DESIGN AND FABRICATION OF SUGAR CANE SKIN REMOVAL MACHINE

A PROJECT REPORT

Submitted by

GOKUL T (927622BME021)

GOWSIK M (927622BME022)

GOWTHAM B (927622BME023)

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

In

MECHANICAL ENGINEERING

M.KUMARASAMY COLLEGE OF ENGINEERING, KARUR

ANNA UNIVERSITY: CHENNAI 600 025

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BONAFIDE CERTIFICATE

Certified that this project report **"DESIGN AND FABRICATION OF SUGAR CANE SKIN REMOVAL MACHINE"** is the bonafide work of **"GOKUL T (927622BME021), GOWSIK M (927622BME022), GOWTHAM B (927622BME023)"** who carried out the project work during the academic year 2021 – 2022 under my supervision. Certified further, that to the best of my knowledge the work reported here in does not form part of any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

SIGNATURE	**SIGNATURE**
Dr.M.MOHANPRASADM.E., MBA.,Ph.D.	Dr.N. PARTHIPAN M.Tech, phD
HEADOFTHEDEPARTMENT	**SUPERVISOR**
Department of Mechanical Engineering,	Department of Mechanical Engineering,
M.Kumarasamy College of Engineering,	M.Kumarasamy College of Engineering,
Thalavapalayam,Karur-639113.	Thalavapalayam,Karur-639113.

This project report has been submitted for the end semester project viva voce examination held on __________________

INTERNAL EXAMINER EXTERNAL EXAMINER

DECLARATION

We affirm that the Project titled **"DESIGN AND FABRICATION OF SUGAR CANE SKIN REMOVAL MACHINE"** being submitted in partial fulfillment of for the award of Bachelor of Engineering in Mechanical Engineering, is the original work carried out by us .It has not formed the part of any other project or dissertation on the basis of which a degree or award was conferred on an earlier occasion on any other candidate.

Student name	Signature
1. GOKUL T	________________________
2. GOWSIK M	________________________
3. GOWTHAM B	________________________

Name and signature of the supervisor with date

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Words are boundless to thank Our Parents and Friends for their constant encouragement to complete this project successfully.

INSTITUTION VISION&MISSION

Vision

- To emerge as a leader among the top institutions in the field of technical education.

Mission

- Produces mart technocrats with empirical knowledge who can surmount the global challenges.
- Create adiverse,fully-engaged,learner-centric campus environment to provide quality education to the students.
- Maintain mutually beneficial partnerships with our alumni, industry and professional associations.

DEPARTMENT,VISION,MISSION,PEO,PO&PSO

Vision

- To create globally recognized competent Mechanical engineers to work in multicultural Enviroinment.

Mission

- To impart quality education in the field of mechanical engineering and to enhance theirs kills ,to pursue careers or enter into higher education in their area of interest.
- To establish a learner-centric atmosphere along with state-of-the-art research facility.
.
- To make collaboration with industries ,distinguished research institution and to become a centre of excellence.

PROGRAM EDUCATIONAL OBJECTIVES(PEOS)

The graduates of Mechanical Engineering will be able to

- PEO1:Graduates of the program will accommodate in sigh ful in formation of engineering principles necessary for the applications of engineering.
- PEO2: Graduates of the program will acquire knowledge of recent trends in technology and solve problem in industry.
- PEO3:Graduates of the program will have practical experience and interpersonal skills to work both in local and international environments.
- PEO4:Graduates of the program will possess creative professionalism, understand their ethical responsibility and committed towards society

PROGRAM OUTCOME

The following are the Program Outcomes of Engineering Graduates: Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics ,science ,engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural ,societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data ,and synthesis of the information to provide valid the conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources,and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning in formed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of ,and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams ,and in multi disciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team ,to manage projects and in multi disciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES(PSOs)

The following are the Program Specific Outcomes of Engineering

Graduates : The students will demonstrate the abilities

1. **Real world application:** To comprehend ,analyze, design and develop innovative products and provide solutions for the real-life problems.
2. **Multi-disciplinary areas:** To work collaboratively on multi-disciplinary area sand make quality projects.

Research oriented innovative ideas and methods : To adopt modern tools, mathematical, scientific and engineering fundamentals required to solve industrial and societal problems.

Course Outcomes	At the end of this course ,learners will be able to:	**Knowledge Level**
CO-1	Identify the issues and challenges related to industry ,society and environment.	Apply
CO-2	Describe the identified problem and formulate the possible solutions	Apply
CO-3	Design/ Fabricate new experimental setup/ devices to provide solutions for the identified problems	Analyse
CO-4	Prepare a detailed report describing the project outcome	Apply
CO-5	Communicate outcome of the project and defend by making an effective oral presentation.	Apply

MAPPING OF PO& PSO WITH THE PROJECT OUTCOME

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO - 1	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3
CO - 2	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3
CO - 3	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3
CO - 4	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3
CO - 5	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3

ABSTRACT

This study explores a novel approach to sugar cane skin removal through the integration of a lead screw mechanism and a precision knife. The lead screw serves as a controlled translational motion system, facilitating the gradual and efficient peeling of sugar cane skin. The knife, strategically positioned, engages with the lead screw-driven motion to delicately remove the outer layer while minimizing damage to the underlying flesh. This automated process aims to enhance efficiency and reduce manual labor in sugar cane processing. The design ensures precision, repeatability, and adaptability to varying cane sizes. The proposed system holds promise for the sugar industry by offering a mechanized solution for skin removal, contributing to increased productivity and cost-effectiveness in the sugar cane processing chain.

CHAPTER 1

INTRODUCTION

The sugar cane skin removal process employing a leadscrew and knife operates based on a straight forward principle. A leadscrew, a threaded rod, translates rotational motion into linear motion. In this setup, as the leadscrew rotates, it moves a knife horizontally across the sugar cane's surface. The knife's movement, driven by the leadscrew, facilitates the systematic removal of the cane's outer skin. This mechanical approach ensures precision and efficiency in the skinning process. The leadscrew's rotational power, possibly derived from a motor or manual input, imparts a controlled and consistent motion to the knife, allowing for the effective peeling of sugar cane. This method enhances automation and streamlines the sugar processing industry by optimizing the removal of undesirable outer layers.

CHAPTER 2

LITERATURE REVIEW

Ge Xinfeng ET Al (2015) In order to solve the problem that appeared in hand peeling sugarcane, the sugarcane peeling machine is designed, the sugarcane peeling machine includes motor, groove wheel, cutting room, slider crank mechanism, reducer (including belt drive, chain drive) and so on. The designed sugarcane peeling machine is simulated, the results show that the sugarcane peeling machine can peel sugarcane successfully with convenient, fast and uniform.

