FABRICATION OF GENEVA WHEEL BASED COMPRESS WASTE DUSTBIN

A MAJOR PROJECT REPORT

SUBMITTED TO

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY
BHILAI (C.G.)

FOR THE PARTIAL FULFILMENT OF THE AWARD OF DEGREE

BACHELOR OF ENGINEERING
IN
MECHANICAL ENGINEERING
BY

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SESSION: 2016-2020

DECLARATION BY THE CANDIDATES

We, the undersigned, solemnly declare that this report of the project work entitled **"FABRICATION OF GENEVA WHEEL BASED COMPRESS WASTE DUSTBIN"** is based on the work carried out during the course of my study under the supervision of **Mr. VISHAL RASTOGI.**

We assure that the statements made and conclusions drawn are an outcome of the project work. I further declare that to the best of my knowledge and belief that the report does not contain any part of any work which has been submitted for the award of any other post degree in this University or any other University.

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CERTIFICATE OF APPROVAL

The project work entitled **"FABRICATION OF GENEVA WHEEL BASED COMPRESS WASTE DUSTBIN"** carried out by **Himanshu Lahare, Mrityunjay Pandey, Dikesh Kumar**, under the supervision of **Mr VISHAL RASTOGI , Associate Professor, Mechanical Engineering Department, SSGI, BHILAI,** for the partial fulfilment of the requirement of the degree of **Bachelor of Engineering,** is hereby approved and being recommended and forwarded to Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.), India for examination and evaluation.

for

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Project Guide

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CERTIFICATEBY THE EXAMINERS

This is to certify that the project work entitled **"Fabrication of Geneva Wheel Based Compress Waste Dustbin",** carried out by Himanshu Lahare, Mrityunjay Pandey, Dikesh Kumar, SHRI SHANKARACHARYA TECHNICAL CAMPUS, SSGI, BHILAI(C.G.) has been examined, and hereby approved by the undersigned after proper evaluation.

It is understood that by this approval, the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion therein, but approve the report for the purpose which it is submitted.

INTERNAL EXAMINER

Name: ……………………………………..…..

Designation: ……………………………..

Institution: ……………………………….

Date : ……./……./2020

EXTERNAL EXAMINER

Name: ……………………………………..…..

Designation: ……………………………..

Institution: ……………………………….

Date : ……./……./2020

ACKNOWLEDGEMENT

We would like to express my special thanks of gratitude to our project guide as well as our HOD who gave us the golden opportunity to do this wonderful project on the topic, "**"Fabrication of Geneva Wheel Based Compress Waste Dustbin**" and also helped us in doing lots of research.

We owe thanks to many people who helped and supported us during writing out this project.

Our deepest thanks to lecture Mr. VISHAL RASTOGI sir, the guide of the project for enlightening us with his knowledge and correcting various documents of our project with attention and care. I want to thank him for his help, stimulating suggestion and encouragement.

We would also thank our institute and our faculty members without whom this project would have been a distant reality. I also extend my heartfelt thanks to our family, friends and well-wishers.

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ABSTRACT

The aim of the project is to increase the capacity of dustbin and its significant id that it can be used on those place where there is space constraint, the approach used is such that waste in the dustbin cab be compressed by using potential energy of spring along with the application of sprocket and Geneva mechanism.

In this compress waste dustbin consists of two sections. One sections is automatic container opening mechanism and the second section is conversion of rotary motion into linear reciprocating motion for pressing of dry waste. The first section consists of geneva wheel disc keyed with a shaft at one end and the other end is connected with chain sprocket wheel. This Geneva wheel shaft is supported on two Plummer block bearings. This sprocket wheel transmit the rotary motion from the Geneva wheel to press the waste material by chain drive. Hence when the Geneva wheel is rotated, it press the dry waste. Finally, we were succeeded to increase the capacity of dustbin by more than 60%.

CONTENTS

1. INTRODUCTION

The present invention relates to an automatic compressing using Geneva mechanism, particularly one suitable for performing compress of a dry waste in a programmed and programmable manner according to a predetermined number of different compress shapes.

The compressing of this invention is of the type comprising a compress head provided with a plurality of punch/die pairs for effecting the desired compress of a dry waste , and a numerically controlled programmable manipulator, equipped with gripping means for the said dry waste , for displacing it over a horizontal plane passing between the said punches and their associated dies. In known compress machines of the said type there exists a single, well determined and unchangeable operative position, into which each press /die pair is carried by appropriate automatic means and retained for the time necessary for the execution of all the compress of the same predetermined shape envisaged in a dry waste .

In operation of such a known compressing using Geneva mechanism, whilst a first press /die pair is maintained in the said operative position the manipulator causes the displacement of the dry waste in such a way that the said pair performs the predetermined number of identical compress in a corresponding number of predetermined and different positions in the said dry waste . Once this first series of compress has been completed the press /die pair first considered is replaced with another pair of different shape to effect a second series of compress on the same dry waste . This mode of operation, which is tied to the structural and functional characteristics of the known compressing and, above all, to the fundamental characteristic consisting in a single and unchangeable operative position, involves dead times which until now were inevitable, for the substitution of the press /die pair in the operative position, as well as a not inconsiderable consumption of time tied to the movements which the manipulator must perform in order to displace a dry waste during the operation of successive press /die pairs.

1.1 Definition of Problem:

In conventional compress machine, the job is to marked before compress operation and set the alignment of the work piece with the pressing tool. Moreover the job is feeded manually for every press waste. Due to the above reasons, the entire process takes more time for series of compress waste operations. In this Geneva wheel intermittent drive, the job is feeding automatically during the return stroke of compress operation.

1.2 Scope of the project:

- Operation is very smooth and in this system we can get more output by applying less effort.
- Simple construction by ntroducing geneva wheel disc drive transmission.
- The job is feeded automatically.
- Low cost automation
- Less maintenance

2. METHODOLOGY

This project is designed with using Geneva mechanism, moving arrangement and punching mechanism. Punching machine is designed with mechanical arrangement in which movements are controlled by using Geneva mechanism. Moving mechanism is attached with compress spindle. So we can move the compress spindle anywhere within the area of machine. Moving mechanism also controlled using Geneva mechanism.

In this compressing machine using Geneva mechanism consists of two sections. One is automatic compress mechanism and the second section is conversion of rotary motion into linear reciprocation motion of compress tool. The first sections consist of Geneva wheel disc keyed with a shaft of one end and the other end is connected to chain sprocket wheel. This Geneva wheel shaft is supported on two Plummer block bearings. This sprocket wheel transmit the rotary motion from the Geneva wheel.

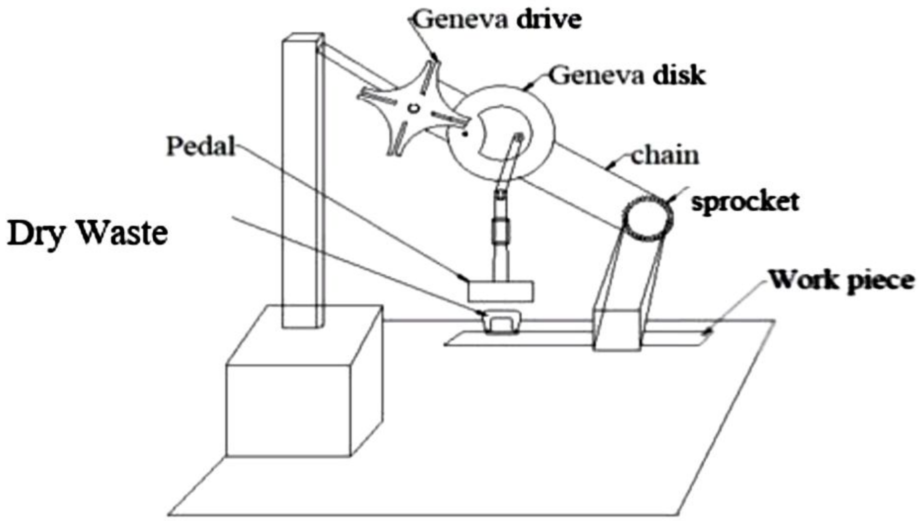


figure 2.1 Auto compress by using geneva mechanism

2.1 Working principle:

When the switch is on the motor rotates the crank wheel. Hence the compress slide with compress tool moved up and down and make a press on the dry waste. The crank wheel face have a pin which touches the slot in the geneva wheel and also rotates the geneva wheel .Due to the rotation or indexing of geneva wheel ,the dry waste get compressed.

