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DESIGN AND DEVELOPMENT OF SHIRODHARA YANTRA

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Abstract: In Shirodhara yantra for inducing deep the mental relaxation.this involves the technique of automating the shirodhara yantra that means device that perform desired operation.it will reduce the human effort and increase the performance of Shirodhara yantra. In this paper we are concentrating on the issue of the automated Shirodhara yantra by converting rotary motion obtained by motor into oscillating motion of desired mechanism. our literature focus on the area of application uniform rotary motion and deep relaxation technique.
The objective of this project is to obtain the different stroke length and rotation of pipe through which the liquid will fall on the forehead effectively and speed control of oscillating motion.
Keywords: shirodhara, oscillation, stroke length, rpm, gear, bearing

I. INTRODUCTION

This project is about apparatus allowing the ayurvedic technique of shirodhara to be used consisting in inducing the state of relaxation by allowing liquid to automatically fall onto the forehead in a continuous flow.
It comprises a headrest for maintaining the forehead in a predetermined supine position. It also consist of a collector for delivering liquid to reservoir, a pump for delivering said liquid from reservoir to a distribution pipe directing fluid towards forehead, a and a stand for supporting distribution pipe. A oscillating device is used for moving pipe lateral across an area defined by forehead.
The name comes from the Sanskrit words:

Shira - 'head'
Dhara - 'flow'.

This treatment involves oil gently poured over the forehead and third eye space – the Ajna Chakra. The liquids used in shirodhara depend on what is being treated, but can include oil, milk, buttermilk, coconut water, or even plain water.

The existing Shirodhara yantra basically consist of a shirodhara pot with a hole in bottom which is hung with the strings on the vertical stand which is mounted over the bed on which the person who needs the treatment is laid down.
The existing Shirodhara yantra requires a manual operator for oscillating the shirodhara pot over the forehead.

A continuous flow of liquid such as coconut, sesame, almond, coconut water, buttermilk, water or jojoba is made to flow through the pot which falls on the patient's forehead.

Fig.1. Conventional Shirodhara Technique

II. THEORY AND PRINCIPLE

The project is about the atomization of shirodhara yantra. In our project what we are doing is that we atomizing this shirodhara pot with an eccentric mechanism which reduces the human effort.
In shirodhara yantra we required to convert rotary to oscillating motion, so we study some mechanism which is use to convert rotary motion to oscillating motion. In our project we required various calculations regarding length of stroke and movement.
In this project main components are motor, worm gear, speed variation gear drive and eccentric disc with frame.
Working of project is simple, motor is rotated at 1800 rpm which rpm is reduce by two pair of worm gear to 7 rpm. We required that much amount of low rpm because operation of shirodhars yantra is very slow. Shaft of worm gear is attached to a driver gears arrangement which having three different diameter gears. Driver gear is drive driven gear arrangement which have also three different diameter gears. Diameter of decided according to a speed variation required in project example 5,10,15,20 rpm at driven shaft.

III. DESIGN AND DEVELOPMENT

A. Motor

An AC motor is an electric motor driven by an alternating current (AC). It commonly consists of two basic parts, an outside stationary stator having coils supplied with alternating current to produce a rotating magnetic field, and an inside rotor attached to the output shaft that is given a torque by the rotating field.

The two basic parts of an induction motor are the stationary stator located in the motor frame and the rotor that is free to rotate with the motor shaft. Today's motor design and construction are highly refined. For example, stator and rotor laminations have been designed to achieve maximum magnetic density with minimum core losses and heating. The basic simplicity of this design ensures high efficiency and makes them easily adaptable to a variety of shapes and enclosures

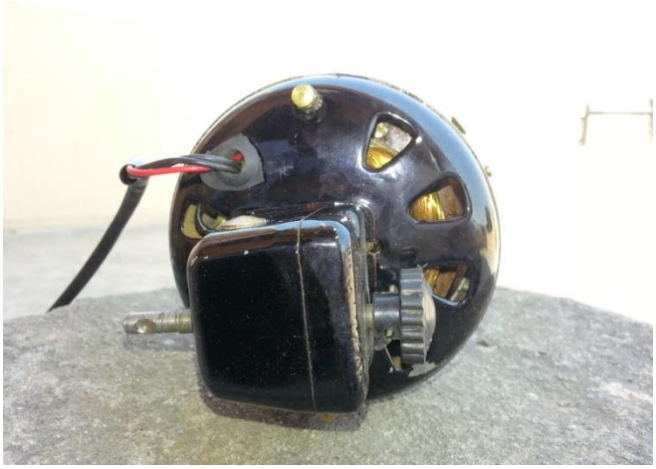

Fig.2. AC Motor

B. Worm Gear

Worms and worm gears are gear sets that offer high gear reduction and torque multiplication with a small footprint. A worm drive is a cylindrical gear with a shallow spiral thread that engages the worm gear in a non-intersecting, perpendicular axes configuration

Efficiency of a worm drive is determined by the lead angle and the number of threads in contact with the worm gear. A high lead angle on the drive reduces frictional losses and heat. A low lead angle reduces gear speed while proportionally increasing torque.

Friction is an issue with all worm sets; the worm gear cannot transfer motion back to the worm drive in most instances. Lubrication and ground teeth both contribute to the sets' overall silence while minimizing friction. Worm gear sets are usually produced in pairs due to their precision.

Fig.3. Worm Gear

C. Spur gear

Spur gears or straight-cut gears are the simplest type of gear. They consist of a cylinder or disk with the teeth projecting radially, and although they are not straight-sided in form, the edge of each tooth is straight and aligned parallel to the axis of rotation. These gears can be meshed together correctly only if they are fitted to parallel shafts. In a gear drive, two types of curves, the cycloidal and the involute, are generally used. In a gear drive, the shape of the tooth depends upon the pressure angle. Gears of involute profile with 14.5°, 20° full-depth and 20° stub pressure angles are most commonly used in industries.