Zhang Dehui ET Al (2015) Sugarcane is a common raw material for sugar, but in the process of machining, there will be suspended solids in the cane juice, in order to process better, the sugarcane should be peeled. Traditional way of peeling is by man, production efficiency is low.

M.M. AhmatAsimHe ET Al ()developed Sugarcane Bark/Skin Peeling Machine, Due to increasing demand of sugarcane product and development of sugarcane industry a problem was found out that conservative peeling method of sugarcane would take times to cope with the increasing demand. The problem was based on our customer Sugarcane World and Natural Organic Sugarcane.

Bundit Jarimopas ET Al (Oct 8, 2008) He constructed a prototype automatic young coconut fruit trimming machine. The fruit consists of a husk enclosing shell, flesh and juice.

Mr. Tagare V.S, M. P (2013) This project work is on the design and manufacturing of a sugarcane peeling machine. It is aimed at providing a base for the commercial production of a sugarcane peeling machine, using locally available raw materials at a relatively low cost.

Chen, C.F. and Z.F. Tang,(2012) : In order to solve the problem that appeared in hand peeling sugarcane, the sugarcane peeling machine is designed, the sugarcane peeling machine includes motor, groove wheel, cutting room, slider crank mechanism, reducer (including belt drive, chain drive) and so on.

CHAPTER 3

WORKING PRINCIPLE

The sugar cane skin removal process employing a leads crew and knife operates based on a straightforward principle. A leadscrew, a threaded rod, translates rotational motion into linear motion. In this setup, as the leadscrew rotates, it moves a knife horizontally across the sugar cane's surface. The knife's movement, driven by the leadscrew, facilitates the systematic removal of the cane's outer skin. This mechanical approach ensures precision and efficiency in the skinning process. The leadscrew's rotational power, possibly derived from a motor or manual input, imparts a controlled and consistent motion to the knife, allowing for the effective peeling of sugar cane. This method enhances automation and streamlines the sugar processing industry by optimizing the removal of undesirable outer layers.

CHAPTER 4

MAJOR COMPONENTS

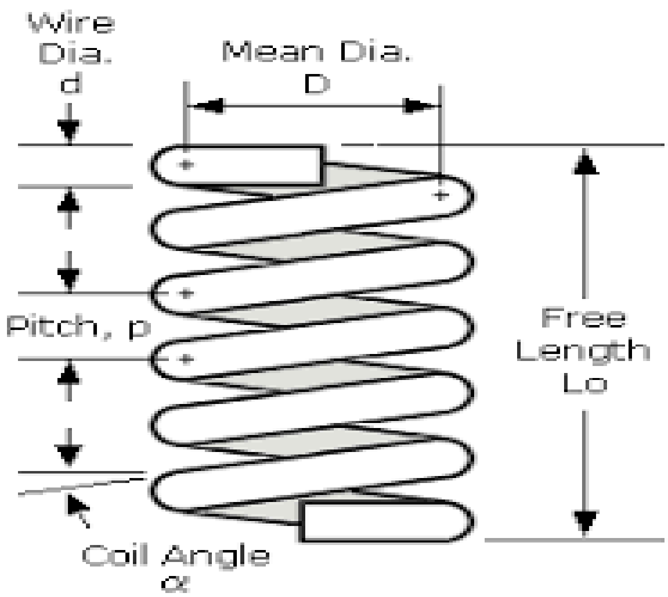
1. FRAME
2. LEAD SCREW
3. KNIEF
4. SPRING

SPRING

Mechanical springs have varied use in different types of machines. We shall briefly discuss here about some applications, followed by design aspects of springs

SPECIFICATION

Material	: Mild steel
Diameter	: 5 to 8 cm
Coil diameter	: 0.75 to 0.95 cm
Pitch	: 2cm , Height : 15 to 18 cm



DEFINITION OF SPRING:

Spring act as a flexible joint in between two parts or bodies

OBJECTIVES OF SPRING

Following are the objectives of a spring when used as a machine member:

1. **Cushioning, absorbing, or controlling of energy due to shock and vibration**.
   - Car springs or railway buffers
   - To control energy, springs-supports and vibration dampers.

2. **Control of motion**
   - Maintaining contact between two elements (cam and its follower) In a cam and a follower arrangement, widely used in numerous applications,

a spring maintains contact between the two elements. It primarily controls the motion.

- Creation of the necessary pressure in a friction device (a brake or a clutch) A person driving a car uses a brake or a clutch for controlling the car motion. A spring system keep the brake in disengaged position until applied to stop the car. The clutch has also got a spring system (single springs or multiple springs) which engages and disengages the engine with the transmission system.
- Restoration of a machine part to its normal position when the applied force is withdrawn (a governor or valve) A typical example is a governor for turbine speed control. A governor system uses a spring controlled valve to regulate flow of fluid through the turbine, there by controlling the turbine speed.

3. **Measuring forces**

   Spring balances, gages

4. **Storing of energy**

   - In clocks or starters The clock has spiral type of spring which is wound to coil and then the stored energy helps gradual recoil of the spring when in operation. Nowadays we do not find much use of the winding clocks.

COMMONLY USED SPRING MATERIALS

One of the important considerations in spring design is the choice of the spring material. Some of the common spring materials are given below.

HARD-DRAWN WIRE

This is cold drawn, cheapest spring steel. Normally used for low stress and static load. The material is not suitable at subzero temperatures or at temperatures above 1200C.

OIL-TEMPERED WIRE

It is a cold drawn, quenched, tempered, and general purpose spring steel. However, it is not suitable for fatigue or sudden loads, at subzero temperatures and at temperatures above 1800C.

When we go for highly stressed conditions then alloy steels are useful.

CHROME VANADIUM

This alloy spring steel is used for high stress conditions and at high temperature up to 2200C. It is good for fatigue resistance and long endurance for shock and impact loads.

CHROME SILICON

This material can be used for highly stressed springs. It offers excellent service for long life, shock loading and for temperature up to 2500C.

MUSIC WIRE

This spring material is most widely used for small springs. It is the toughest and has highest tensile strength and can withstand repeated loading at high stresses. However, it cannot be used at subzero temperatures or at temperatures above 1200C.

Normally when we talk about springs we will find that the music wire is a common choice for springs.

STAINLESS STEEL

Widely used alloy spring materials.

PHOSPHOR BRONZE / SPRING BRASS

It has good corrosion resistance and electrical conductivity. That's the reason it is commonly used for contacts in electrical switches. Spring brass can be used at subzero temperatures.