3. GENEVA CONVEYOR

3.1 DESIGN AND FABRICATION OF GENEVA CONVEYOR:

The Geneva drive or Maltese cross is a gear mechanism that translates a continuous rotation into an intermittent rotary motion. The rotating drive wheel has a pin that reaches into a slot of the driven wheel advancing it by one step. The drive wheel also has a raised circular blocking disc that locks the driven wheel in position between steps. The geneva mechanism is a timing device.

According to Vector Mechanics for Engineers for Ferdinand P. Beer and E. Russell Johnston Jr.says "Is used in many counting instruments and in other applications where an intermittent rotary motion is required." Essentially " the Geneva mechanism consists of a rotating disk with a pin and another rotating disk with slots into which the pin slides.

According to Brittanica.com, the Geneva mechanism was originally invented by a watch maker. The watch maker only put a limited number of slots in one of the rotating disks so that the system could only go through so many rotations. This prevented the spring on the watch from being wound too tight, thus giving the mechanism its other name, the Geneva Stop. The Geneva Stop was incorporated into many of the first film projectors used in theaters.

In Optimum Design of Mechanical Elements, Ray C. Johnson makes many references to the use of the Geneva mechanism to provide an intermittent motion the conveyor belt of a "film recording marching." He also discusses several weak points in the Geneva mechanism. For instance, for each rotation of the Geneva (slotted) gear the drive shaft must make one complete rotation. Thus for very high speeds, the drive shaft may start to vibrate. Another problem is wear, which is centralized at the drive pin. Finally, the designer has no control over the acceleration the Geneva mechanism will produce. Also, the Geneva mechanism will always go through a small backlash, which stops the slotted gear. This backlash prevents controlled exact motion. Below are models of the Geneva mechanism made with Working Model 2d v4.0. The second model shows velocity vectors for the slotted gear and the drive shaft. Velocity is the black arrow and acceleration is the green arrow. Move the mouse them running. over the mechanisms to start.

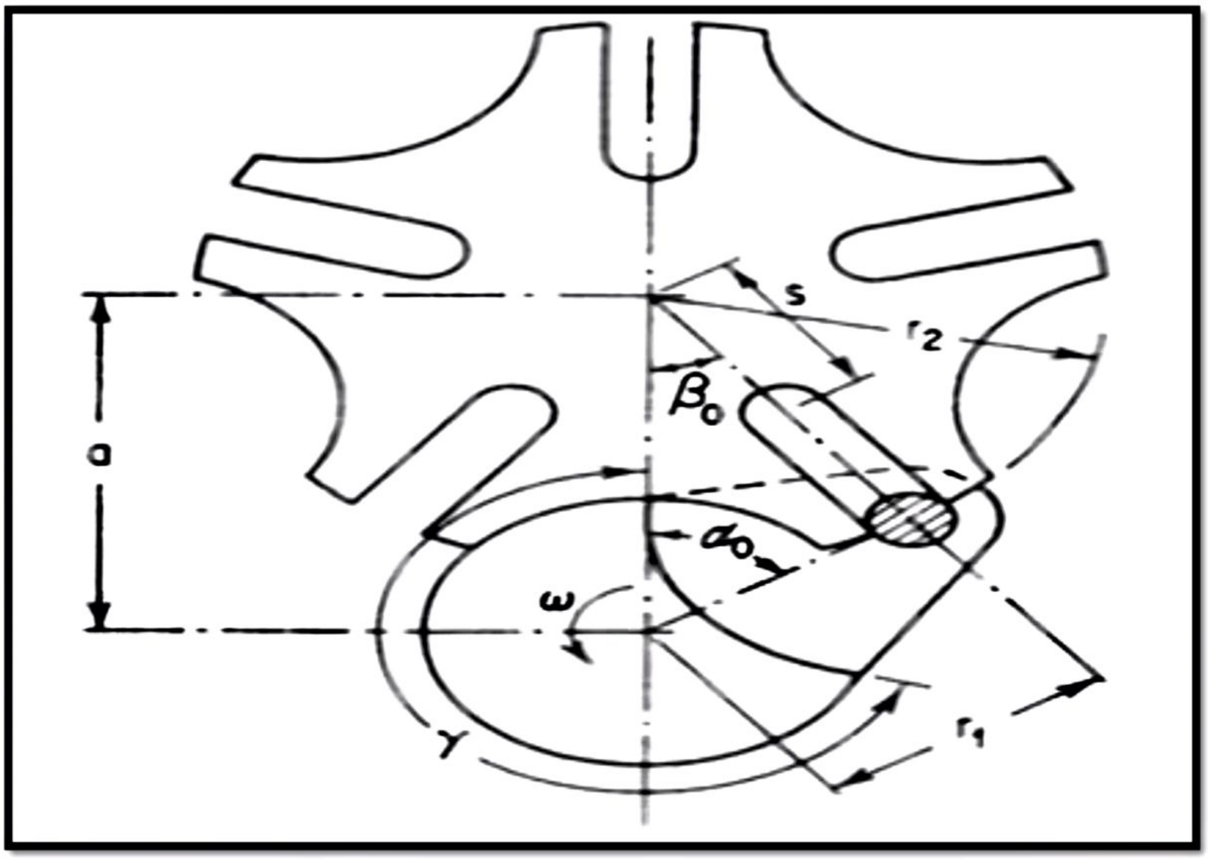


FIGURE 3.1 External geneva mechanism in starting position

3.2 SYNOPSIS:

This is the new innovative concept mainly used for industries. It is simple in construction and the working process is easy. In industries, it is very necessary to move the components from one area to the other in a regular basis. It is necessary to minimize the workers involved in it. We have designed a conveyor with Geneva drive which is useful in industries. So, here we have made a conveyor model which is used for material transformation from one place to another. Main components used in this project are motor, belt, roller, bearing and Geneva wheel.

The Geneva drive or Maltese cross is a gear mechanism that translates a continuous rotation into an intermittent rotary motion. The rotating drive wheel has a pin that reaches into a slot of the driven wheel advancing it by one step. The drive wheel also has a raised circular blocking disc that locks the driven wheel in position between steps.

The name derives from the device's earliest application in mechanical watches, Geneva, Switzerland being an important center of watch making. The Geneva drive is also commonly called a Maltese cross mechanism due to the visual resemblance when the driven wheel has four spokes. Since they can be made small and are able to withstand substantial mechanical stress, these mechanisms are frequently used in watches.

In the most common arrangement, the driven wheel has four slots and thus advances by one step of 90 degrees for each rotation of the drive wheel. If the driven wheel has n slots, it advances by $360°/n$ per full rotation of the drive wheel. Because the mechanism needs to be well lubricated, it is often enclosed in an oil capsule.

