

**APPLICATION AND CONCEPT OF STEERING HEADLAMPS AND AUTOMATIC
HANDBRAKE RELEASE**

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Abstract

The purpose of this venture is guided controlled (or directional) headlights, that are by and large an alternate game plan of headlights fitted to road vehicles other than the common low bar/high column headlights and their element is that they turn toward controlling, with the goal that the driver of the vehicle can see the bend, what he is really transforming into. Since the static headlamp just gives certain lighting up fields to drivers in the evening and is deficient to serve for bended streets and convergence. The headlights can be related with the managing linkage by technique for bars or connections.

A few automobiles with plate brakes have isolate handbrake drum-brake shoes or even a different disc brake caliper for the handbrake. Put just, an electronic stopping brake replaces this mechanical framework with an electrical one. By squeezing the switch, engines on each brake caliper crush the cushions into the disc.

Programmed hand brake discharge is only one of the stopping mechanisms in car at the season of vehicle turned off condition. This stopping mechanism is mechanized worked. The programmed hand brake discharge instrument is a standout amongst the best hand slowing mechanisms over the traditional frameworks. In this, the control unit gets the flag from the key switch.

Key Words: Headlamp, Steering Mechanism, Hand Brake, Control Unit, DC Motor

I. INTRODUCTION

1.1 Automatic Head Light Alignment

Automobile prosperity is the avoiding of auto collisions or the minimization of ruinous effects of accidents, particularly as identifying with human life and prosperity. Exceptional prosperity features have been consolidated with cars for an impressive period, some for the security of automobile's inhabitants just, and a part of the security of others. One of the choices available is Design and fabricate of coordinating controlled head light system.

Headlamp execution has continually redesigned all through the vehicles age, urged by the colossal uniqueness in the midst of daytime and evening time improvement fatalities: the US National Highway Traffic Safety Administration imparts that practically 50% of all activity related fatalities happen careless, despite just 25% of advancement going amidst absence of clearness. Particular vehicles, for example, plans and flying machine, are required to have headlamps.

These components, incorporates the applicable criteria that follow.

1.2 Importance

Conventional parking brake actuation involves the human interference. Without pulling or pushing the lever, the parking brake will now not work. Also, sometimes due to negligence or in emergency situations, we human beings regularly overlook to apply parking brakes. This may lead to rolling of car in case of slopes and collision with other automobiles in parking location. Constant upgrades in active safety and enhancements with admire to the reliability and luxury of operation suggest that mechanical handbrakes are increasingly more being changed by electromechanical structures

Automobile protection is the evasion of car crashes or the minimization of hurtful affects of mischance, mainly as referring to human existence and well-being. Uncommon safety highlights had been incorporated with autos for a big length of time, a few for the health of car's tenants just, and some for the security of others.

1.3 Automatic hand brake release

In automobiles, the preventing brake, likewise called hand brake, crisis brake, or e-brake, is a hooking brake generally used to preserve the vehicle stationary. It is on occasion moreover used to hold a vehicle from rolling when the administrator desires the 2 feet to paintings the hold close and throttle pedals. Vehicle hand brakes more frequently than not comprise of a hyperlink straightforwardly associated with the brake device towards one side and to a lever or foot pedal on the driving force's position.

"Programmed hand brake discharge", that's totally organized by modified structure. It is a wander which is totally arranged and expected for Automobile motors. This structures a fundamental bit of pleasant first-rate. This thing experienced strenuous check in our Automobile vehicles and it is notable. In automobiles, the ceasing brake, in like manner referred to as hand brake, emergency brake, or e-brake, is a locking brake via and huge used to maintain the car stationary. It is every so often extensively utilized to protect a car from rolling when the supervisor wishes the two ft to paintings the grip and throttle pedals.

1.4 Problem Statement

- Design and build up the model of car so that you can have the vehicle protection arrangement of programmed head light arrangement framework and hand brake discharge for directional headlights and programmed hand brake discharge which helps for programmed
- Also to create the version of the same. Which might equip to demonstrate the attributes of each the frameworks and their individual; working as indicated by using require.

1.5 Objectives

In Four wheeler application for secure preventing of vehicles on slants, whilst driver overlooks or intentionally stays faraway from to utilize the hand brake.

- To deliver computerization to bodily worked hand brakes so as to lower human endeavors and give consolation in riding.
- To expect street mischance on sharp turning round evening time especially in choppy zones.
- To regulate the headlights in ways (Left, right).

- To configuration, create and manufacture the version that showcases each the frameworks.
- To illuminate the perceivability area of driver in the course of the evening so the motive force can judge road turning admirably.
- To increment protection amid night voyaging.