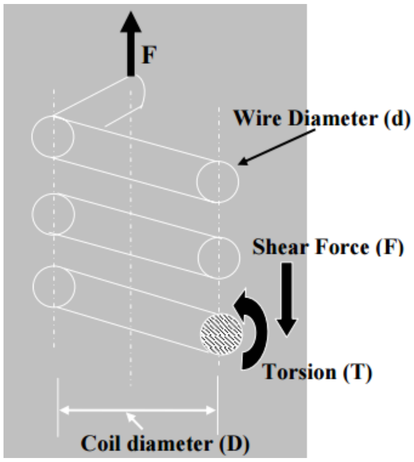
Spring manufacturing processes

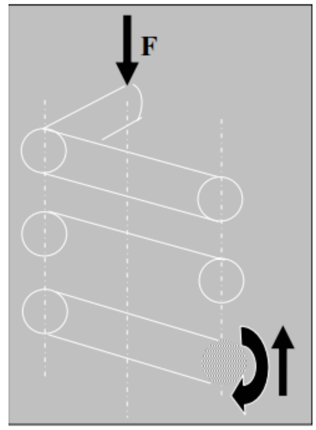
If springs are of very small diameter and the wire diameter is also small then the springs are normally manufactured by a cold drawn process through a mangle. However, for very large springs having also large coil diameter and wire diameter one has to go for manufacture by hot processes. First one has to heat the wire and then use a proper mangle to wind the coils.

Two types of springs which are mainly used are, helical springs and leaf springs. We shall consider in this course the design aspects of two types of springs.

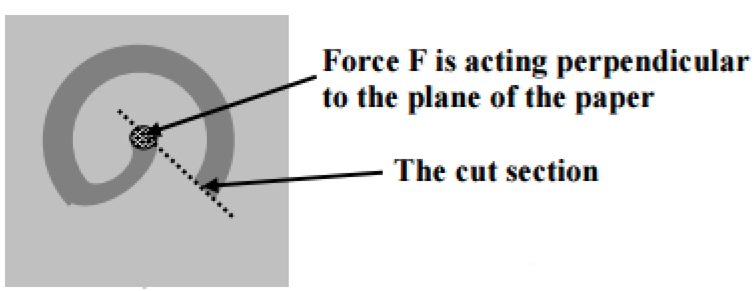
HELICAL SPRING

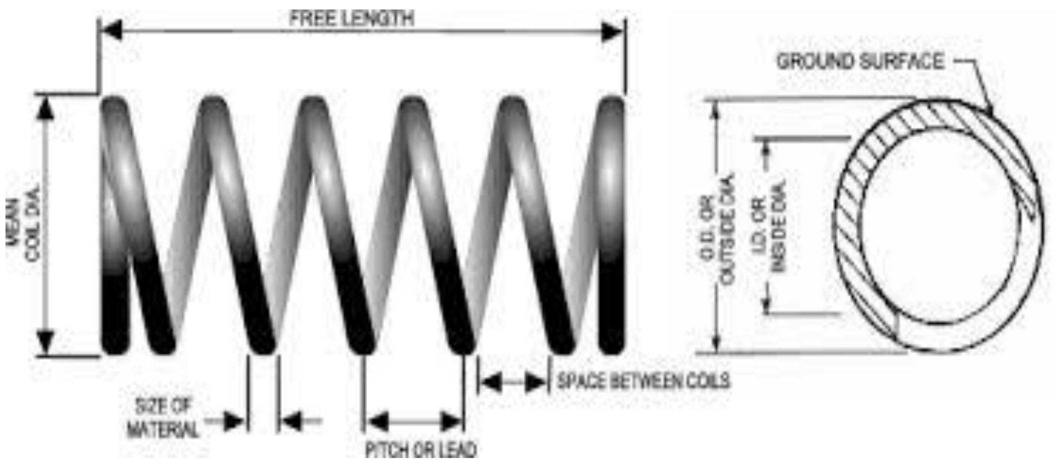
The figures below show the schematic representation of a helical spring acted upon by a tensile load F and compressive load F. The circles denote the cross section of the spring wire. The cut section, i.e. from the entire coil somewhere we make a cut, is indicated as a circle with shade.





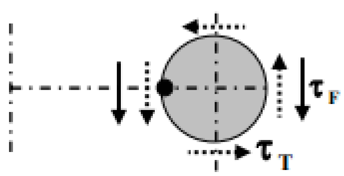
If we look at the free body diagram of the shaded region only (the cut section) then we shall see that at the cut section, vertical equilibrium of forces will give us force, F as indicated in the figure. This F is the shear force. The torque T, at the cut section and it's direction is also marked in the figure. There is no horizontal force coming into the picture because externally there is no horizontal force present. So from the fundamental understanding of the free body diagram one can see that any section of the spring is experiencing a torque and a force. Shear force will always be associated with a bending moment. However, in an ideal situation, when force is acting at the centre of the circular spring and the coils of spring are almost parallel to each other, no bending moment would result at any section of the spring (no moment arm), except torsion and shear force. The Fig.7.1.3 will explain the fact stated below.





STRESSES IN THE HELICAL SPRING WIRE

From the free body diagram, we have found out the direction of the internal torsion T and internal shear force F at the section due to the external load F acting at the centre of the coil. The cut sections of the spring, subjected to tensile and compressive loads respectively, are shown separately in the Fig.7.1.4 and 7.1.5. The broken arrows show the shear stresses (τT) arising due to the torsion T and solid arrows show the shear stresses (τF)due to the force F. It is observed that for both tensile load as well as compressive load on the spring, maximum shear stress (τT + τF) always occurs at the inner side of the spring. Hence, failure of the spring, in the form of crake, is always initiated from the inner radius of the spring.



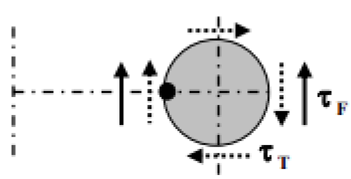


Fig 7.1.4 Fig 7.1.5

The radius of the spring is given by D/2. Note that D is the mean diameter of the spring. The torque T acting on the spring is

$$T = F \times \frac{D}{2}$$

If d is the diameter of the coil wire and polar $I_p = \frac{\pi d^4}{32}$, moment of inertia,

The shear stress in the spring wire due to torsion is

$$\tau_T = \frac{Tr}{I_p} = \frac{F \times \frac{D}{2} \times \frac{d}{2}}{\frac{\pi d^4}{32}} = \frac{8FD}{\pi d^3}$$

Average shear stress in the spring wire due to force F is

$$\tau_F = \frac{F}{\frac{\pi d^2}{4}} = \frac{4F}{\pi d^2}$$

Therefore, maximum shear stress the spring wire is

$$\tau_T + \tau_F = \frac{8FD}{\pi d^3} + \frac{4F}{\pi d^2}$$

or $$\tau_{max} = \frac{8FD}{\pi d^3}\left(1 + \frac{1}{\frac{2D}{d}}\right)$$

or $$\tau_{max} = \frac{8FD}{\pi d^3}\left(1 + \frac{1}{2C}\right)$$

Where, C=D/d, is called the spring index.

$$\tau_{max} = (K_s)\frac{8FD}{\pi d^3} \qquad K_s = 1 + \frac{1}{2C}$$ Finally,where,

The above equation gives maximum shear stress occurring in a spring. Ks is the shear stress correction factor.