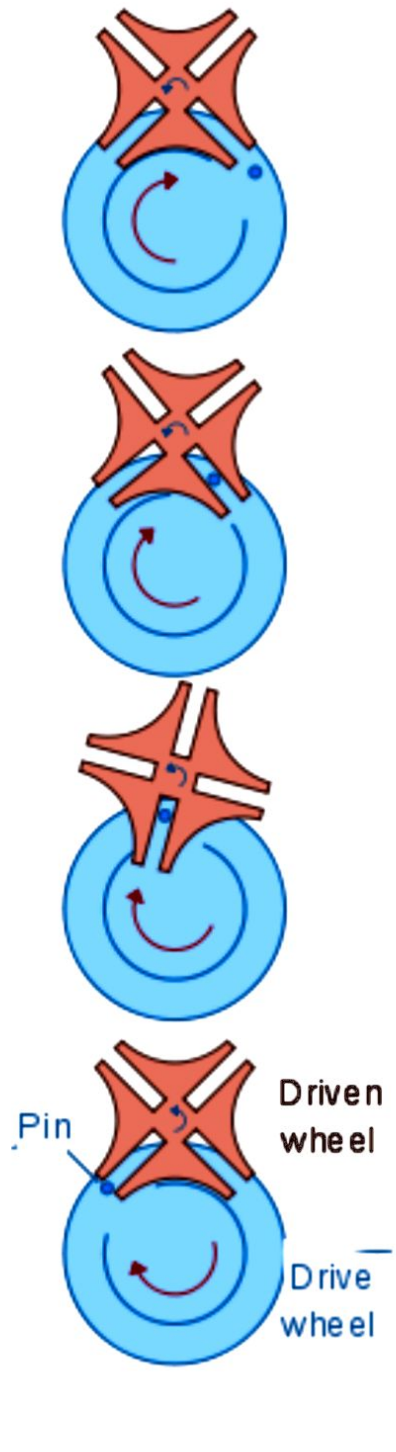


Figure 3.2 Geneva mechanism

3.3 USES AND APPLICATIONS OF GENEVA CONVEYOR:

One application of the Geneva drive is in movie projectors: the film does not run continuously through the projector. Instead, the film is advanced frame by frame, each frame standing still in front of the lens for 1/24 of a second (and being exposed twice in that time, resulting in a frequency of 48 Hz). This intermittent motion is achieved using a Geneva drive. (Modern film projectors may also use an electronically controlled indexing mechanism or stepper motor, which allows for fast-forwarding the film.) The first uses of the Geneva drive in film projectors go back to 1896 to the projectors of Oskar Messter and Max Gliewe and the Teatrograph of Robert William Paul. Previous projectors, including Thomas Armat's projector, marketed by Edison as the Vitascope, had used a "beater mechanism", invented by Georges Demenÿ in 1893, to achieve intermittent film transport.

Geneva wheels having the form of the driven wheel were also used in mechanical watches, but not in a drive, rather to limit the tension of the spring, such that it would operate only in the range where its elastic force is nearly linear. If one of the slots of the driven wheel is occluded, the number of rotations the drive wheel can make is limited. In watches, the "drive" wheel is the one that winds up the spring, and the Geneva wheel with four or five spokes and one closed slot prevents overwinding (and also complete unwinding) of the spring. This so-called Geneva stop or "Geneva stop work" was the invention of 17th or 18th century watch makers .Other applications of the Geneva drive include the pen change mechanism in plotters, automated sampling devices, indexing tables in assembly lines, tool changers for CNC machines, banknote counting and so on. The Iron Ring Clock uses a Geneva mechanism to provide intermittent motion to one of its rings.

A Geneva drive was used to change filters in the Dawn mission framing camera used to image the asteroid 4 Vesta in 2011. It was selected to ensure that should the mechanism fail at least one filter would be usable.

Internal Geneva drive:

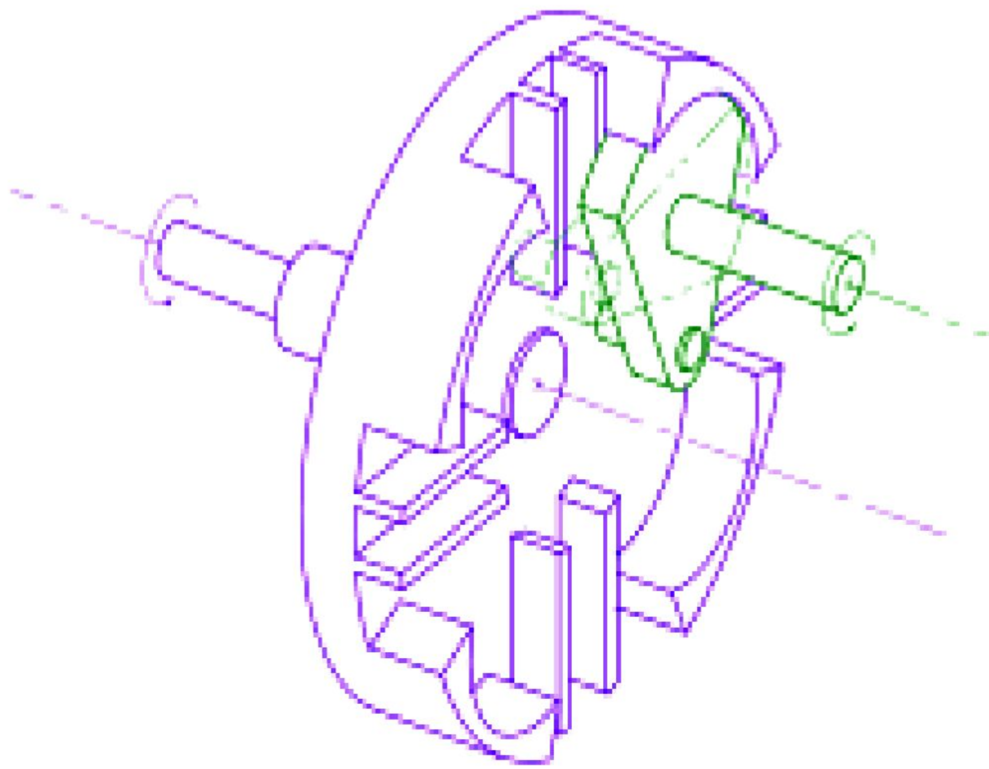


Figure3.3 Internal Geneva conveyor.

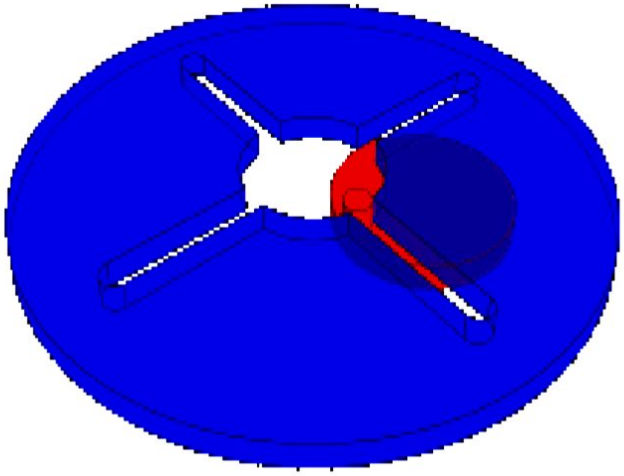


Figure:3.4 Animation showing an internal Geneva drive in operation.
https://en.wikipedia.org/wiki/File:Internal_Geneva_wheel_ani_220px.gif

An internal Geneva drive is a variant on the design. The axis of the drive wheel of the internal drive can have a bearing only on one side. The angle by which the drive wheel has to rotate to effect one step rotation of the driven wheel is always smaller than 180° in an external Geneva drive and always greater than 180° in an internal one, where the switch time is therefore greater than the time the driven wheel stands still. The external form is the more common, as it can be built smaller and can withstand higher mechanical stresses.

