the interface between Arduino controller and gas valve.

so when the current comes flow comes from Arduino it makes the relay work automatically and at this case it works as closed switch , on the other hand the foot pedal is worked as closed switch by the pushing it . To let the current move from relay to the air valve.so that is the important function of series connection between relay and foot pedal that means if one of these two components work without the other thecurrentwill not able to move to air valve

## CHAPTER 4

### MANUFACTURING OF THE CARBOXY DEVICE

#### What Are The stages of Device Configuration ?

The device contains 3 electric circuits :

1. Neumatic circuit
2. Power supply circuit
3. Control circuit

#### 4.1. The Components of NeumaticCircuit and Their Functions:

A. Two regulators: one of them is used for knowing the gas pressure in which the tube and the other one is used for controlling the quantity of flowing air which outside the tube.

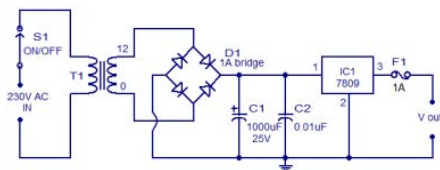
B. Solonide: is responsible for opening and closing path of the gas.

C. Syringe: it used for injection and it is changed for every patient.

D. The hose pipes and other links: it is the connection units between these components.

#### 4.2. Power Supply Circuit:

It is the circuit which is responsible for supplying the device with electricity and it is represented as adaptor which is connected to the power source 220 V AC and its other side is connected to the arduino to supply it with direct current with its value 9 volt DC.



**Figure 11.1:** Power supply circuit

The power supply circuit consists of four elements:

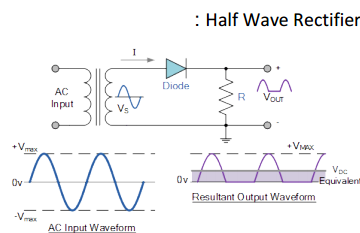
1. Step down transformer: used to reduce the 220 voltage to the desired voltage.



**Figure 12.2:** Step down transformer (Ali Express, 2018)

2. Bridge: it consists of four diodes in the shape of a bridge and is used for converting the AC current to DC current and there are two types of rectifiers:

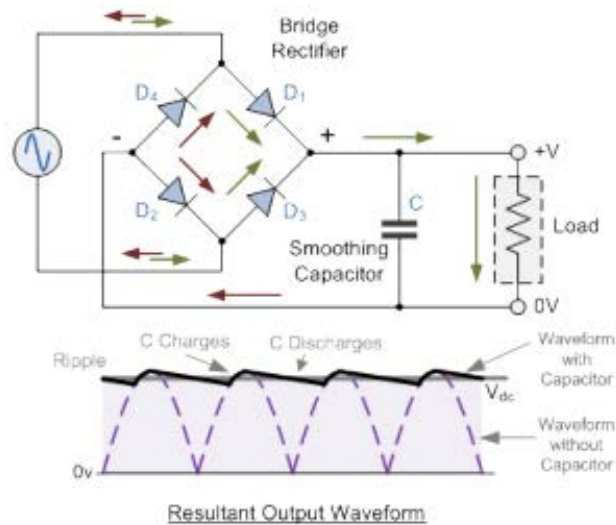
A. Half wave rectifier: at this case when we apply positive voltage so at this moment the current flows and this state is forward state but when we apply negative voltage so at this moment the diode is closed and there is no current flow and this state is reverse state.



**Figure 13.3:** Half wave rectifier

B. Full wave rectifier: at this state the current flows at positive or negative range because at positive range the current flows through the first and third diode and at negative range the current flows through the second and fourth diode.





**Figure 14.4:** Full wave rectifier

3. Capacitance: it consists of two metal plates between them air medium so when there is extra current source the air medium used to cover this extra current and also it may cause damage for the elements and for the whole circuit and the main advantage it used to remove the aliasing of the current wave which we rectified it.

4. Regulator: it used to convert power supply voltage to 9 volt which is desired by the arduino.



**Figure 15.5:** Regulator(Addicore, 2018)

#### 4.3. Control circuit:

It consists of arduino and its components like keypad and screen which are used for set the time of process as we explained before.

## **CHAPTER 5**

### **DEVICE INSTALLATION**

#### **5.1 What Are The Stages of Device Installation?**

1. Making suitable body to cover all of the device components and the devices electrical circuits it is manufactured in the workshop as in these photos.