DEFLECTION OF HELICAL SPRING

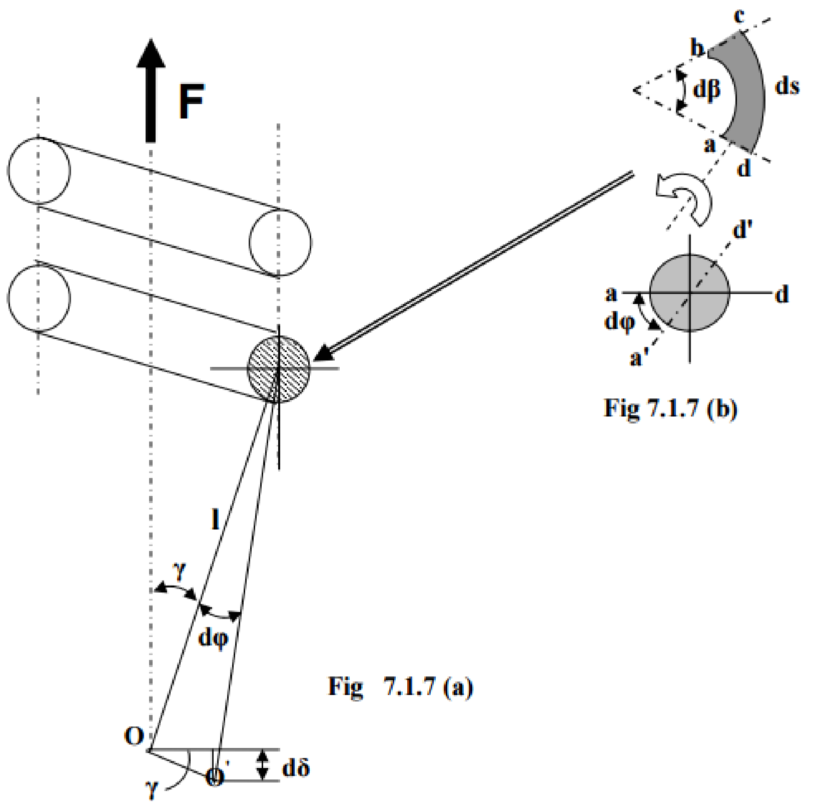


Fig 7.1.7 (b)

Fig 7.1.7 (a)

The Fig shows a schematic view of a spring, a cross section of the spring wire and a small spring segment of length dl. It is acted upon by a force F. From simple geometry we will see that the deflection, δ, in a helical spring is given by the formula,

$$\delta = \frac{8FD^3N}{Gd^4}$$

Where, N is the number of active turns and G is the shear modulus of elasticity. Now what is an active coil? The force F cannot just hang in space, it has to have some material contact with the spring. Normally the same spring wire e will be given a shape of a hook to support the force F. The hook etc., although is a part of the spring, they do not contribute to the deflection of the spring. Apart from these coils, other coils which take part in imparting deflection to the spring are known as active coils.

HOW TO COMPUTE THE DEFLECTION OF A HELICAL SPRING

Consider a small segment of spring of length ds, subtending an angle of dβ at the center of the spring coil as shown in Fig.7.1.7 (b). Let this small spring segment be considered to be an active portion and remaining portion is rigid. Hence, we consider only the deflection of spring arising due to application of force F. The rotation, dφ, of the section a-d with respect to b-c is given as,

$$d\varphi = \frac{Tds}{GI_p} = \frac{F \times \frac{D}{2} \times \frac{D}{2} \times d\beta}{G \times \frac{\pi d^4}{32}} = \frac{8FD^2(d\beta)}{G\pi d^4}$$

The rotation, dφ will cause the end of the spring O to rotate to O', shown in Fig.7.1.7 $O - O' = l d\varphi$ (a). From geometry, O-O' is given as,

However, the vertical component of O-O' only will contributes towards spring deflection. Due to symmetric condition, there is no lateral deflection of spring, ie, the horizontal component of O-O' gets cancelled. The vertical component of O-O', dδ, is given as,

$$d\delta = l d\varphi \sin\gamma = l d\varphi \times \frac{D}{2l}$$

$$= \frac{8FD^2(d\beta)}{G\pi d^4} \times \frac{D}{2}$$

$$= \frac{4FD^3}{G\pi d^4} d\beta$$

Total deflection of spring, δ, can be obtained by integrating the above expression for entire length of the spring wire.

$$\delta = \int_0^{2\pi N} \frac{4FD^3(d\beta)}{G\pi d^4}$$

Simplifying the above expression we get,

$$\delta = \frac{8FD^3N}{Gd^4}$$

The above equation is used to compute the deflection of a helical spring. Another important design parameter often used is the spring rate.

$$K = \frac{F}{\delta} = \frac{Gd^4}{8D^3N}$$

SCREW ROD

A screw rod, also known as a stud, is a relatively long rod that is threaded on both ends; the thread may extend along the complete length of the rod. They are designed to be used in tension. Threaded rod in bar stock form is often called all-thread.

The screw is really a twisted inclined plane. ... A screw can also act to hold things together in some cases. Some examples of the uses of a screw are in a jar lid, a drill, a bolt, a light bulb, faucets, bottle caps and ball point pens.

A stove bolt is a type of machine screw that has a round or flat head and is threaded to the head. They are usually made of low grade steel, have a slot or Phillips drive, and are used to join sheet metal parts using a hex or square nut.

Screw Rod

Internal and external threads illustrated using a common nut and bolt. The screw and nut pair can be used to convert torque into linear force. As the screw (or bolt) is rotated, the screw moves along its axis through the fixed nut, or the non-rotating nut moves along the lead-screw.

Screw thread, used to convert torque into the linear force in the flood_gate. The operator rotates the two vertical bevel gears that have threaded holes, thereby raising or lowering the two long vertical threaded shafts which are not free to rotate.

A screw thread, often shortened to thread, is a helical structure used to convert between rotational and linear movement or force. A screw thread is a ridge wrapped around a cylinder or cone in the form of a helix, with the former being called a *straight* thread and the latter called a tapered thread. A screw thread is the essential feature of the screw as a simple machine and also as a fastener.

The mechanical advantage of a screw thread depends on its *lead*, which is the linear distance the screw travels in one revolution. In most applications, the lead of a screw thread is chosen so that friction is sufficient to prevent linear motion being converted to rotary, that is so the screw does not slip even when linear force is applied, as long as no external rotational force is present. This characteristic is essential to the vast majority of its uses. The tightening of a fastener's screw thread is comparable to driving a wedge into a gap until it sticks fast through friction and slight elastic deformation.