4. GENEVA DRIVE

4.1 DESIGN OF GENEVA DRIVE GEOMENTRY OF GENEVA DRIVE:

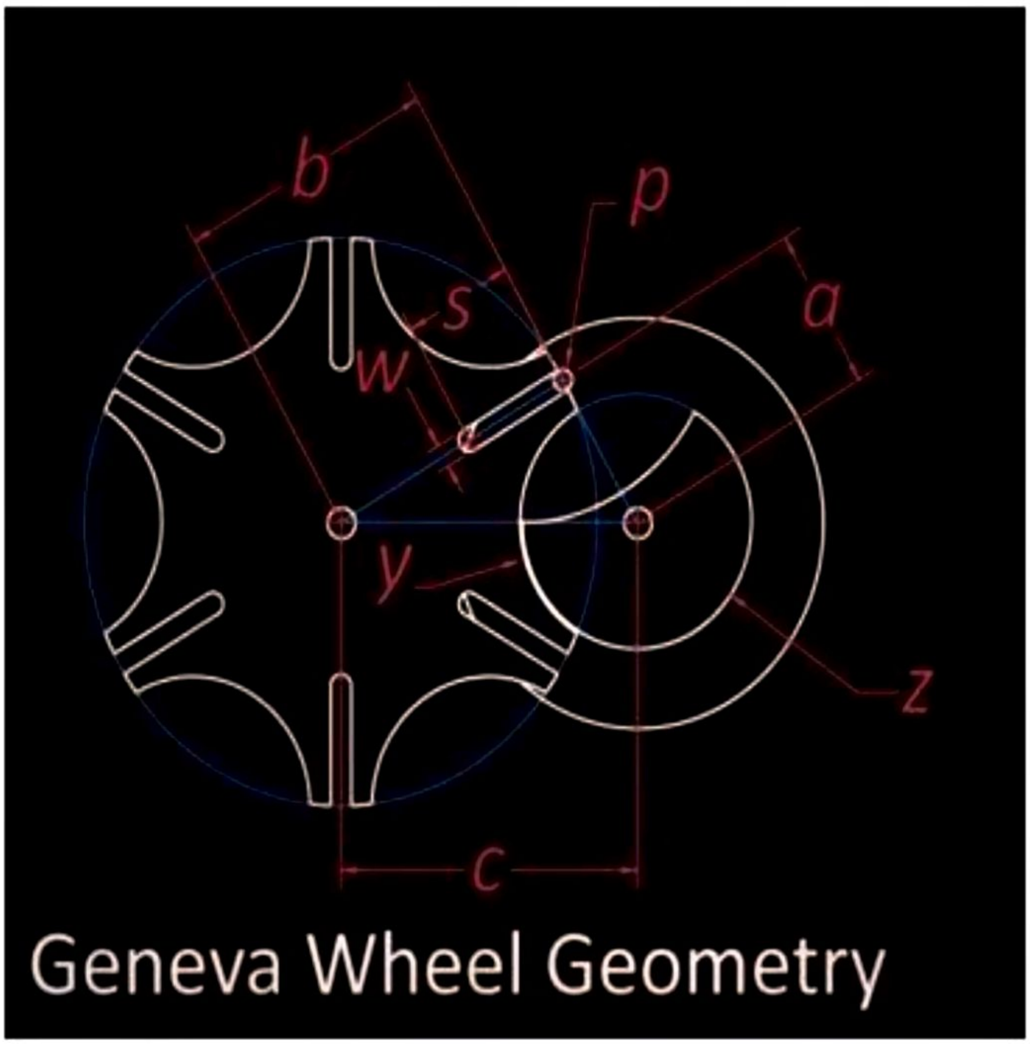


Figure 4.1 DESIGN PARAMETERS OF GENEVA DRIVE

4.2 DIMENSIONS OF GENEVA DRIVE

a=drive crank radius=50 mm,

n=driven slot quantity=4,

p=drive pin diameter=4 mm,

t=allowed clearance=2 mm,

c=centre distance=a/sin (180/n) =70 mm,

b^2=Geneva wheel radius=c^2-a^2=50 mm,

s=slot centre length= (a+b)-c=30 mm,

w=slot width=p+t=6 mm,

y= stop arc radius=a-(p*(1.5))=44 mm,

z=stop disc radius=y-t=44 mm,

v=clearance arc= BZ/a, =45 mm

4.3 APPLICATIONS GENEVA DRIVE:

One application of the Geneva drive is in movie projectors: the film does not run continuously through the projector. Instead, the film is advanced frame by frame, each frame standing still in front of the lens for 1/24 of a second (and being exposed twice in that time, resulting in a frequency of 48 Hz). This intermittent motion is achieved using a Geneva drive. (Modern film projectors may also use an electronically controlled indexing mechanism or stepper motor, which allows for fast-forwarding the film.) The first uses of the Geneva drive in film projectors go back to 1896 to the projectors of Oskar Messter and Max Gliewe and the Teatrograph of Robert William Paul. Previous projectors, including Thomas Armat's projector, marketed by Edison as the Vitascope, had used a "beater mechanism", invented by Georges Demenÿ in 1893, to achieve intermittent film transport.

4.4 ADVANTAGES OF GENEVA MECHANISM:

1. Geneva mechanism may be the simplest and least Expensive of all intermittent motion mechanisms.
2. They come in a wide variety of sizes, ranging from those used in instruments, to those used in machine tools to index spindle carriers weighing several tons.
3. They have good motion curves characteristics compared to ratchets, but exhibit more "jerk" or instantaneous change in acceleration, than better cam systems
4. Geneva maintains good control of its load at all times, since it is provided with locking ring surfaces.

4.5 DISADVANTAGES OF GENEVA MECHANISM:

i. The Geneva is not a versatile mechanism.
ii. The ratio of dwell period to motion is also established Once the no of dwells per revolution has been selected.
iii. All Geneva acceleration curves start and end With finite acceleration & deceleration.
iv. This means they produce jerk.

