

# Design of An Acupressure Stimulator

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**Abstract:-** An Acupressure Stimulator Stimulates and regulates the flow of blood in the back region. This acupressure machine can be used for coma patients who can't able to move for long period, because they will be affected with bed sore often. Acupressure is essentially a massage of acupuncture points. The principle of massage has been used to alleviate pain for thousands of years. The stimulation of acupuncture points will lead to the better functioning of organs like heart, kidney, lungs, etc... This setup consists of acupressure probes which are supposed to hit the back region of the patient at definite intervals of time. The hitting pressure can be controlled by adjusting the cam. When compared to other medical treatments, acupressure is less cost. The different components of the acupressure stimulator are modeled and assembled using one of the end parametric modeling software Autodesk inventor 17.

**Key Words:** Acupressure points, Acupressure probes, Adjustable cam, Autodesk inventor 17.

## 1. INTRODUCTION:

Acupressure is firm, controlled and timed pressure applied by thumb, fingers, or elbow, on specific pain-causing "sore" spots of the muscles. No drugs or other medicines are used. "Sore" spots are actually a pattern of small knots, which constrict the flow of blood and oxygen, causing a painful muscle spasm. Acupressure is both safe and healthful. Simple Pressure on the constrictive knots will melt them, to free the flow of blood and oxygen. The acupressure therapy is momentarily painful. Pain should be controlled by a variance of pressure to individual tolerances. On completion of acupressure and suggested muscle-stretching exercises,

the very source of the pain is usually removed often permanently and blood circulation is enhanced in the areas treated. The acupressure is similar to acupuncture, but in this there is need of needles. It is essentially a massage of acupuncture points. The science of acupressure developed after it was seen that effects similar to that of acupuncture could be obtained by pressing acupuncture points. Thus the principle of massage has been used to alleviate pain for thousands of years. According to this we are using concept of acupressure in our projects. Acupressure and acupuncture share the same active points (also called trigger points). We are using acupressure probes to stimulate the acupuncture points present in our body, due to which the functioning of organs like heart, kidney, lungs, etc... may be improved and also by using this we can increase the blood circulation. Thus the acupressure stimulation may lead to relaxation and normalization of body function, pain relief and induce feeling of happiness. This acupressure machine can be used for coma patients who can't able to move for long period, because they will be affected with bed sore often.

## 2. MATERIAL SELECTION:

Selection of material is based on availability, stiffness, cost and suitability of the materials for heat treatment. All parts are suitably heat treated and necessary precautionary steps are taken to prevent corrosion. The materials assigned for each component are tabulated as follows

S.No	COMPONENTS	QTY	MATERIALS
1	Extrusions	11	Aluminum
2	Cam	1	Stainless steel
3	Bolts and Nuts	10	C45 Steel
4	Probes	50	Plastic
5	Probe Frame	1	Stainless steel
6	Bed	1	Wood
7	Springs	4	Steel

## 3. PROBLEM IDENTIFICATION:

Medical massage is a method for relaxation and maintaining health as well as curing diseases and returning the patient to good health. Especially in Hospitals, the coma patients are supervised by attendant for their movements in bed. If they are not noticed for a

long time without any movement, then there is no blood circulation in that specific area. So, due to this the blood cells present in the skin are decomposed and formed into wounds. Formation of these wounds will leads to scattering of wound in all over the back region of the patient. Once these wounds are formed it should be regularly cleaned and vaccinated. Cleaning and

vaccinating of wounds in coma patients are quiet difficult. These are the major issues currently faced by coma patients.

### 3.1. JUSTIFICATION FOR THE PROBLEM:

Required massage for the coma patients are provided accurately at the acupressure points by this acupressure stimulator without disturbing them while they are in bed. Due to providing thrust at acupressure points prevents the cells from mortality thus it stops formation of wound in back region of the patient. Massage at acupressure points will also helps in fine circulation of blood.

## 4. COMPONENTS IN ACUPRESSURE STIMULATOR:

### 4.1. BED:

The bed is made up of wood. This bed consists of five slots which allow the probes to move from down the frame to upside. The bed is fine finished and coated with respective agents to prevent from termite attack and moisture attack.

### 4.2. CAM:

The cam is made up of stainless steel. This cam consists of three slots for mounting of the probe frame. The raising and lowering level of the cam can be controlled by mounting the probe frame on respective slots. Thus the cam is also known as level adjuster.

### 4.3. PROBE FRAME:

Probe frame is made up of stainless steel. Probe frame is simply a frame in which all the probes required for massaging the acupressure points are mounted at equal interval of space.

### 4.3. PROBES:

The probes are made up of plastic material. The probe is the end system which massages the acupressure points of the patients. The movement to the probe system is given by the cam the level adjuster.

### 4.4. EXTRUSIONS:

The extrusions are the main systems which serve as the main frame to the bed. The extrusions used here are made up of aluminum material. The size selected for the extrusion here is 40x40.

### 4.5. MOTOR:

The motor selected here is CNED-201, SCHINDLER. The voltage ranges between 220v-380v. Lifting weight ranges between 240-400kg.