Specifications

- Typical Material: Low Carbon Steel
- Material & Mechanical Properties: Purchased to meet ASTM A307 Grade A.
- Zinc Plating: Purchased to meet F1941 FeZn3A.
- Hot-Dip Galvanized: Purchased to meet ASTM A153.
- Tensile Strength: 60,000 PSI minimum.
- Material : Stainless Steel
- Diameter: 12mm
- Length:1meter

Fastening

- Fastening such as wood screws, machine screws, nuts, and bolts.
- Connecting threaded pipes and hoses to each other and to caps and fixtures.
- Gear reduction via worm drives

- Moving objects linearly by converting rotary motion to linear motion, as in the lead screw of a jack.
- Measuring by correlating linear motion to rotary motion and simultaneously amplifying it, as in a micrometer.
- Both moving objects linearly and simultaneously measuring the movement, combining the two aforementioned functions, as in a lead screw of a lathe
- It converts rotary motion into linear motion.
- It prevents linear motion without the corresponding rotation.

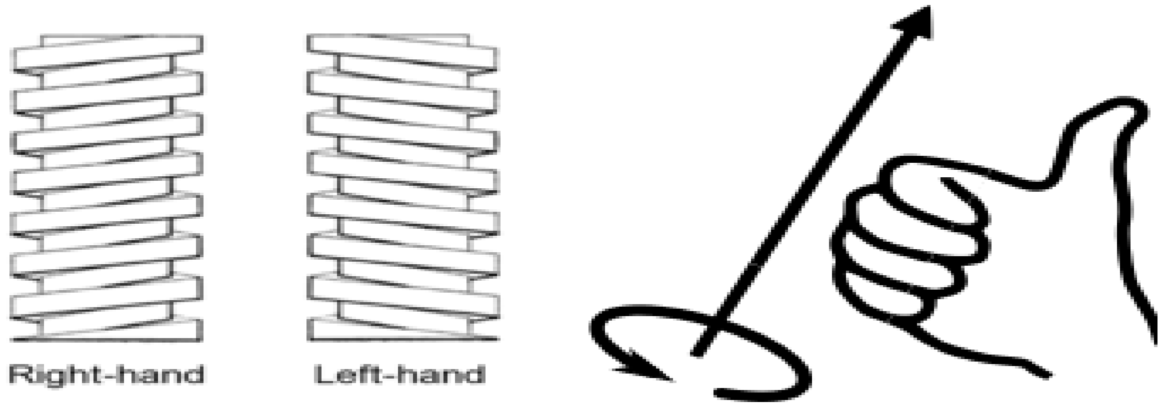
Handedness

The helix of a thread can twist in two possible directions, which is known as *handedness*. Most threads are oriented so that the threaded item, when seen from a point of view on the axis through the center of the helix, moves away from the viewer when it is turned in a clockwise direction, and moves towards the viewer when it is turned counterclockwise. This is known as a *right-handed* (*RH*) thread, because it follows the right hand grip rule. Threads oriented in the opposite direction are known as *left-handed* (*LH*).

By common convention, right-handedness is the default handedness for screw threads. Therefore, most threaded parts and fasteners have right-handed threads. Left-handed thread applications include:

- Where the rotation of a shaft would cause a conventional right-handed nut to loosen rather than to tighten due applied torque or to fretting induced precession. Examples include:
    - The left hand pedal on a bicycle.
    - The left-hand grinding wheel on a bench grinder.
    - The lug nuts on the left side of some automobiles.

    - The securing nut on some circular saw blades - the large torque at startup should tend to tighten the nut.
    - The spindle on brush cutter and line trimmer heads, so that the torque tends to tighten rather than loosen the connection
- In combination with right-hand threads in turnbuckles and clamping studs.[3]
- In some gas supply connections to prevent dangerous misconnections, for example:
    - In gas welding the flammable gas supply uses left-handed threads, while the oxygen supply if there is one has a conventional thread
    - The POL valve for LPG cylinders
- In a situation where neither threaded pipe end can be rotated to tighten or loosen the joint (e.g. in traditional heating pipes running through multiple rooms in a building). In such a case, the coupling will have one right-handed and one left-handed thread.
- In some instances, for example early ballpoint pens, to provide a "secret" method of disassembly.
- In mechanisms to give a more intuitive action as:
    - The lead screw of the cross slide of a lathe to cause the cross slide to move away from the operator when the lead screw is turned clockwise.
    - The depth of cut screw of a "Stanley" type metal plane (tool) for the blade to move in the direction of a regulating right hand finger.
- Some Edison base lamps and fittings (such as those formerly used on the New York City Subway) have a left-hand thread to deter theft, since they cannot be used in other light fixtures.



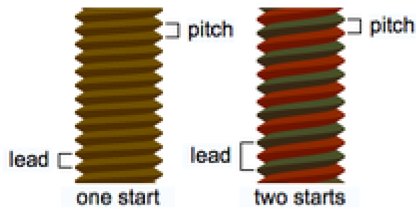
Angle

The included angle characteristic of the cross-sectional shape is often called the *thread angle*. For most V-threads, this is standardized as 60 degrees, but any angle can be used. The cross section to measure this angle lies on a plane which includes the axis of the cylinder or cone on which the thread is produced.

Lead, pitch, and starts

Lead can be confused because they are the same for most screws. Lead is the distance along the screw's axis that is covered by one complete rotation of the screw (360°). Pitch is the distance from the crest of one thread to the next. Because the vast majority of screw thread forms are single-start thread forms, their lead and pitch are the same. Single-start means that there is only one "ridge" wrapped around the cylinder of the screw's body. Each time that the screw's body rotates one turn (360°), it has advanced axially by the width of one ridge. "Double-start" means that there are two "ridges" wrapped around the cylinder of the screw's body.[4] Each time that the screw's body rotates one turn (360°), it has advanced axially by the width of two ridges. Another way to express this is that lead and pitch are parametrically related, and the parameter that relates them, the number of starts, very often has a value of

1, in which case their relationship becomes equality. In general, lead is equal to pitch times the number of starts.

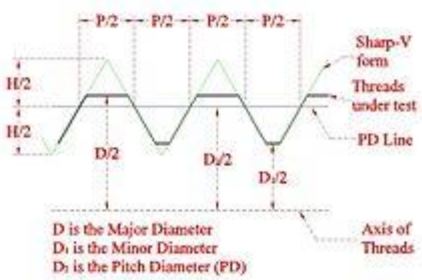


Whereas metric threads are usually defined by their pitch, that is, how much distance per thread, inch-based standards usually use the reverse logic, that is, how many threads occur per a given distance. Thus, inch-based threads are defined in terms of threads per inch (TPI). Pitch and TPI describe the same underlying physical property—merely in different terms. When the inch is used as the unit of measurement for pitch, TPI is the reciprocal of pitch and vice versa. For example, a $\frac{1}{4}$-20 thread has 20 TPI, which means that its pitch is $\frac{1}{20}$ inch (0.050 in or 1.27 mm).