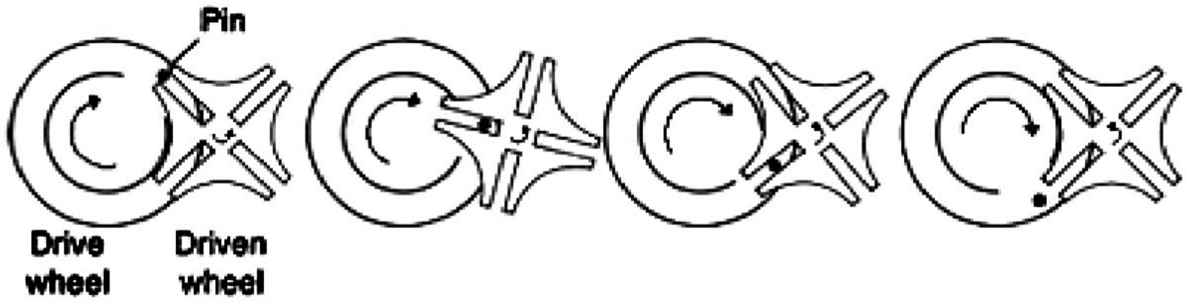


Figure 4.2 Working Stages of Geneva mechanism

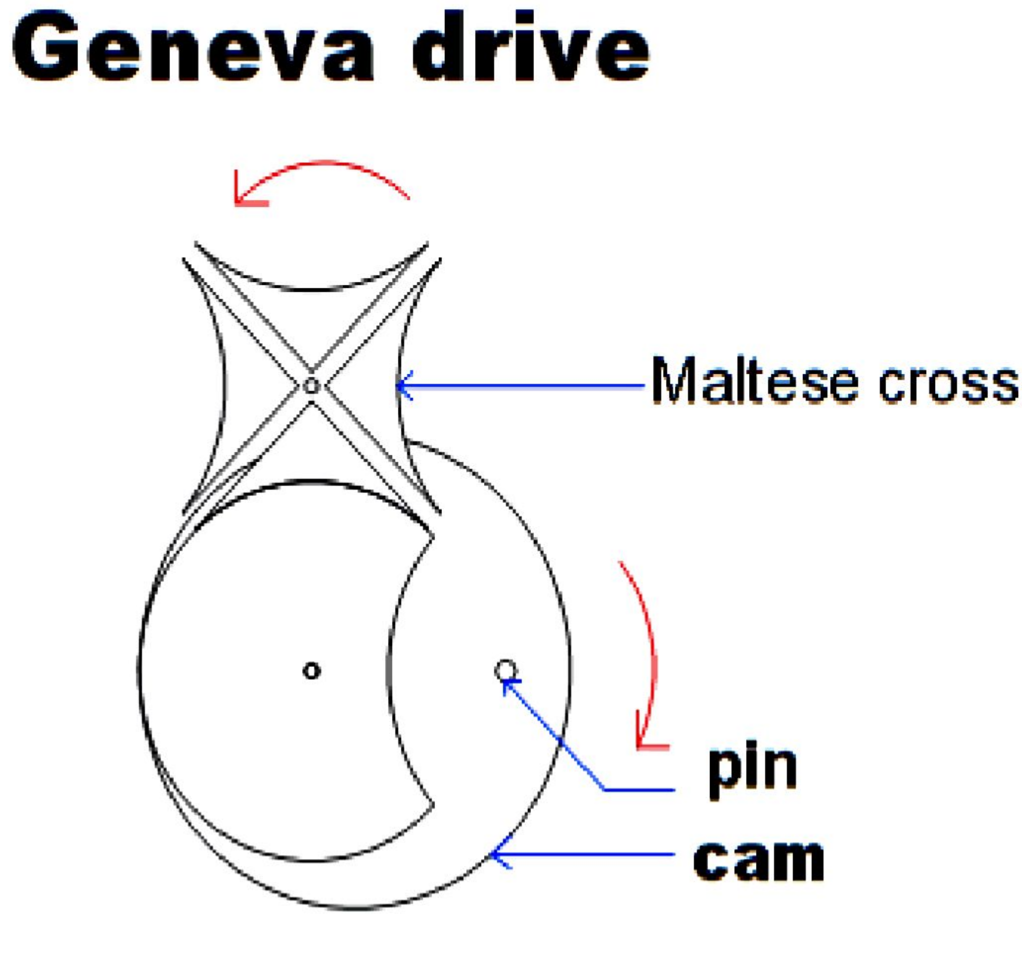


Figure 4.3 Geneva drive

4.6 USES GENEVA DRIVE:

- STEPPER
- MECHANICAL WATCHES
- PLOTTERS
- CNC MACHINE
- IRON RING CLOCK

- Modern film projectors may also use an electronically controlled indexing mechanism or stepper motor, which allows for fast-forwarding the film.
- Geneva wheels having the form of the driven wheel were also used in mechanical watches, but not in a drive, rather to limit the tension of the spring, such that it would operate only in the range where its elastic force is nearly linear.
- Geneva drive include the pen change mechanism in plotters, automated sampling devices
- Indexing tables in assembly lines, tool changers for CNC machines, and so on.
- The Iron Ring Clock uses a Geneva mechanism to provide intermittent motion to one of its rings.

4.6.1 MERITS:

The sequence of slides can be altered to meet specific needs.

- May be adopted to group or to individual user
- Easily handled, stored and rearranged for various uses.
- The room need not be extremely dark for projection.

4.6.2 DEMERITS:

- The fixed sequence does not permit easy flexibility.
- Can get out of sequence and be projected incorrectly if slides are handled individually use of the never automatic projectors will alleviate this problem as the sequence can be worked out and loaded into the special car bridge before presentation.

5. DC MOTOR

5.1.1PRINCIPLES OF OPERATION:

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a .current-carrying conductor and an external magnetic field to generate rotational motion.

Let's start by looking at a simple 2-pole DC electric motor (here red represents a magnet or winding with a "North" polarization, while green represents a magnet or winding with a "South" polarization).

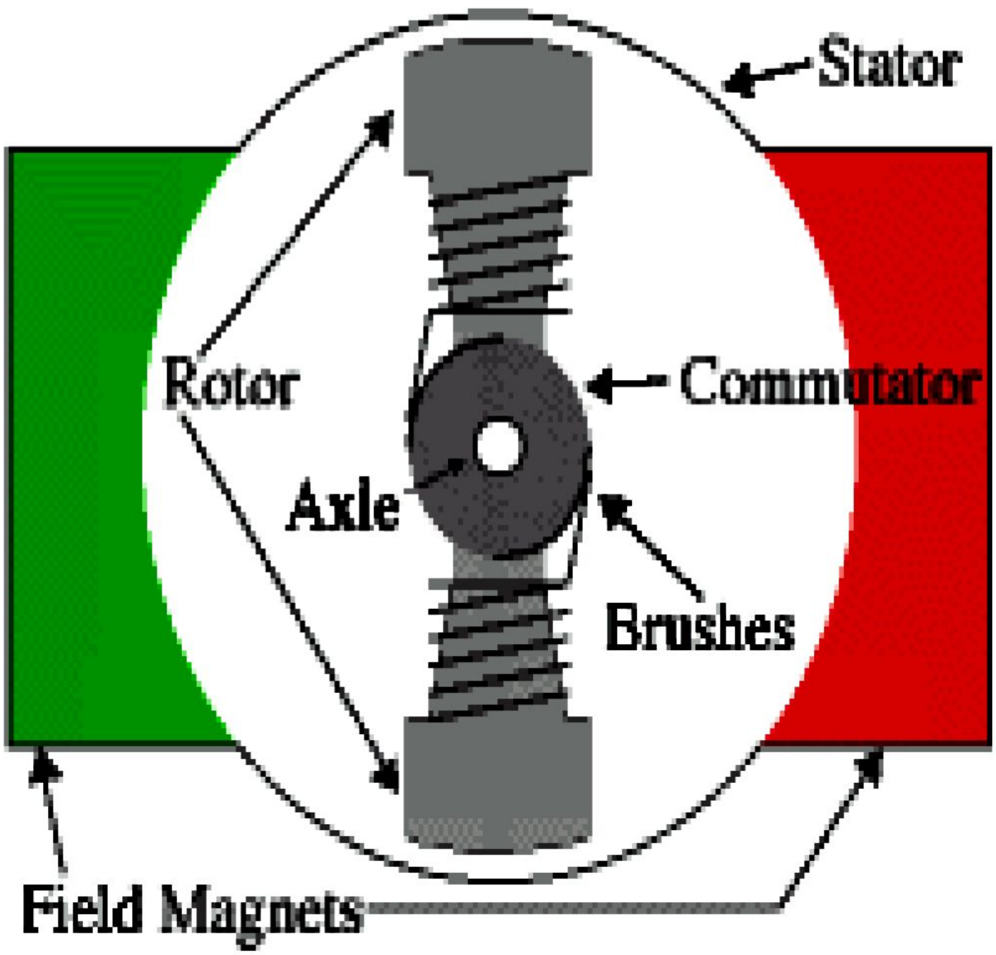


Figure 5.1 DC Motor

Every DC motor has six basic parts -- axle, rotor, stator, commutator, field magnet, and brushes. In most common DC motors, the external magnetic field is produced by high-strength permanent magnets.The stator is the stationary part of the motor this includes the motor casing, as well as two or more permanent magnet pole pieces. The rotor rotate with respect to the stator. The rotor consists of windings (generally on a core), the windings being electrically connected to the commutator. The above diagram shows a common motor layout -- with the rotor inside the stator (field) magnets.

