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CONSTRUCTIONAL DESIGN OF GEAR OPERATED HAND MIXER

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ABSTRACT

A mixer is a kitchen appliance intended for mixing, folding, beating, and whipping food ingredients. Mixers come in two major variations, hand mixers and stand mixers. At that time the mixer run on electricity are of not used. For that to eliminate the effect of load shading we are here to introduce you to our project Hand Mixer it is simple and portable unit contains gear trains of gear ratio1:3 for handle and 1:10 for spider to transmit the motion of handle to spider we are using bevel pair. This instrument is used for various operations like grinding and mixing of food product in kitchen.

Keywords:Mixing, Beating, Whipping, Grinding and Mixing.

I. INTRODUCTION

As the name implies, a hand mixer is a hand-held mixing device. The modern electrical designs tend to consist of a handle mounted over a large enclosure containing the motor. The motor drives one or two beaters which are immersed in the food to perform the mixing action. More traditional, non-electrical designs tend to consist of a handle with a hand-operated crank on the side, geared to two beaters. The user grips the handle with one hand and operates the crank with the other, creating the mixing action. Gears are wheel-like machine elements that have teeth uniformly spaced around the outer surface. Gears can be a fraction of an inch in diameter to a hundred feet in diameter. Gears are used in pairs and are a very valuable design tool. They are used in everything from clocks to rockets and have been around for 3000 years. Gears are mounted on rotatable shafts and the teeth are made to mesh (engage) with a gear on another shaft. Gears deliver force (torque) and motion (rpm) from one part of a machine to another.

II. BEVEL GEARS

2.1 General:

Bevel gears are primarily used to transfer power between intersecting shafts. The teeth of these gears are formed on a conical surface. Standard bevel gears have teeth which are cut straight and are all parallel to the line pointing the apex of the cone on which the teeth are based. Spiral bevel gears are also available which have teeth that form arcs. Hypocycloid bevel gears are a special type of spiral gear that will allow nonintersecting, non-parallel shafts to mesh. Straight tool bevel gears are generally considered the best choice for systems with speeds lower than 1000 feet per minute: they commonly become noisy above this point. One of the most common applications of bevel gears is the bevel gear differential.

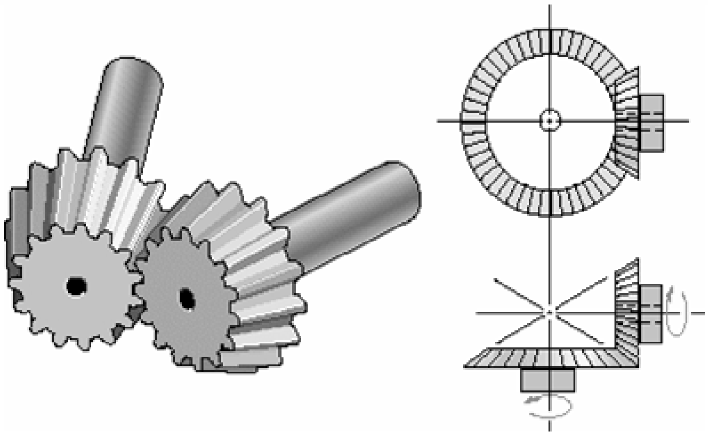

Fig.1. Bevel Gear

Limitations: Limited availability, Cannot be used for parallel shafts, Can become noisy at high speeds.
Advantages: Excellent choice for intersecting shaft systems**.**

III. HELICAL GEARS

3.1 General

Helical gears are similar to the spur gear except that the teeth are at an angle to the shaft, rather than parallel to it as in a spur gear. The resulting teeth are longer than the teeth on a spur gear of equivalent pitch diameter. The longer teeth cause helical gears to have the following differences from spur gears of the same size:

1.Tooth strength is greater because the teeth are longer,

2.Greater surface contact on the teeth allows a helical gear to carry more load than a spur gear

3.The longer surface of contact reduces the efficiency of a helical gear relative to a spur gear Helical gears may be used to mesh two shafts that are not parallel, although they are still primarily use in parallel shaft applications.

A special application in which helical gears are used is a crossed gear mesh, in which the two shafts are perpendicular to each other: The basic descriptive geometry for a helical gear is essentially the same as that of the spur gear, except that the helix angle must be added as a parameter.