As the distance from the crest of one thread to the next, pitch can be compared to the wavelength of a wave. Another wave analogy is that pitch and TPI are inverses of each other in a similar way that period and frequency are inverses of each other.

Diameter

There are three characteristic diameters of threads: major diameter, minor diameter, and pitch diameter: Industry standards specify minimum (min.) and maximum (max.) limits for each of these, for all recognized thread sizes. The minimum limits for external (or bolt, in ISO terminology), and the maximum limits for internal (nut), thread sizes are there to ensure that threads do not strip at the tensile strength limits for the parent material. The minimum limits for internal, and maximum limits for external, threads are there to ensure that the threads fit together.



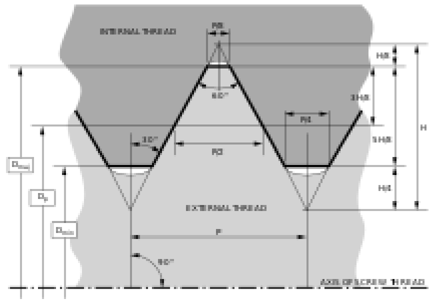
Major Diameter

The major diameter of threads is the larger of two extreme diameters delimiting the height of the thread profile, as a cross-sectional view is taken in a plane containing the axis of the threads. For a screw, this is its outside diameter (OD). The major diameter of a nut may not be directly measured, but it may be tested with go/no-go gauges.

The major diameter of external threads is normally smaller than the major diameter of the internal threads, if the threads are designed to fit together. But this requirement alone does not guarantee that a bolt and a nut of the same pitch would fit together: the same requirement must separately be made for the minor and pitch diameters of the threads. Besides providing for a clearance between the crest of the bolt threads and the root of the nut threads, one must also ensure that the clearances are not so excessive as to cause the fasteners to fail.

Minor Diameter

The minor diameter is the lower extreme diameter of the thread. Major diameter minus minor diameter, divided by two, equals the height of the thread. The minor diameter of a nut is its inside diameter. The minor diameter of a bolt can be measured with go/no-go gauges or, directly, with an optical comparator.



As shown in the figure at right, threads of equal pitch and angle that have matching minor diameters, with differing major and pitch diameters, may appear to fit snugly, but only do so radially; threads that have only major diameters matching (not shown) could also be visualized as not allowing radial movement. The reduced *material condition*, due to the unused spaces between the threads, must be minimized so as not to overly weaken the fasteners.

Pitch Diameter

The pitch diameter (PD, or D_2) of a particular thread, internal or external, is the diameter of a cylindrical surface, axially concentric to the thread, which intersects the thread flanks at equidistant points, when viewed in a cross-sectional plane containing the axis of the thread, the distance between these points being exactly one half the pitch distance. Equivalently, a line running parallel to the axis and a distance D_2away from it, the "PD line," slices the sharp-V form of the thread, having flanks coincident with the flanks of the thread under test, at exactly 50% of its height.

We have assumed that the flanks have the proper shape, angle, and pitch for the specified thread standard. It is generally unrelated to the major (D) and minor (D_1) diameters, especially if the crest and root truncations of the sharp-V form at these diameters are unknown. Everything else being ideal, D_2, D, & D_1, together, would fully describe the thread form. Knowledge of PD determines the position of the sharp-V thread form, the sides of which coincide with the straight sides of the thread flanks: e.g., the crest of the external thread would truncate these sides a radial displacement D - D_2 away from the position of the PD line.

Provided that there are moderate non-negative clearances between the root and crest of the opposing threads, and everything else is ideal, if the pitch diameters of a screw and nut are exactly matched, there should be no play at all between the two as assembled, even in the presence of positive root-crest clearances. This is the case when the flanks of the threads come into intimate contact with one another, before the roots and crests do, if at all.

However, this ideal condition would in practice only be approximated and would generally require wrench-assisted assembly, possibly causing the galling of the threads. For this reason, some allowance, or minimum difference, between the PDs of the internal and external threads has to generally be provided for, to eliminate the possibility of deviations from the ideal thread form causing interference and to expedite hand assembly up to the length of engagement. Such allowances, or fundamental deviations, as ISO standards call them, are provided for in various degrees in corresponding classes of fit for ranges of thread sizes. At one extreme, no allowance is provided by a class, but the maximum PD of the external thread is specified to be the same as the minimum PD of the internal thread, within specified tolerances, ensuring that the two can be assembled, with some looseness of fit still possible due to the margin of tolerance. A class called interference fit may even provide for negative allowances, where the PD of the screw is greater than the PD of the nut by at least the amount of the allowance.

The pitch diameter of external threads is measured by various methods:

- A dedicated type of micrometer, called a thread mic or pitch mic, which has a V-anvil and a conical spindle tip, contacts the thread flanks for a direct reading.

- A general-purpose micrometer (flat anvil and spindle) is used over a set of three wires that rest on the thread flanks, and a known constant is subtracted from the reading. (The wires are truly gauge pins, being ground to precise size, although "wires" is their common name.) This method is called the 3-wire method. Sometimes grease is used to hold the wires in place, helping the user to juggle the part, mic, and wires into position.
- An optical comparator may also be used to determine PD graphically.

Inspection

Another common inspection point is the straightness of a bolt or screw. This topic comes up often when there are assembly issues with predrilled holes as the first troubleshooting point is to determine if the fastener or the hole is at fault. ASME B18.2.9 "Straightness Gage and Gaging for Bolts and Screws" was developed to address this issue. Per the scope of the standard, it describes the gage and procedure for checking bolt and screw straightness at maximum material condition (MMC) and provides default limits when not stated in the applicable product standard.

KNIFE

The knife is a versatile tool with a rich history that spans millennia. Crafted with precision, its blade is typically composed of high-quality stainless steel, renowned for its durability and resistance to corrosion. The sharp edge is honed to a fine point, allowing for precise cutting and slicing, while the robust spine provides strength for more demanding tasks.

The handle, often fashioned from durable materials such as hardwood or synthetic composites, is ergonomically designed to ensure a comfortable grip during prolonged use. The tang, an extension of the blade into the handle, enhances the knife's balance and stability. Some knives feature decorative elements on the handle, showcasing the artistry and craftsmanship invested in their creation.

The blade design varies, ranging from the classic straight-edge to the more specialized serrated or scalloped patterns. Each design serves a unique purpose, catering to specific cutting needs. A well-designed knife facilitates efficient food preparation, culinary artistry, and various outdoor activities.