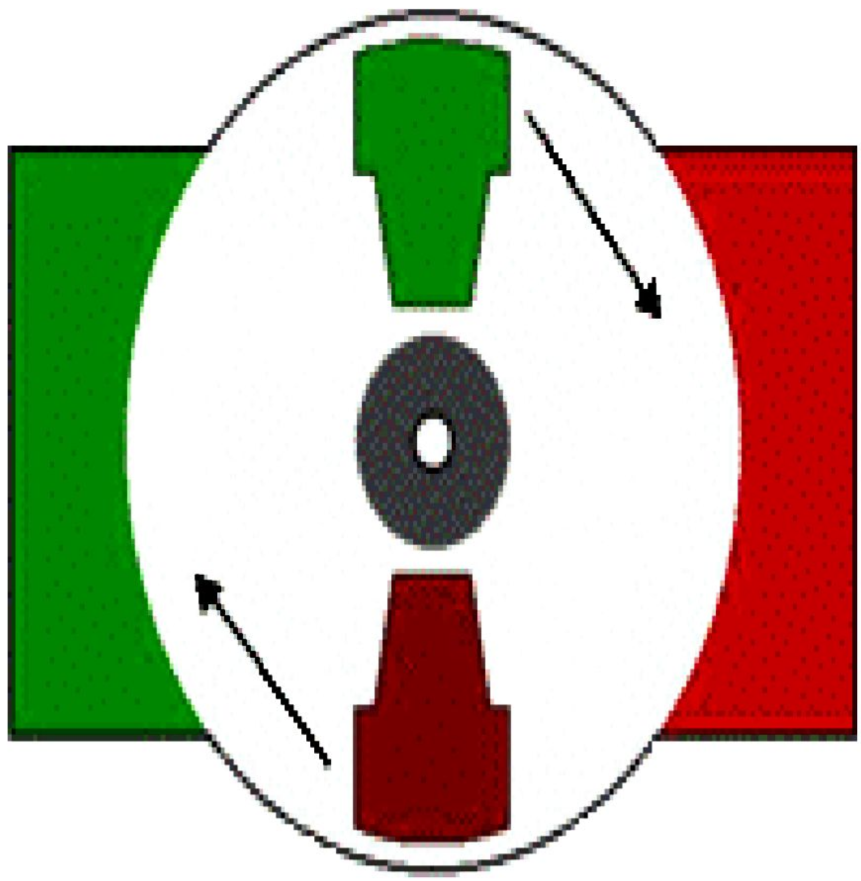


Figure 5.2 Two poles in dc motor

The geometry of the brushes, commutator contacts, and rotor windings are such that when power is applied, the polarities of the energized winding and the stator magnet(s) are misaligned, and the rotor will rotate until it is almost aligned with the stator's field magnets. As the rotor reaches alignment, the brushes move to the next commutator contacts, and energize the next winding. Given our example two-pole motor, the rotation reverses the direction of current through the rotor winding, leading to a "flip" of the rotor's magnetic field, driving it to continue rotating.

In real life, though, DC motors will always have more than two poles (three is a very common number). In particular, this avoids "dead spots" in the commutator. You can imagine how with our example two-pole motor, if the rotor is exactly at the middle of its rotation (perfectly aligned with the field magnets), it will get "stuck" there. Meanwhile, with a two-pole motor, there is a moment where the commutator shorts out the power supply (i.e., both brushes touch both commutator contacts simultaneously). This would be bad for the power supply, waste energy, and damage motor components as well. Yet another disadvantage of such a simple motor is that it would exhibit a high amount of torque "ripple" (the amount of torque it could produce is cyclic with the position of the rotor).

most small DC motors are of a three-pole design

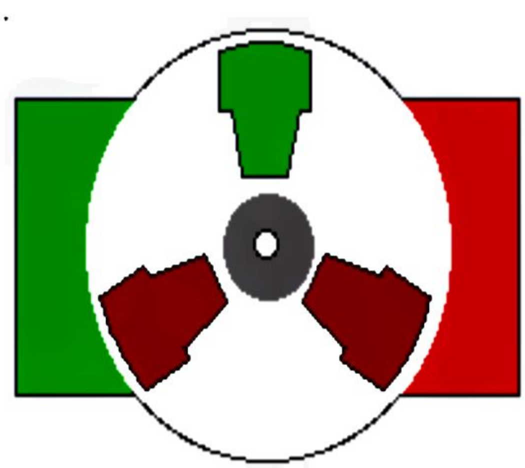


Figure 5.3 Three poles in dc motor

You'll notice a few things from this -- namely, one pole is fully energized at a time (but two others are "partially" energized). As each brush transitions from one commutator contact to the next, one coil's field will rapidly collapse, as the next coil's field will rapidly charge up (this occurs within a few microsecond). We'll see more about the effects of this later, but in the meantime you can see that this is a direct result of the coil windings' series wiring:

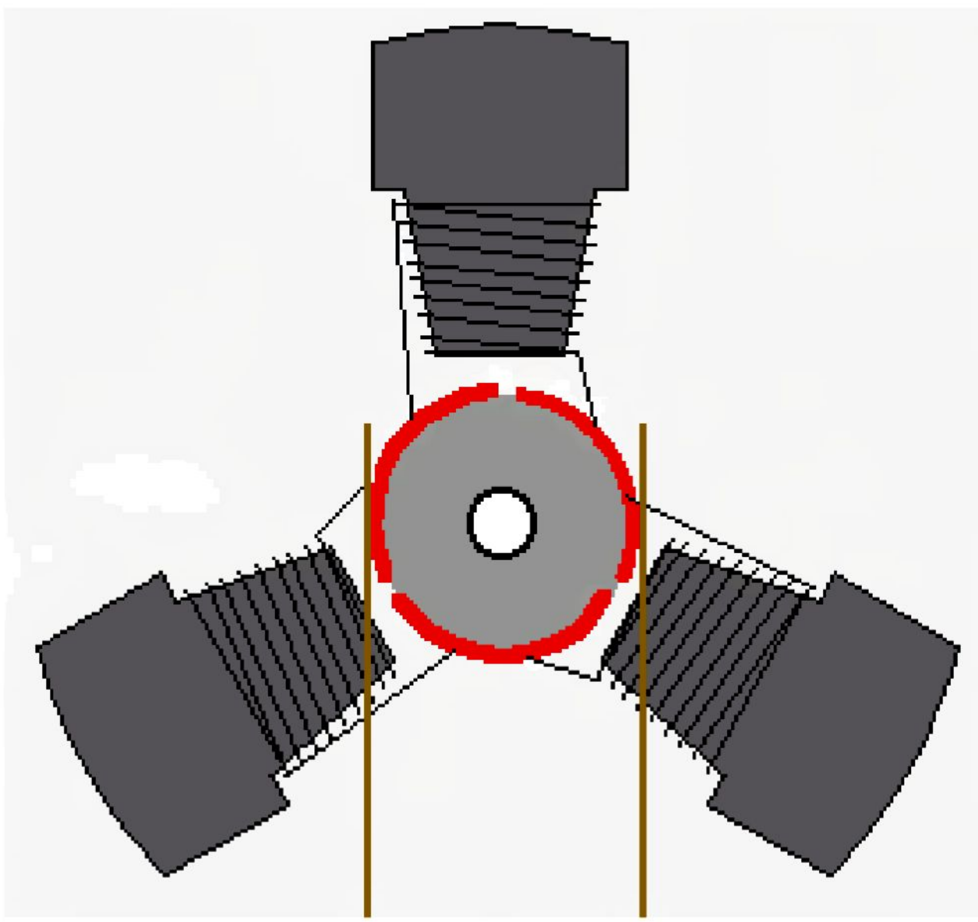


Figure 5.4 Mabuchi motor

The use of an iron core armature (as in the Mabuchi, above) is quite common, and has a number of advantages[2]. First off, the iron core provides a strong, rigid support for the windings. a particularly important consideration for high-torque motors. The core also conducts heat away from the rotor windings, allowing the motor to be driven harder than might otherwise be the case. Iron core construction is also relatively inexpensive compared with other construction types.

But iron core construction also has several disadvantages. The iron armature has a relatively high inertia which limits motor acceleration. This construction also results in high winding inductances which limit brush and commutator life.

In small motors, an alternative design is often used which features a 'coreless' armature winding. This design depends upon the coil wire itself for structural integrity. As a result, the armature is hollow, and the permanent magnet can be mounted inside the rotor coil. Coreless DC motors have much lower armature inductance than iron-core motors of comparable size, extending brush and commutator life.

