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Design and Fabrication of Coconut Crushing Machine Using Four Bar Mechanism

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Abstract:
Our project work describes the “DESIGN AND FABRICATION OF COCONUT CRUSHING USING FOR BAR MECHANISM”. Agriculture is one of the oldest professions but the development and use of machinery has made the job title of farmer a rarity. Instead of every person having to work to provide food for themselves, smaller portion of our population today works in agriculture, the smaller portion provides considerably more food than the other can eat. The basic technology of agricultural machines has changed little in the last century with the coming of the Industrial Revolution and the development of more complicated machines. In this work design and fabricate the automatic coconut crushing by using crank and slotted lever mechanism, for crushing agricultural products like coconut. The present work to fabricate a machine which is simple in construction than the existing machines. The equipment make the use of crank and slotted lever mechanism with one slider to couple with an electric motorusing pulley and belt drive.

I. INTRODUCTION

PRINCIPLE OF OPERATION

In both induction and synchronous motors, the a.c power supplied to the motor’s stator creates a magnetic field that rotates in time with the a.c oscillations. Whereas a synchronous motor's rotor turns at the same rate as the stator field, an induction motor's rotor rotates at a slower speed than the Stator Field. The Induction motor Stator's Magnetic field is therefore changing or rotating Relative to the rotor. This induces an opposing current in the induction.

II. MATERIAL SPECIFICATION

S. N O.	MATERIALS	SPCIFICATION
01	AC MOTOR	230V,0.25HP,50HZ,SINGL E PHASE
02	V-BELT	39A
03	MOTOR PULLEY	40mm
04	LARGE PULLEYS	300mm
05	BEARINGS	6203Z
06	BOLT AND NUT	(1/3)-22 (1/4”-13)
07	FRAME	STEEL-600mm height,400mm length
08	SLOTTED LEVER	400 mm
09	CRUSHING PLATE	230 mm (RADIUS)
10	FLAT PLATE	300 mm
11	CONNECTING ROD	200 mm

III. FABRICATION PROCESS

MACHINING PROCESS
ELECTRIC ARCWELDING

Arc welding is a process that is used to join metal to metal by using electricity to create enough heat to melt metal, and the melted metals when cool result in a binding of the metals. It is a type of welding that uses a welding power supply to create an electric arc between an electrode and the base material to melt the metals at the welding point. They can use either direct (DC) or alternating (AC) current, and consumable or non-consumable electrodes. The welding region is usually protected by some type of shielding gas, vapor, or slag. Arc welding processes may be manual, semi-automatic, or fully automated. First developed in the late part of the 19th century, arc welding became commercially important in shipbuilding during the Second World War. Today it remains an important process for the fabrication of steel structures and vehicles.

Figure.1. Electric arc welding

The direction of current used in arc welding also plays an important role in welding. Consumable electrode processes such as shielded metal arc welding and gas metal arc welding generally use direct current, but the electrode can be charged either positively or negatively. In welding, the positively charged anode will have a greater heat concentration (around 60%) and, as a result, changing the polarity of the electrode affects weld properties. If the electrode is positively charged, it will melt more quickly, increasing weld penetration and welding speed. Alternatively, a negatively charged electrode results in more shallow welds. Non-consumable electrode processes, such as gas tungsten arc welding can use either type of direct current (DC), as well as alternating current (AC). With direct current however, because the electrode only creates the arc and does not provide filler material, a positively charged electrode causes shallow welds, while a negatively charged electrode makes deeper welds. Alternating current rapidly moves between these two, resulting in medium-penetration welds. One disadvantage of AC, the fact that the arc must be re-ignited after every zero crossing, has been addressed with the invention of special power units that produce a square wave pattern instead of the normal sine wave, eliminating low-voltage time after the zero crossings and minimizing the effects of the problem. Duty cycle is a welding equipment specification which defines the number of minutes, within a 10-minute period, during which a given arc welder can safely be used. For example, an 80 A welder with a 60% duty cycle must be & quot; rested & quot; for at least 4 minutes after 6 minutes of continuous welding. Failure to observe duty cycle limitations could damage the welder. Commercial- or professional-grade welders typically have a 100% duty cycle

IV. DRILLING PROCESS

Drilling is a cutting process that uses a drill bit to cut a hole of circular cross-section in solid materials. The drill bit is usually a rotary cutting tool, often multipoint. The bit is pressed against the workpiece and rotated at rates from hundreds to thousands of revolutions per minute. This forces the cutting edge against the workpiece, cutting off chips (swarf) from the hole as it is drilled. In rock drilling, the hole is usually not made through a circular cutting motion, though the bit is usually rotated. Instead, the hole is usually made by hammering a drill bit into the hole with quickly repeated short movements. The hammering action can be performed from outside of the hole (top-hammer drill) or within the

Hole (down-the-hole drill, DTH). Drills used for horizontal drilling are called drifter drills. In rare cases, specially-shaped bits are used to cut holes of non-circular cross- section; a square cross-section is possible. Drilled holes are characterized by their sharp edge on the entrance side and the presence of burrs on the exit side (unless they have been removed). Also, the inside of the hole usually has helical feed marks. Drilling may affect the mechanical properties of the workpiece by creating low residual stresses around the hole opening and a very thin layer of highly stressed and disturbed material on the newly formed surface. This causes the workpiece to become more susceptible to corrosion and crack propagation at the stressed surface. A finish operation may be done to avoid these detrimental conditions. For fluted drill bits, any chips are removed via the flutes. Chips may form long spirals (undesirable) or small flakes, depending on the material, and process parameters. The type of chips formed can be an indicator of the machinability of the material, with long chips suggesting poor material machinability. When possible drilled holes should be located perpendicular to the workpiece surface. This minimizes the drill bit's tendency to " walk", that is, to be deflected from the intended center-line of the bore, causing the hole to be misplaced. The higher the length-to-diameter ratio of the drill bit, the greater the tendency to walk. The tendency to walk is also preempted in various ways. Surface finish produced by drilling may range from 32 to 500 microinches.