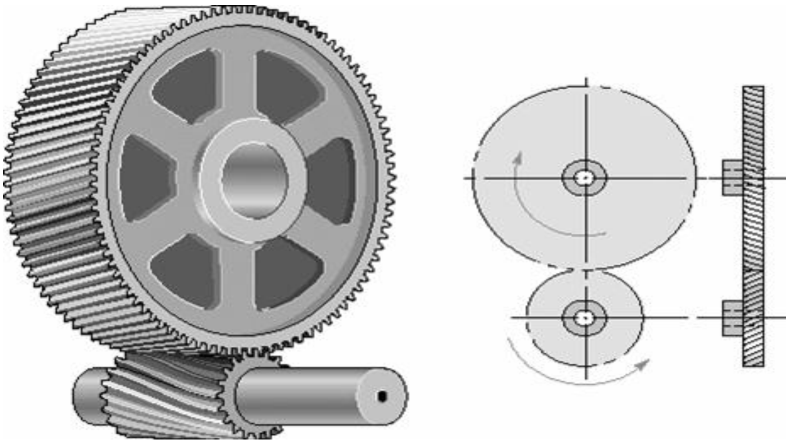

Fig.2. Helical gear

Limitations: Helical gears have the major disadvantage that they are expensive and much more difficult to find helical gears are also slightly less efficient than a spur gear of the same size

Advantages: Helical gear can be used on non-parallel and even perpendicular shafts, and can carry higher loads than can spur gears.

IV. DESIGN OF GEAR

The spur gear set that was previously rated will be replaced by the same size helical gear set and the power. rating of the two will be compared. The helix of the new gear set will be 10°. All other aspects of the two designs will be equal. As before grade 1 thru-hardened and grade.

1case-hardened steel with the same four diametric pitches will be evaluated. The only thing that changes in the pitting and bending equations that were previously used is the tooth geometry factor. Accordingly, the pitting tooth geometry ratio of .255/.132 gives helical gears a 93% increase in pitting transmitted horsepower and the bending tooth geometry factor ratio of .56/.30 gives the helical gears an 87% increase in bending transmitted horsepower.

Following Steps are used for design the gear:

Step: 1 Gear design starts with material selection. Proper material selection is very important;
Aluminum has been selected as a material. If the material for gear and pinion is same then the
design should be based since it is weak.

Step: 2 Find out the minimum central distance based on the surface compression stress is

a≥ (i+1)3√ (0.7/σc) 2 E (Mt) iψ……. [Design data]

Here Mt=torque transmitted by the pinion=97420(KW/N)*Kd*K Where Kd*K=1.3 , ψ=b/a………..[Design data]

Step: 3 Minimum normal modules may e determined as mn≥1.15Cosβ {Mt/Yv σb ψm Z1} ^1/3..[design data] Assume Z1=18, ψm=b/mn=10 from ..[design data] Virtual number of teeth Zv=Z1/cos3β , Lewis form factor Yv=0.1540.192/

Zv ….[Design data] Number of teeth on pinion Z1=2acosβ/mn*(i+1) , Number of teeth on gear Z2=iZ1 Diameter of pinion D1=mn*Z1/cosβ , Diameter of gear D2=mn*Z2/cosβ Centre distance a=D1+D2/2 , Face width b= ψa

Step: 4 checking the calculations: a): based on the compressive stress, σc=0.7(i+1)/a*√{(i+1/ib)*E[mt]} b): based on the bending stress, σb=0.7(i+1) (Mt)/{a.b.mn.Yv}

Here the bending and compressive stress values obtained are less than the material property values, and then the design is safe.

V. CONSTRUCTION

The following parts are used for construction:

1. Wooden frame: It is the basic structure of hand mixer which support the hole assembly
2. Shaft: It is used to transmit the motion shaft carries the two gears.
3. Handle: It is used to rotate the hand mixer. It is that part which is actually in hand of operator. At the end of handle helical gear train is mounted.

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4. Helical gear: It is transmitted the rotary motion of handle to the shaft to increase the speed.
5. Bevel gear: This pair is used to transmit the horizontal motion of shaft to vertical.
6. Epicyclical gear train: it is used to increase the speed transmitted by bevel gear.
7. Spider assembly: It is that part which is transmitting the motion to pot where grind are mix ingredients.
8. Bearings: It is used for smooth motion and support to shaft.

VI. TESTING WITH FOLLOWING SPECIFICATION

1. We can grind mix the ingredients up to 400grm
2. The gear train used in this machine are increased the speed1:3
3. Increase the speed of rotation by increasing the size of driving bevel gear.
4. For better torque the handle sizes is also greater

VII. CONCLUSION

Two gears with the driven gear having twice the number of teeth of the driving gear will rotate at one-half the speed of the driving gear and deliver twice the torque. Being able to control speed and torque by varying the number of teeth in one gear with respect to another makes gears a valuable design tool. An automobile transmission is an excellent example of how this principle is put to use to control vehicle motion. The manually powered machine met all customer and engineering design requirements. Using the mixer, were able to produce twice as much with little to no physical strain. The final design was able to reducing the average mixing time. With reduced mixing time, reduced physical strain and an increase in batch size, production of products will increase.

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