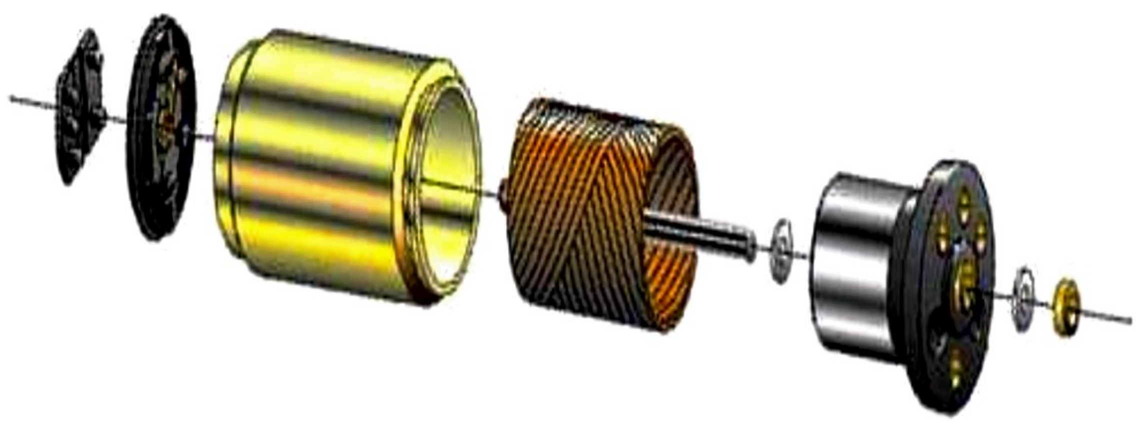


Figure 5.5 Courtesy of Micro motors

The coreless design also allows manufacturers to build smaller motors; meanwhile, due to the lack of iron in their rotors, coreless motors are somewhat prone to overheating. As a result, this design is generally used just in small

5.2 Driver circuit for motor:

Digital systems and microcontroller pins lack sufficient current to drive the circuits like relays, buzzer circuits, motors etc. While these circuits require around 10milli amps to be operated, the microcontroller's pin can provide a maximum of 1-2milli amps current. For this reason, a driver such as a power transistor is placed in between the microcontroller and the motor.

The operation of this circuit is as follows:

The input to the base of the transistor is applied from the microcontroller port pin. The transistor will be switched on when the base to emitter voltage is greater than 0.7V. Thus when the voltage applied to the pin is high. The transistor will be switched on and thus the motor will be ON.

When the voltage at the pin is low. The transistor will be in off state and the motor will be OFF. Thus the transistor acts like a current driver to operate the motor accordingly.

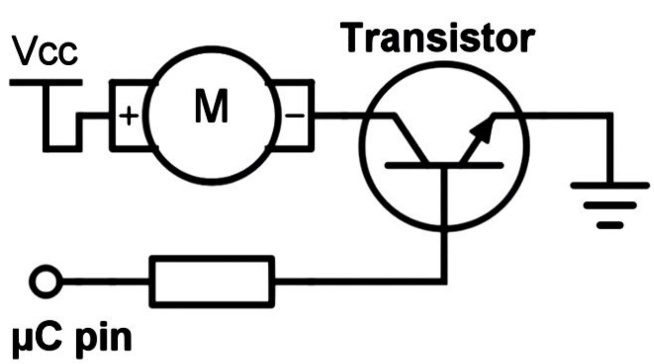


Figure 5.6 Transistor placed between Microcontroller and Motor

6. CHAIN

6.1 CHAIN DRIVE:

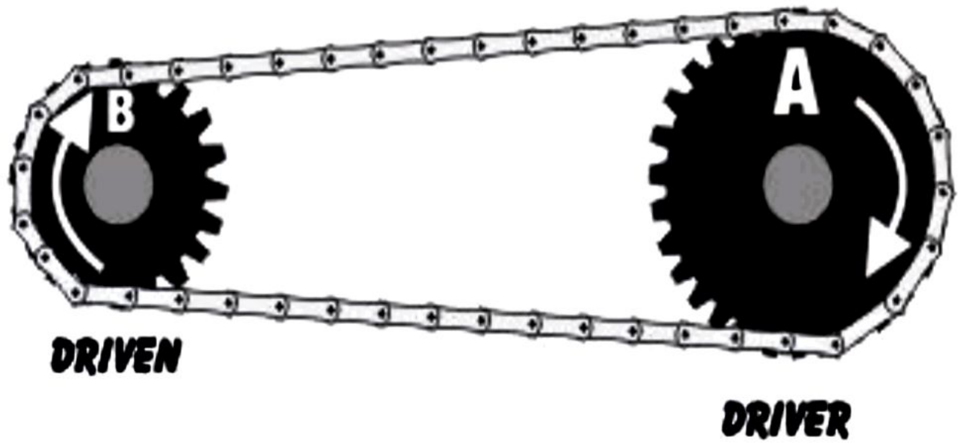


Figure 7.1: Simple chain drive mechanism

M.A. = V.R. = NB/NA ……….. (1) Where,

M.A. = Mechanical Advantage. V.R. = Velocity Ratio.

NA, NB = Number of rotation of sprocket wheel A and B respectively.

So, if we able to increase V.R. we will get more M.A. i.e. more efficient drive.

Chain types are identified by number; ie. a number 40 chain. The rightmost digit is 0 for chain of the standard dimensions; 1 for lightweight chain; and 5 for roller less bushing chain. The digits to the left indicate the pitch of the chain in eighths of an inch. For example, a number 40 chain would have a pitch of four-eighths of an inch, or 1/2", and would be of the standard dimensions in width, roller diameter, etc.

The roller diameter is "nearest binary fraction" (32nd of an inch) to 5/8ths of the pitch; pin diameter is half of roller diameter. The width of the chain, for "standard" chain, is the nearest binary fraction to 5/8ths of the pitch; for narrow chains width is 41% of the pitch. Sprocket thickness is approximately 85-90% of the roller width.

6.2 Gearing

There are several gears available on the rear sprocket assembly, attached to the rear wheel. A few more sprockets are usually added to the front assembly as well. Multiplying the number of sprocket gears in front by the number to the rear gives the number of gear ratios, often called "speeds".

Hub gears use epicycle gearing and are enclosed within the axle of the rear wheel. Because of the small space, they typically offer fewer different speeds, although at least one has reached 14 gear ratios and Fallbrook Technologies manufactures a transmission with technically infinite ratios. Causes for failure of bicycle gearing include: worn teeth, damage caused by a faulty chain, damage due to thermal expansion, broken teeth due to excessive pedaling force, interference by foreign objects, and loss of lubrication due to negligence.

6.2.1 Mechanical Advantage of Gearing :

Mechanical advantage is a measure of the amplification of particular parameter, achieved by using a tool, mechanical device or machine system. In simple words M.A. means getting the thing done at lesser effort. Ideally, the device preserves the input power and simply trades off forces against movement or no. of rotation. In case of cycle, amplification of force on pedal, no. of rotation of wheel is done in order to increase efficiency or mechanical advantage. There are two possible ways to measure mechanical advantage.

7. COMPRESSING MACHINE

Waste compression is the process of compacting waste, reducing it in size. Garbage compactors and waste collection vehicles compress waste so that more of it can be stored in the same space. Waste is compacted again, more thoroughly, at the landfill to conserve valuable airspace and to extend the landfill's life span.

Pre-landfill waste compaction is often beneficial, both for people disposing of waste and the company collecting it, since waste collection companies frequently charge by volume or require use of standard-volume containers, and compaction allows more waste to fit in the same space. Compacting garbage after is collected allows more waste to fit inside the collection vehicle, meaning fewer trips to a dump or transfer station are required.