### 4.6. SPRINGS:

The springs used here are made up of stainless steel. Open coil springs are preferred for this operation. Number of coils in the springs ranges between 6-8.

## 5. 3D MODEL DEVELOPMENT USING AUTODESK INVENTOR:

Autodesk inventor is the world leading 3D product development solution which is developed by Autodesk. It takes care of entire product development process from creative concept through detailed product definition to serviceability. Inventor plays a vital role in creation of 3D models of all complicated components both in small scale and large scale industries not only in India but also in all western countries. This image represents 3D model of the Acupressure stimulator.

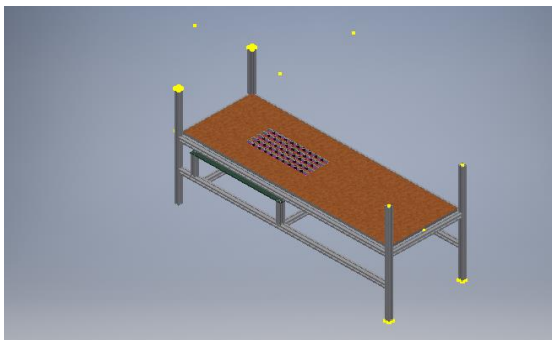


Fig 5.1 Entire 3D model

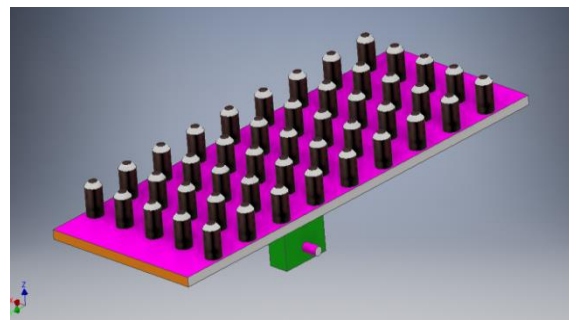


Fig 5.2 Probe Frame.

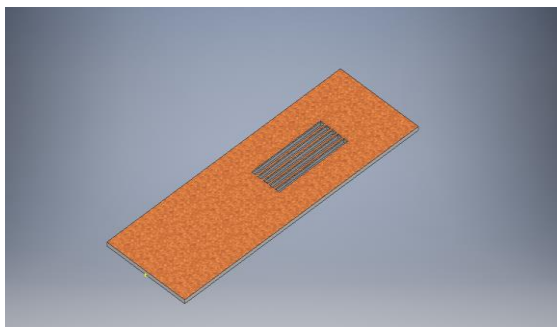


Fig 5.3 Wooden Bed

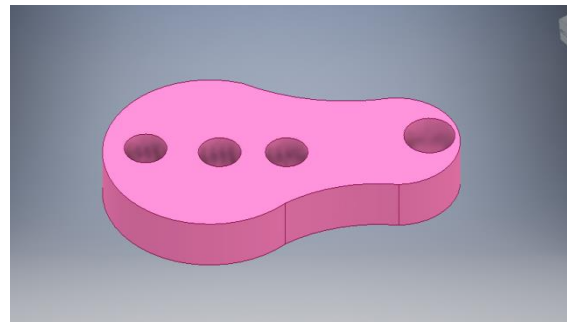


Fig 5.4 Level Adjuster

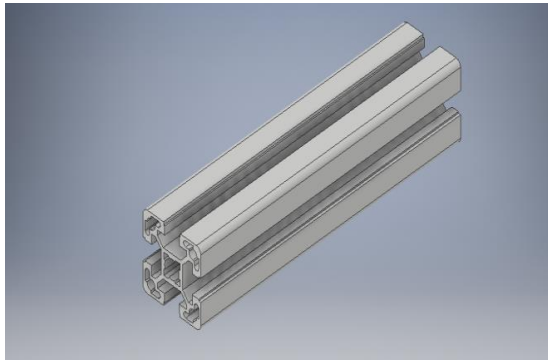


Fig 5.5 Extrusion

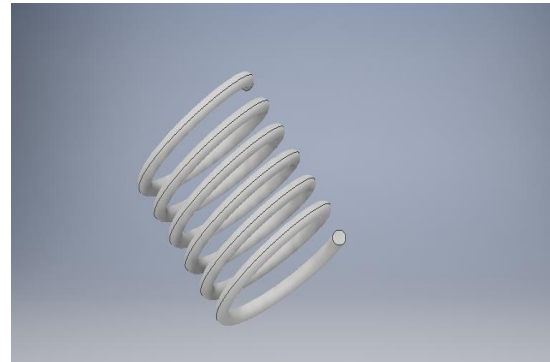


Fig 5.6 Spring

## 6. DESIGN CALCULATION:

### Springs

From PSG data book Page no 7.100

Choose helical springs

### Wire thickness:

$$t = k_s 8PD / 3.14d^3$$

Assume patient's weight  $P = 140$  kg

$$= (1.40) 8 * 140 * 50 / 3.14 * (12)^3$$

$$t = 1.4 \text{ cm}$$

### Spring Index

$$C = D/d$$

$$C = 4.16$$

### Spring Deflection

$$Y = 8PD^3n / Gd^4$$

$$G = 0.790 * 10^5 \text{ (From PSG data book Page no 7.100)}$$

$$= 8 * 140 * 5^3 * 6 / 79000 * 1.2^4$$

$$Y = 5.12 \text{ mm}$$

### Check for buckling

$$L_f = p_n + d$$

$$L_f = 37.2 \text{ mm}$$

Buckling check (From PSG data book Page no 7.100)