II. LITERTURE REVIEW

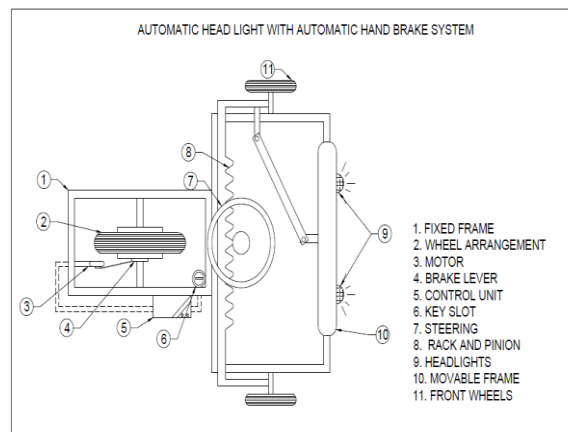
2.1 S.KaramanT.HacıbekirE. KuralE. S. Öztürk, M.DemirciB. Aksun Güvenç [6] Offers the hardware inside the loop simulation of an Adaptive Headlight System for motor vehicles. The headlamp orientation manipulate gadget rotates the right and left low beam headlights independently. It also possesses an automated headlamp leveling system, which, in addition to compensating for exclusive hundreds, additionally cancels out the pitching impact in the course of acceleration or braking to offer better night time visibility.

2.2 Yi-Shun Chen; Sheng-Chien Chiu [11] describes a new technique and control manner for an optical headlight design. A series of experiments had been performed to illustrate the projection angle of headlights the use of this technique. In addition, the dynamic versions of the headlight manage system changed into discussed. Several parameters have been considered, inclusive of the uphill and downhill street situations and automobile velocity, to understand the multistage variations of the brand new headlight manipulate gadget.

2.3 Chien-Tai. Huang, Chien-Tzu Chen, Shou-Yi Cheng, Bo-Ruei Chen and Ming-Hu Huang [4] Offer a new concept layout of the EPB machine that has simple and occasional cost characteristics. The trying out effects has proved the feasibility of this layout. First they describe the working precept of this new layout, and then introduce the arrangement of the checking out system, followed by using the dialogue of experimental records.

III. System Description

3.1 Working Diagram



3.2 Working Principal

- The running widespread of fog light arrangement framework depends at the rack and pinion machine.
- The pinion that is amassed to the directing. When controlling might be grown to become haggles could be pivot with identical bearing.
- In hand ruin discharge framework is the combo of gadgets and mechanical framework.
- This framework comprises of MS define, wheel, engine, lever and drum brake and gadgets circuit.
- Electronics circuit is applied to manipulate the mechanical framework by way of utilizing arduino controller.
- Automatic hand brake discharge is simplest one of the spoil frameworks in vehicle at the season of automobile turns off condition. In this break framework mechanized laboured one.

3.3 Components Description

3.3.1 Frame

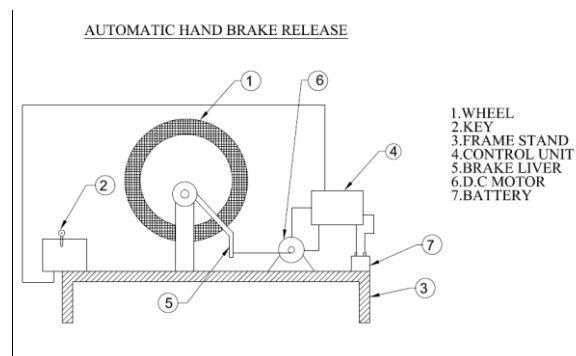


Fig.3.3 Working diagram of Automatic hand brake release

A casing is regularly a simple framework that backings one-of-a-kind segments of a bodily improvement and moreover metal outline that constrains the development's diploma. This is product of gentle steel fabric.

Specification

Frame design for safety of 25*25*3 L angle mild steel channel
b = 25 mm, d= 25 mm, t = 3 mm.

Consider the maximum load on the frame to be 15 kg.

3.3.2 Working Principle Of Hand Brake System

- In hand brake release, system is the combination of electronics and mechanical system.
- This system consists of MS frame, wheel, motor, lever, drum brake and electronic circuit.
- Electronics circuit is used to control the mechanical system by using Arduino controller.
- Automatic hand brake release is nothing but one of the braking system in automobile at the time when the vehicle is in a stationary condition. This braking system is motorized operated.