**Figure 16.1:** body of the device

2. It is painted by White colour as in this photo.



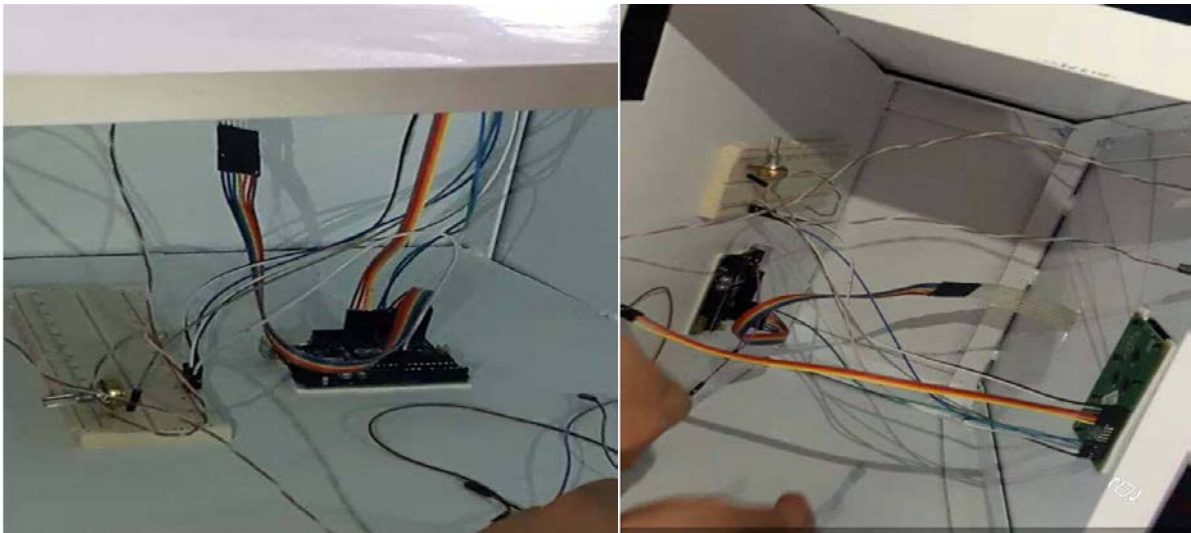
**Figure 17.2:** The body after painting

3. Making the holes in the interface of the body to fit the LCD screen and other hole for the keypad of the arduino.



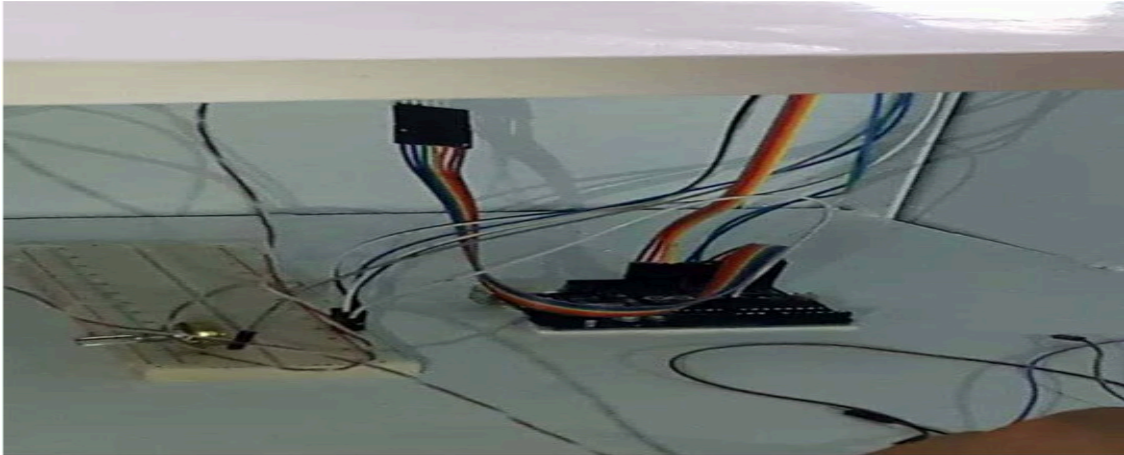
**Figure 18.3:** The body with the holes for Arduino components

4. Make a connection between main arduino device in which inside the body with the keypad and LCD screen in which the interface of the device.