In addition to culinary knives, there are diverse types tailored for specific applications, such as hunting, survival, and tactical use. These knives often incorporate additional features like serrations, gut hooks, or specialized blade coatings, enhancing their utility in specific contexts.

The sheath, a protective covering for the blade, is another crucial component. It ensures safe storage and transportation, preventing accidental injuries and maintaining the knife's sharpness.

Beyond its practical applications, the knife holds cultural significance, symbolizing craftsmanship, survival, and even prestige in various societies. Whether wielded by chefs in professional kitchens, outdoor enthusiasts in the wilderness, or individuals in everyday tasks, the knife remains an indispensaindispensable tool, a testament to human ingenuity and adaptability.

CHAPTER 5

METAL FRAME

The metal frame is generally made of **mild steel** bars for machining, suitable for lightly stressed components including studs, bolts, gears and shafts. It can be case-hardened to improve wear resistance. They are available in bright rounds, squares and flats, and hot rolled rounds

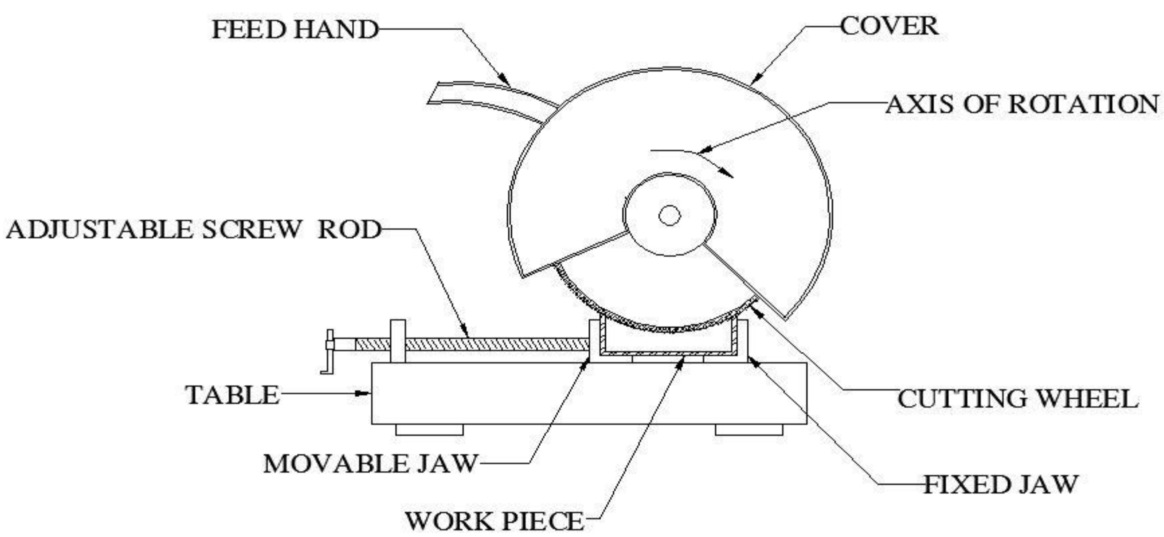
Suitable machining allowances should therefore be added when ordering. It does not contain any additions for enhancing mechanical or machining properties. Bright drawn mild steel is an improved quality material, free of scale, and has been cold worked (drawn or rolled) to size. It is produced to close dimensional tolerances. Straightness and flatness are better than black steel. It is more suitable for repetition precision machining. Bright drawn steel has more consistent hardness, and increased tensile strength. Bright steel can also be obtained in precision turned or ground form if desired.

MANUFACTURING PROCESS

Manufacturing processes are the steps through which raw materials are transformed into a final product. The manufacturing process begins with the creation of the materials from which the design is made. These materials are then modified through manufacturing processes to become the required part. Manufacturing processes can include treating (such as heat treating or coating), machining, or reshaping the material. The manufacturing process also includes tests and checks for quality assurance during or after the manufacturing, and planning the production process prior to manufacturing.

SAWING:

Cold saws are saws that make use of a circular saw blade to cut through various types of metal, including sheet metal. The name of the saw has to do with the action that takes place during the cutting process, which manages to keep both the metal and the blade from becoming too hot. A cold saw is powered with electricity and is usually a stationary type of saw machine rather than a portable type of saw.

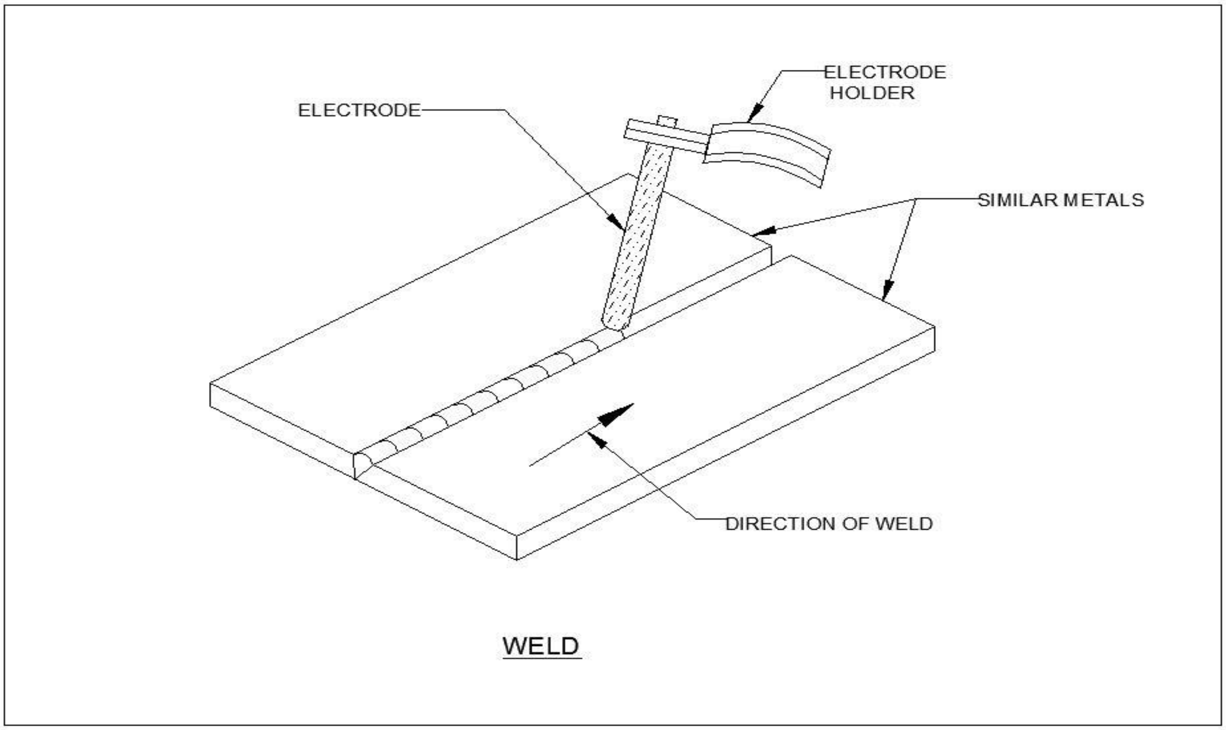


SAWING CUTTING MACHINE

The circular saw blades used with a cold saw are often constructed of high speed steel. Steel blades of this type are resistant to wear even under daily usage. The end result is that it is possible to complete a number of cutting projects before there is a need to replace the blade.High speed steel blades are especially useful when the saws are used for cutting through thicker sections of metal.