$$L_f / 50 < 3$$

$$37.2 / 50 = 0.744$$

$$0.744 < 3$$

Hence the design is safe.

## 7. ACUPRESSURE STIMULATOR – WORKING:

The description and working of acupressure stimulator is simple. Acupressure bed is made up of wood. This bed consists of five slots which allow the probes to move from down the frame to upside. The frame probe is fitted below the bed. Probe frame is made up of stainless steel. Probe frame is simply a frame in which all the probes required for massaging the acupressure points are mounted at equal interval of space. The motion required for the frame is obtained from the cam (level adjuster) which was coupled one side to the frame and other to the motor. This cam consists of three slots for mounting of the probe frame. The raising and lowering level of the cam can be controlled by mounting the probe frame on respective slots. During motor rotates, cam also rotates respective to the motor. When the cam rotates the frame probe will tends to move up and down. When the cam is at rise position the probes will project over the bed and hit the back region of the patient who is supposed to lie on it and when the cam is at dwell the probes return back to original position (behind the bed). The hitting pressure of the probe can be adjusted by locking the probe frame in different slots of the cam. This system is fully automated and no manual inspection is required.

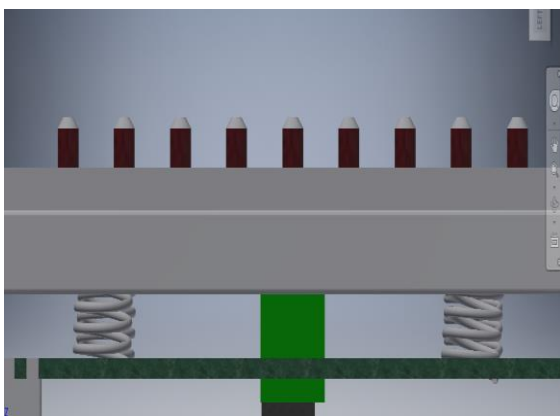


Fig 7.1 Cam Rise

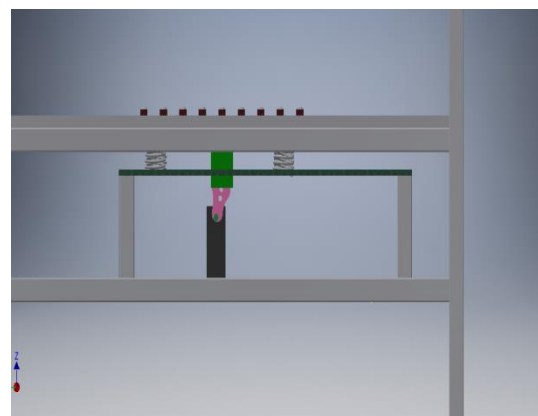


Fig 7.2 Cam Dwell

#### 8. MERITS:

- Simple in operation.
- Maintenance cost is low.
- No need of attainer to inspect patient periodically.
- Suitable for all aged peoples.
- Simple mechanism.
- Improves blood circulation.

#### 9. SCOPE FOR FUTURE IMPROOVEMENT:

Top priority is given for safety operation; acupressure stimulator is fabricated with safety in operation and reduced cost. After installation and establishing successful working of the machine, it is proposed to concentrate on value engineering to increase the future value of the machine in all aspects. Presently full focus is given to designing and placing of probes accurate to the meridian points. We can add wheels to the beds thus it is easily movable to everywhere and we can incorporate the same massage for head and feet in the same machine. Thus we can improve the future value of the machine.

#### 10. CONCLUSION:

An acupressure stimulator is designed for coma patients to overcome the lack of blood flow in their back region. The main motive is to regulate proper blood flow in back region and prevent the formation of wounds due to death of cells. No need of attainer to monitor and massage the patients. The cost of the machine comes around Rs 8000/- INR.

#### 11. REFERENCE:

- [1] "Hot Accupressure and Massage Machine" – JOON PARK , PATENT NO US10762649.
- [2] "Acupuncture & Evidence-based Medicine: a Philosophical Critique"- Michael
- [3] T. Greenwood, Medical Acupunctue Journal, vol 13, no.2, 2002.
- [4] "Apparatus and Method for Massaging the Back Utilizing Pneumatic Cushions" – JOHN F.GILLEN – PATENT NO-US07727666.
- [5] "Apparatus for Head Acupressure using Air Pressure"-PATENT NO-CN 200680048416.