**Figure 19.4:** The internal connection between Arduino components inside the body

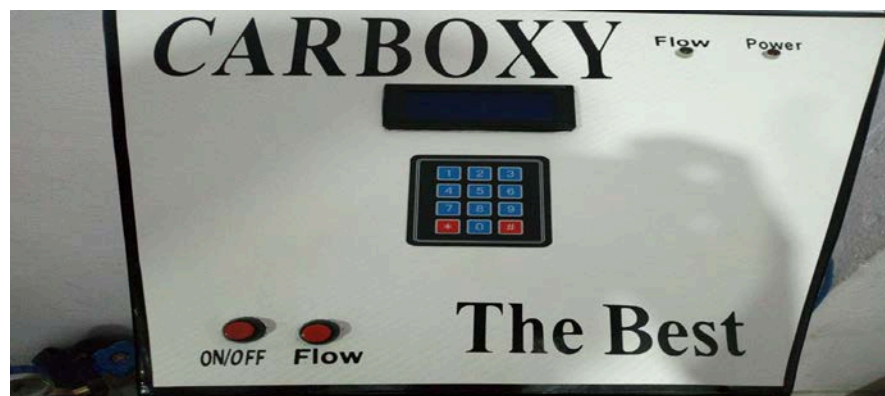
5. Make a connection for potentiometer in breadboard for controlling the light intensity of the LCD screen.



**Figure 20.5:** Existence of potentiometer for controlling the intensity of the light

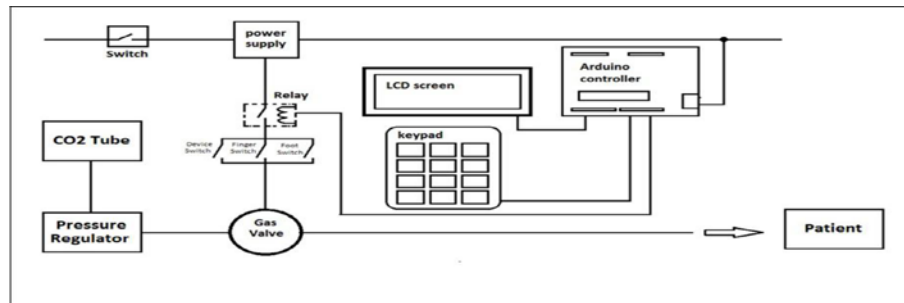
6. There is on/off switch which is related to power led so that they are connected parallel with adaptors wires so that when we connect the adaptor with electricity and push the on/off switch the device starts working and power led is opened.

7. There is flow switch which is related to flow led so that they are connected parallel with electrical solonide so that when we push the flow switch the solonide starts working to transport the gas to syringe and at this time the flow led is opened.



**Figure 21.6:** Flow and on off switch with their leds

8. There is parallel connection between 3 switch so that if we switch on one of them the flow of carbon dioxide begins to flow from the tube to the syringe: as in this diagram.



**Figure 22.7:** The whole diagram of the device

The first one is the flow switch in which the interface of the body of the device.



**Figure 23.8:** The flow switch

The second one is the pedal.



**Figure 24.9:** The pedal switch



The third one is the push button which is placed beside the syringe to make the doctor control it easily while injection process.



**Figure 25.10:** The push button switch

9. The last thing to be done is making a hole in the side of the body of the device to get the gas hose out of the body which is come from the  $\text{CO}_2$  tube and will be connected to the syringe which will be used in injection the patient.



**Figure 26.11:** The gas hose gets out of the internal side of the body

And after all of these stages this is the shape of our Project. (Manufacturing device)

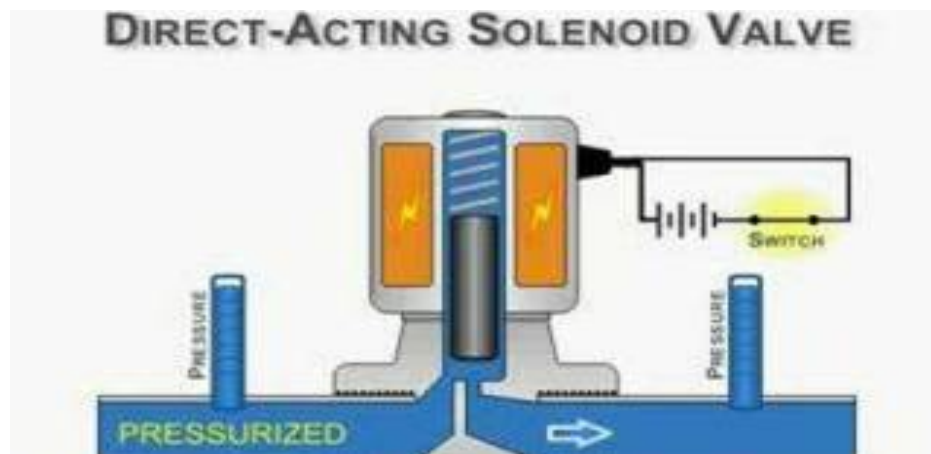


**Figure 27.12:** The project of carboxy therapy

## 5.2 WhatIs The Summary Work of The Device In General?

1. The Arduino is electrically connected through the Adaptor and then an electric current coming from the Arduino passes through a specific time on the LCD screen of the Arduino to the relay. The relay acts as a closed switch to allow the current to flow from it to flow to the air valve through foot pedal switch at closed state so when the electrical current comes to air valve it allows the passage of the current from the tube to the syringe that falls under the skin of the patient.