WELDING:

Welding is a process for joining similar metals. Welding joins metals by melting and fusing **1,** the base metals being joined and **2,** the filler metal applied. Welding employs pinpointed, localized heat input. Most welding involves ferrous-based metals such as steel and stainless steel.Weld joints are usually stronger than or as strong as the base metals being joined.



Welding is used for making permanent joints. It is used in the manufacture of automobile bodies, aircraft frames, railway wagons, machine frames, structural works, tanks, furniture, boilers, general repair work and ship building.

OPERATION:

Several welding processes are based on heating with an electric arc, only a few are considered here, starting with the oldest, simple arc welding, also known as shielded metal arc welding (SMAW) or stick welding.

In this process an electrical machine (which may be DC or AC, but nowadays is usually AC) supplies current to an electrode holder which carries an electrode which is normally coated with a mixture of chemicals or flux. An earth cable connects the work piece to the welding machine to provide a return path for the current. The weld is initiated by tapping ('striking') the tip of the electrode against the work piece which initiates an electric arc. The high temperature generated (about 6000^{o}C) almost instantly produces a molten pool and the end of the electrode continuously melts into this pool and forms the joint.

The operator needs to control the gap between the electrode tip and the work piece while moving the electrode along the joint.

DRILLNG:

Drilling is a cutting process that uses a drill bit to cut or enlarge a hole of circular cross-section in solid materials. The drill bit is a rotary cutting tool, often multipoint. The bit is pressed against the work piece and rotated at rates from hundreds to thousands of revolutions per minute. This forces the cutting edge against the work piece, cutting off chips (sward) from the hole as it is drille

CHAPTER 6

ADVANTAGES AND APPLICATIONS

ADVANTAGES

The precision of a leadscrew ensures consistent and controlled skin removal, optimizing the efficiency of the process. This mechanical setup enhances the overall reliability of the operation, reducing manual effort and increasing productivity. The knife's sharpness, coupled with leadscrew guidance, ensures clean and uniform skin removal, minimizing wastage. Additionally, the mechanized approach improves safety by reducing human involvement in potentially hazardous tasks. Overall, this innovative system enhances efficiency, precision, and safety in sugar cane processing.

APPLICATION

Machines for sugar cane skin removal are commonly used in sugar mills and processing plants. They help streamline the sugar extraction process by efficiently removing the outer skin or bark of sugar cane before further processing. These machines are integral to the sugar industry, enhancing productivity and ensuring a more efficient extraction of sugar from the cane.

DISADVANTAGES

There is a chance that the blade is will lose its sharpness due to friction.

CHAPTER 7

MATERIAL USED

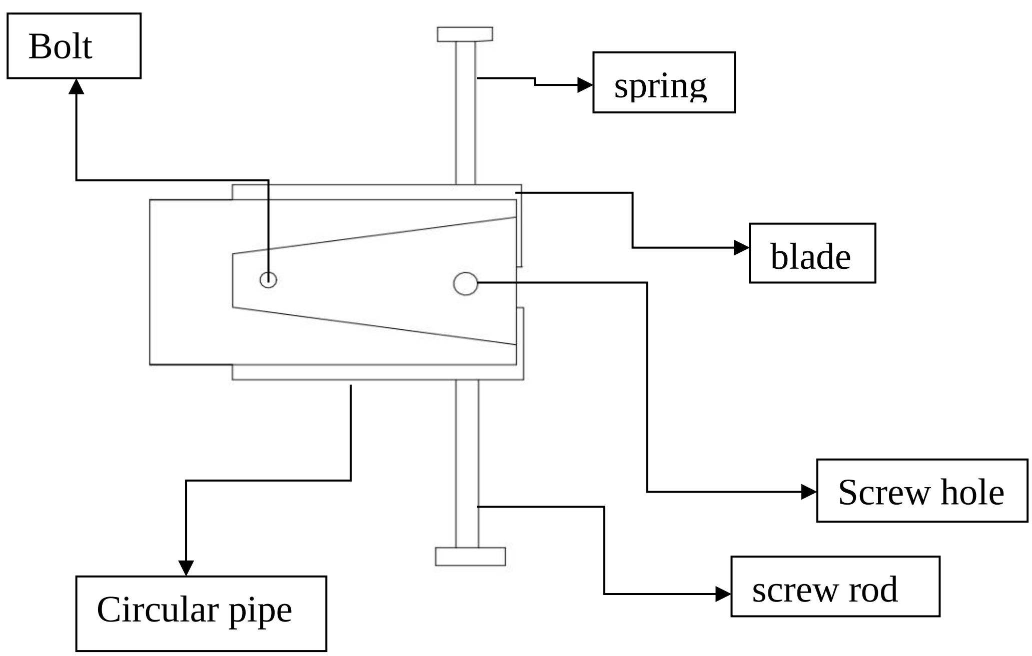
S.No	DESCIRPTION	QTY	MATERIAL
1	LEAD SCREW	4	MILD STEEL
2	SPRING	4	STAINLESS STEEL
3	KNIEF	4	STAINLESS STEEL
4	FRAME	AS PER REWUIRMENT	MILD STEEL

COST ESTIMATION

SL.NO	DISCRIPTION	COST Rs:
1	LEAD SCREW	400
2	SPRING	400
3	KNIEF	200
4	FRAME	1000
5	TOTAL	2000

CHAPTER 8

2D LAYOUTS OF MODEL



CHAPTER 9

CONCLUSION

In conclusion, the fabrication of sugar cane skin removal presents a significant advancement in streamlining the sugar extraction process. The innovative design and implementation of this technology contribute to increased efficiency and reduced manual labor, addressing challenges associated with traditional methods. By automating the skin removal process, the system enhances overall productivity, ensuring a higher yield of pure sugar. Additionally, the reduced dependency on manual labor contributes to cost savings and promotes a more sustainable and scalable approach to sugar production. As technology continues to evolve, further refinements in sugar cane processing equipment promise even greater advancements in the industry. The successful integration of this fabrication marks a step towards modernizing sugar production methods and underscores the potential for technology to revolutionize traditional agricultural practices.

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