The basis for this is a trumpf compress machine. The versatility of the compression process however only comes about with the wide variety of tools. The product portfolio of trumpf compress tools goes far beyond the range of different punched forms on offer. The use of automation components for loading and unloading the machine means that even automated production is possible.

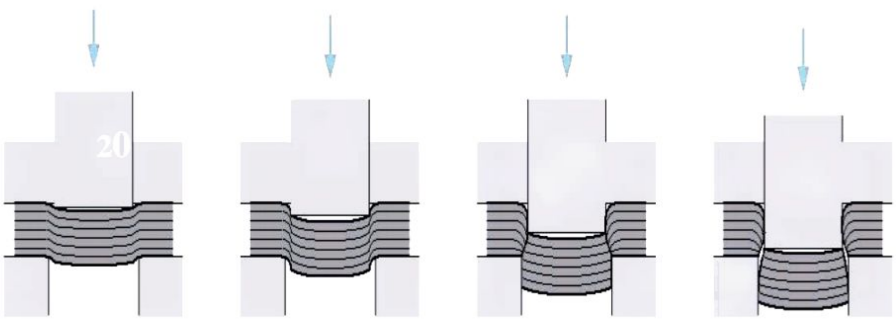
More distance travelled by cycle but keeping magnitude of applied force . same distance travelled by cycle, at less force applied on pedal.

7.2 PUNCHING PRINCIPLE:

Anyone who has ever punched holes in paper has made use of the punching principle. The punch presses the paper from above against the plate of the hole puncher and ultimately in a round opening. This produces a circular hole in the paper. The round pieces of paper that are cut out are collected in the container under the puncher. And punching sheets is no different.

The sheet is positioned between a punch and a die. The punch moves down and plunges into the die. The edges of the punch and die are displaced parallel to each other, so cutting the sheet. For this reason punching is categorized as a shear cutting process. DIN 8588 defines shear cutting as dividing a material with two cutting edges moving past each other.

To be precise here, the punching process takes place in four phases. When the punch touches the sheet, it first of all deforms it. This is followed by cutting. The level of tension produced inside the material is ultimately so great that the sheet breaks along the contour of the cut. The piece of metal punched out here – the so-called punching slug – is ejected in a downward direction. The punch then moves up again. Should it take the sheet of metal with it, the stripper will detach the sheet from the punch.



7.3 PUNCHING PROCESS:

The result of the punching process is not a continuous cut as seems the case when making holes in paper. Instead, the upper part of the material is cut by applying heavy force pressing the punch onto the material, so causing the lower part of the material to break off.

Here the cut-to-break ratio is influenced by the die and cutting gap selected as well as the thickness of the material. The punching process and its result can be optimized in different ways. For example, punching operations are also possible with an extremely smooth surface to the cut or something that is important for people who work on punching machines using especially quiet punching.

7.4 Punching force:

The maximum punch size which can be used on a punching machine depends essentially on two factors: the thickness and tensile strength of the material to be punched. The greater the tensile strength and thickness of a material, the more force that needs to be applied by the machine to cut the material. If you wish to determine the maximum punch diameter that can be achieved by a machine, there are not only values in tables but also formulae which can be used to calculate the relevant values.

7.4.1 Maximum diameter for round punches

$$d_{max} = p/(3.14 \cdot s \cdot 0.9 \cdot R_m \cdot x)$$

where

d_{max} = maximum tool diameter (round) [mm]

p=punching force [N]

s=material thickness [mm]

R_m = tensile strength [N/mm²]

x = shear factor (x =1 for punches without shear, x<1 for beveled punches)

Maximum edge length for square punches:

$$a_{max} = p/(4 \cdot s \cdot 0.9 \cdot Rm \cdot x)$$

Where

a_{max} maximum edge length (square) [mm]

P punching force [N]

S material thickness [mm]

R_m tensile strength [N/mm²]

x shear factor (x =1 for punches without shear, x<1 for beveled punches)

7.4.2 Maximum cutting circumference for any formed or cluster punch without shear

$$PL_{max} = s \cdot 0.9 \cdot R_m$$

L_{max} maximum cutting circumference [mm] p punching force [N]

s material thickness [mm] R_m tensile strength [N/mm²]

8. CONSTRUCTION OF COMPRESS WASTE DUSTBIN

In this compress waste dustbin consists of two sections. One sections is automatic container opening mechanism and the second section is conversion of rotary motion into linear reciprocating motion for pressing of dry waste. The first section consists of geneva wheel disc keyed with a shaft at one end and the other end is connected with chain sprocket wheel. This Geneva wheel shaft is supported on two Plummer block bearings. This sprocket wheel transmit the rotary motion from the Geneva wheel to press the waste material by chain drive. Hence when the Geneva wheel is rotated , it press the dry waste . Finally , we were succeeded to increase the capacity of dustbin by more than 60%.

The second section consists of electrically operated DC motor, Plummer block bearings, crank wheel with a pin ,connecting rod and punching tool. The second section is used to convert the rotary motion of the crank wheel into reciprocating motion of punching tool. The rotating shaft is keyed to the crank wheel at one end and the other end is connected to DC motor. This shaft is supported on two plummer block bearings. The punch tool slide is reciprocated by the connecting the crank wheel through the connecting rod .The metal sheet is feeded automatically by the rotation of geneva wheel.

8.1.1 ADVANTAGES:

- Compared to hydraulic and, pneumatic system, it is economical.
- No extra skill is required for operating this system.
- Operation is very smooth and in this system we can get more output by applying less effort.

8.2 APPLICATIONS:

- It is very much useful for compression of waste present in the dustbin.
- Thus it can be useful for other compression application.

9. INTRODUCTION OF BATTERY

An electric battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices.[1] A battery has a positive terminal, or cathode, and a negative terminal, or anode. The terminal marked positive is at a higher electrical potential energy than is the terminal marked negative. The terminal marked negative is the source of electrons that when connected to an external circuit will flow and deliver energy to an external device. When a battery is connected to an external circuit, electrolytes are able to move as ions within, allowing the chemical reactions to be completed at the separate terminals and so deliver energy to the external circuit. It is the movement of those ions within the battery which allows current to flow out of the battery to perform work.[2] Historically the term "battery" specifically referred to a device composed of multiple cells, however the usage has evolved to additionally include devices composed of a single cell.

Figure 9.1 battery

COMPONENTS USED FOR COMPRESS WASTE DUSTBIN

S.NO	COMPONENTS USED	MATERIAL	SIZE	QUANTITY
1	M.S.FABRICATED STAND(Square tube) 25MM	Mild steel	500X750X300 mm (WXHXD)	1
2	24 VDC MOTOR	Aluminum	10 Kg Torque	1
3	CRANK DISC PLATE 8MM THICKNESS	Mild steel	150mm dia	1
4	GENEVA WHEEL DISC 8MM THICKNESS	Mild steel	150mm dia	1
5	PLUMMER BLOCK BEARING	Casting body (cover)	20mm dia	2 Pairs
6	PAINT	Enamel	500 ml	1
7.	CONNECTING ROD	Mild steel	25mm X 6mm X 1200	1

8	CHAIN WITH SPROCKET	Carbon steel	1600mm X 20mm	1 Set
9	JOB FEED ROLLERS	Mild steel	25mm dia X 250mm	2
10	PUNCH TOOL	Hardened mild steel	6mm dia	1
11	METAL PRIMER	Paint	½ litre	1

CONCLUSION

Finally, we are able to rotate the geneva mechanism by which we are able to press the waste dry material in dustbin. This sprocket wheel transmit the rotary motion from the Geneva wheel to press the waste material by chain drive. Hence when the Geneva wheel is rotated, it press the dry waste . Finally, we were succeeded to increase the capacity of dustbin by more than 60%.

The reduced volume of the dry waste resulted from the compression will ultimately occupy less space where it will get dumped and the dustbin with which the mechanism is attached can store more waste at a time which will result in removing the dustbin content less number of times hence saving human effort.

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