V. GRINDING ANDCUTTING:

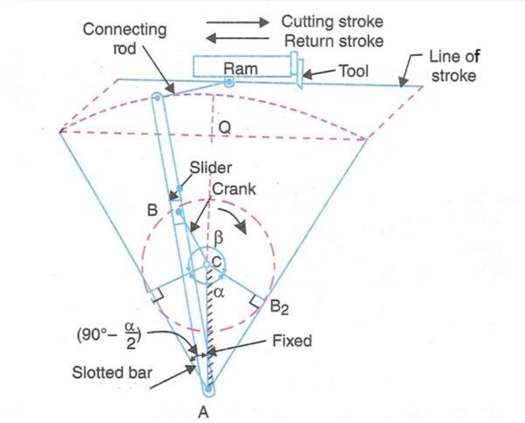
Cutting is the process to used in removed unwanted on and required dimension cutting. Grinding is an abrasive machining process that uses a grinding wheel or grinder as the cutting tool. Grinding is a subset of cutting, as grinding is a true metal-cutting process. Grinding is very common in mineral processing plants and the cement industry. Grinding is used to finish workpieces that must show high surface quality and high accuracy of shape and dimension. It has some roughing applications in which grinding removes high volumes of metal very rapidly.

Figure.3. Grinding and cutting

Grinding machines remove material from the work piece by abrasion, which can generate substantial amounts of heat. To cool the work piece so that it does not overheat and go outside its tolerance, grinding machines incorporate a coolant

VI. CRANK AND SLLOTED LEVER

A quick return mechanism is a mechanism that converts rotary motion into reciprocating motion at different rate for its two strokes i.e working stroke and return stroke. When the time required for the working stroke is greater than that of the return stroke, it is a quick return mechanism. It yields a significant improvement in machining productivity. Currently, it is widely used in machine tools, for instance, shaping machines, power-driven saws, and other applications requiring a working stroke with intensive loading, and a return stroke with non-intensive loading. Several quick return mechanisms can be found including the offset crank slider mechanism, the crank-shaper mechanisms, the double crank mechanisms, crank rocker mechanism and Whitworth mechanism. In mechanical design, the designer often has need of a linkage that provides a certain type of motion for the application in designing. Since linkages are the basic building blocks of almost all mechanisms, it is very important to understand how to design linkages for specific design characteristics. Therefore, the purpose of this project is to synthesize quick-return mechanism that converts rotational to translational motion.



Crank and slotted lever quick return motion mechanism

Figure.11.

VII. DESIGNCALCULATION

DESINGN A PULLEYS:

D - Diameter of large pulley
d - Diameter of small pulley
$N1, N2$ – Driver and Driven pulleys
D/d = N1/N2
D/40 = 1440/200

$\boxed{\textbf{D = 300 mm}}$

7.2 DESIGN A V-BELTS:

$1 = 1440\ rpm$; $N2 = 200\ rpm$
C = 600 mm
P =0.5KW = 500 Watts
10 hours per day

i. **Selection of the belt section:**
500 Watts select aA – sections selected (PSGDB Page no.7.58).

ii. **Select pulleys diameter:**
D = 300mm
d = 40mm

iii. **Selection of center distance:**
C = 600mm

iv. **Determination of nominal pitch length:**
L = 2C+ π/2 (D + d) + $(D-d)^2$/4C
= 2×600+π/2 (300 + 40) + $(300-40)^2$/4×600
= 1734.070 + 28.16
= 1762.23mm.
Next standard pitch length selected 1694mm.
v. Selection of various modification factors:
a. Length of the correction factor for A section refer table (PSGDB page no.7.60)
Length of the correction factor Fc = 100
b. Correction factor for arc of contact (Fd):
Arc of contact = 180° – (D - d)/C ×60
= 180° – (300 – 40)/600 ×60
= 141°
c. **Service factor (Fa):**
For light duty for upto 10 hrs continuous service (PSGDB Page no.7.69)
Fa = 1.0

vi. **Calculation of maximum power capacity (KW):**
Kw = $(3.225^{-0.09} - \frac{506.7}{de} - 4.78 \times 10^{-4} s^2)$ s
S =belt speed = $\frac{\pi dN1}{60} = \frac{\pi \times 0.40 \times 1440}{60}$
= 30 m/s
de = dp × Fb
de = 40 × 1.17 = 46.8
Power Kw
= $(3.225^{-0.09} - \frac{506.7}{46.8} - 4.78 \times 10^{-4} 30^2)$ 30
= 2.37 – 2.36032154689
= 0.0086 × 30
= 0.260 KW
= 260 watts

vii. **Calculate number of belts (nb):**
nb = $\frac{P \times Fa}{Kw \times Fc \times Fd}$

= $\frac{500 \times 1}{260 \times 1 \times 0.90}$

= 2.136

$\boxed{\text{nb = 2 belts}}$

VIII. CONCLUSION

Coconut crushing machine has design and fabricate the different mechanisms and these project work is satisfied in buying the meterials and different places and meet different marketing peoples and workshop worked experience is very useful out of the class in worked. The knowledge is gained more and subject theory is implementing for opportunities. cost is low but benifite is more. The difucult to cutting the coconut and reduces various manuval works and already currently used machines but this project is two in one prpose. future scope is more the research persons is used that. Mechanisms rotating are converted into oscillating then oscillating is converted in to reciprocating. The approach adopted in this work can further be developed by increasing the motor speed to achieve more output to meet commercial applications.

IX. REFERENCE

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