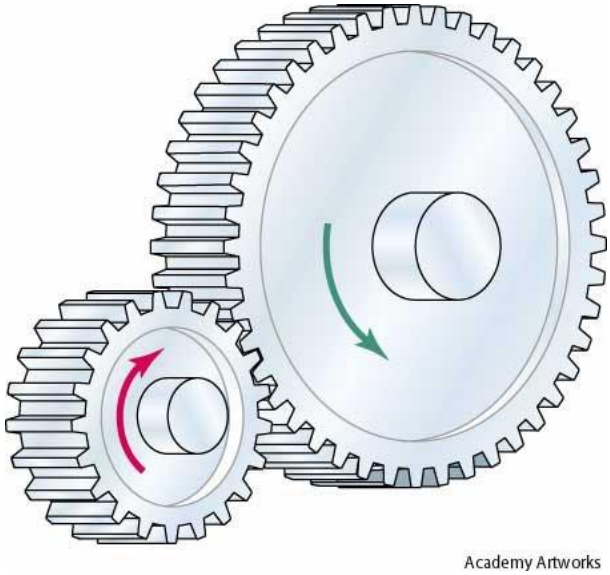

Fig.4. Spur gear

D. Eccentric mechanism

In mechanical engineering, an eccentric is a circular disk (eccentric sheave) solidly fixed to a rotating axle with its centre offset from that of the axle (hence the word "eccentric", out of the centre).

It is most often employed in steam engines and used to convert rotary into linear reciprocating motion in order to drive a sliding valve or a pump ram. In order to do so an eccentric usually has a groove at its circumference around which is closely fitted a circular collar (eccentric strap) attached to which an eccentric rod is suspended in such a way that its other end can impart the required reciprocating motion. A return crank fulfils the same function except that it can only work at the end of an axle or on the outside of a wheel whereas an eccentric can also be fitted to the body of the axle between the wheels. Unlike a cam, which also converts rotary into linear motion at almost any rate of acceleration and deceleration, an eccentric or return crank can only impart simple harmonic motion.

Eccentric mechanism satisfy both need of project which are converting uniform rotary to oscillating motion and variation in stroke length.

Fig.5. Eccentric mechanism

E. Bearing

A bearing is a machine element that constrains relative motion between moving parts to only the desired motion. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may prevent a motion by controlling the vectors of normal forces that bear on the moving parts. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts.A rolling-element bearing, also known as a rolling bearing, is a bearing which carries a load by placing round elements between two bearing rings. The relative motion of the pieces causes the round elements to roll with very little rolling resistance and with little sliding.

Fig.6. Roller Bearing

IV. DESIGN AND CALCULATION

We have this formula for measuring stroke length of the eccentric mechanism

S=2E*(H2/H1)

Where,

E=20mm

H2=350mm

As the value of the eccentricity and the height of delivery point is fixed, only way to change the magnitude of stroke is by changing the height of eccentric center from the frame center i.e. H1

When H1=140mm

S1=2×20× (350/140) S1=100 mm

When H1=112mm

S1=2×20× (350/112) S1=125mm

When H1=94mm

S1=2×20× (350/94)

S1=150mm

When H1=80mm

S1=2×20× (350/80)

S1=175mm

When H1=70mm

S1=2×20× (350/70)

S1=200mm

From above results we can see that the stroke length is increasing by a constant difference i.e. 25mm.So that we can get most of the forehead lengths between 100-200mm.

For measuring the variant speed of oscillation we have the following formula

N1×D1=N2×D2

N2= (N1×D1)/D2

N1=7 rpm

Where,

N1= rpm of the driver gear, N2= rpm of the driven gear

D1= diameter of the driver, D2= diameter of the driven

By using the various combinations of diameters of both the gear variable speeds are achieved, these are as follows

When the larger diameter of the driven gear is engaged with the middle diameter of the driver gear then the following effect is obtained

When D1=55 and D2=38.5

N2=7× (55/38.5)

N2= 10 rpm

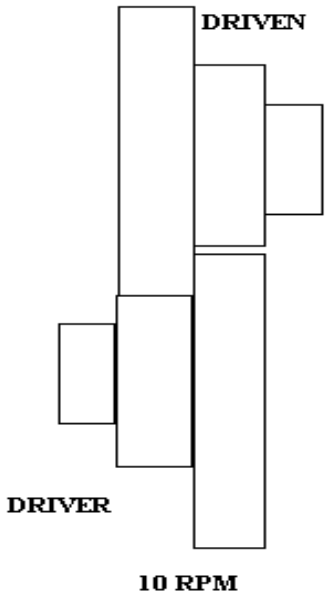

Fig.7 Gear Engaged middle driver

V. RESULTS

A. Difference in Speed by diameter variation

TABLE I
RESULTS FOR SPEED OF DRIVEN GEAR BY DIAMETER VARIATION OF GEAR

D1 (mm)	*D2 (mm)*	*N1 (rpm)*	*N2 (rpm)*
55	25.5	7	15
30	10.5	7	20

From the Design results given in TABLE.I Three different speeds with mechanized form of shirodhara yantra is obtain.

VI. CONCLUSION

The design of proposed Shirodhara Yantra in which rotation of pipe through which the liquid will fall on the forehead effectively and speed control of oscillating motion. Mechanical linkage provide smooth and silent operation. Easy to mount on single stand. Less maintenance required. Unobstructed movement is obtain. Easy to engaged and disengaged height Mass flow rate of pouring oil is easily maintain by adjusting oscillation.

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