2. So when the time of the session will be finished by the end of specific time which was displayed on LCD screen the current which comes from the power supply to the Arduino device and moves from the Arduino to relay will be stopped Arduino so the relay will act as an open key and once the relay will be opened so there is no any electrical signal will be delivered to the air valve so the Solenoid air will act as open switch so there is no air flow will be delivered from the CO2 tube to the medical needle . So Finally the Doctor removes the power supply cable and closes the cylinder valve to ensure from there is no leaking of CO2.



**Figure 28.13:** The air solonide at close state(Solenoid Valves, 2017)



## CHAPTER 6 DEVICE BENEFITS

### 6.1 Treatment for Dark Halos



**Figure 29.1:** Treatment of dark halos(Banglahunt, 2018)



**Figure 30.2:** The treatment of dark halos(Arabaltmed, 2016)

## 6.2 Hair Falling Treatment, Baldness and Alopecia Treatment

RioBlush Carboxytherapy Hair Growth Stimulation



**Figure 31.3:** The treatment of baldness and alopecia(RioBlushCarboxy therapy, 2018)

RioBlush Carboxytherapy Hair Growth Stimulation



**Figure 32.4:** The treatment of baldness(RioBlushCarboxy therapy, 2018)

### 6.3 Treatment for Skin Wrinkles



**Figure 33.5:** The treatment of skin wrinkles(Clear Skin, 2018)



**Figure 34.6:** The treatment of skin wrinkles(RioBlushCarboxy therapy, 2018)



## **CHAPTER 7**

### **POSSIBLE ENGINEERING MODIFICATION**

From the engineering modifications that can be added to the device: adding a massage probe to the device to treat the temporary swelling that occurs in the injected area after the injection and make the skin of patients become elastic again and that probe can be connected electrically with the same voltage with Arduino device.



**Figure 35.1:** The treatment with massage machine(Dreams Time, 2018)



**Figure 36.2:** The treatment with massage machine(Dreams Time, 2018)

## **CHAPTER 8**

### **EXPECTED MALFUNCTION DEVICE AND HOW TO Figure IT OUT.**

#### **8.1. In theNeumaticCircuit:**

- A. may be one of the gas hose has a leakage and at this time it is replaced with new one.
- B. may be the regulator has an error or clogging and if it is damage it is replaced with new one.
- C. the solonide is checked and if it has any leakage it is replaced with another one.
- D. the pedal also is checked and if it has any error it is replaced with another one.

#### **8.2. In theControl Circuit:**

- A. if there is any error in the arduino it should be checked and making sure of wires connection is good between it and other parts in the device.
- B. may be the error in relay which connects the arduino and the switches so it is checked and if it is damage it is replaced.
- C. may be the error in keypad and maybe there is one button is not working so it is checked and if it is not working properly it will be replaced with another one.
- D. maybe the error in LCD screen so it is checked and if is damage it will be replaced with another one and may be the writing on the LCD screen it is not regular so at this time the relay will be checked and doing reset the device.

#### **8.3. In the Power Supply Circuit:**

If there is any error in the adaptor it will be checked and if it is damage It will be replaced.

## **CHAPTER 9**

### **THE MAIN PERCAUTIONS OF THE DEVICE**

1. The calibration of the device should be every time.
2. Not using the excessive force with using the device.
3. not expose the device to any shock to not affect the performance of the device.
4. Not using syringe bigger than the normal volume of the devices syringe of the device.

## **CHAPTER 10**

### **CONCLUSION**

The purpose of this project is applying engineering principle on the medical principle to improve the quality of these devices and make the users of these devices more comfortable with the usage of the devices. The original purpose of the project is to use carbon dioxide to induce the blood to flow into the oxygen-requiring substrate. The project is one of the latest engineering modifications that have been used on the carboxy therapy and that there are other modifications can be included.

Modifications may include treatment of skin shrinkage after use of the device, Such as a massage device that is connected to the device and acts as a medical product that serves the needs of the doctor and the patient at the same time.

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