3.3.3 Rack And Pinion

A rack and pinion is a type of direct actuator that involves a couple of riggings which alternate over rotational motion into instantly movement. A round rigging referred to as "the pinion" connects with tooth on an instantaneous "apparatus" bar known as "the rack"; rotational movement connected to the pinion makes the rack flow in admire to the pinion, therefore interpreting the rotational movement of the pinion into straight movement. Rack-and-pinion guiding is hastily becoming the maximum famous kind of directing on vehicles, little trucks and SUVs.

Specification

1. Diameter of pinion=30mm
2. Module of pinion=1.66mm
3. Module of rack=1.66mm
4. Length of rack=300mm

3.3.4 Arduino

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 virtual enter/output pins (of which 6 may be used as PWM outputs), 6 analog inputs, a sixteen MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It consists of everything had to aid the microcontroller; sincerely connect it to a laptop with a USB cable or strength it with an AC-to-DC adapter or battery to get began.

The Uno differs from all preceding boards in that it does no longer use the FTDI USB-to-serial driver chip. Instead, it functions the Atmega8U2 programmed as a USB-to-serial converter.

"Uno" means "One" in Italian and is named to mark the imminent launch of Arduino 1.Zero. The Uno and model 1.0 will be the reference versions of Arduino, shifting forward. The Uno is the cutting-edge in a chain of USB Arduino forums, and the reference model for the Arduino platform; for a contrast with previous variations, see the index of Arduino boards.

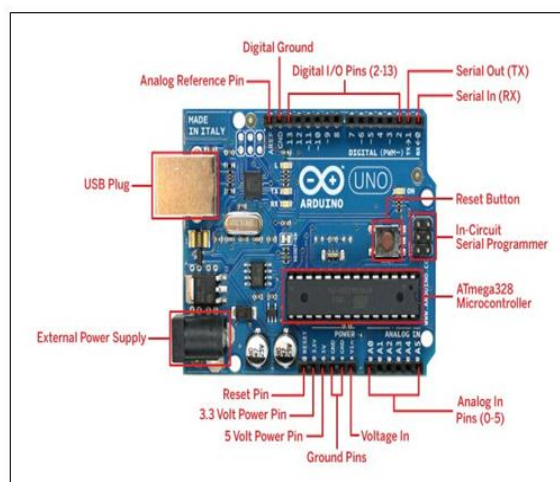


Fig.3.3.4 Arduino

3.3.5 DC Motor

DC engines have been the main type broadly utilized, due to the fact that they could be fueled from existing direct-current lights strength appropriation frameworks. A DC engine's velocity can be managed over an extensive variety, utilizing both a variable deliver voltage or by way of converting the nice of present day in its field windings.

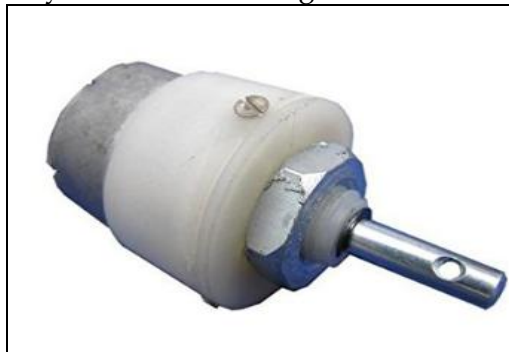


Fig.3.3.5 12volt, 10 rpm geared DC motor

3.3.6 Relay

Two channels Relay driving force undertaking can be managed by using feeding 2-12V cause voltage, Very useful venture for application like Micro-Controller based totally projects, Remote controller, Lamp on off, and any circuits which required isolated excessive present day and high voltage switching. Two LED works as operation indicator while in, three pins screw terminals to connect load and provides both normally open and typically closed switching.

It is an electrically operated switch. Many relays use an electromagnet to robotically perform a transfer; however different operating ideas also are used, consisting of solid-kingdom relays. Relays are used in which it's far necessary to control a circuit by way of a separate low-power sign or in which several circuits have to be controlled by using one signal. Relays have been used significantly in phone exchanges and early computer systems to carry out logical operations.

3.3.7 Wheel Arrangement

The simple wheel and braking association is fixed to the body stand. This wheel association is setup for showing the successful operating of our challenge. But the real implementation can be completed in the car and the brakes may be carried out to all the 4 wheels.



Fig. 3.3.7 Wheel Arrangement

Moped wheel (Honda Activa):

- Tyre size 90/100-10
- Rim size 10 inch
- Color-black
- Brake type & size Drum 130mm

IV. CAD MODEL

Catia Model

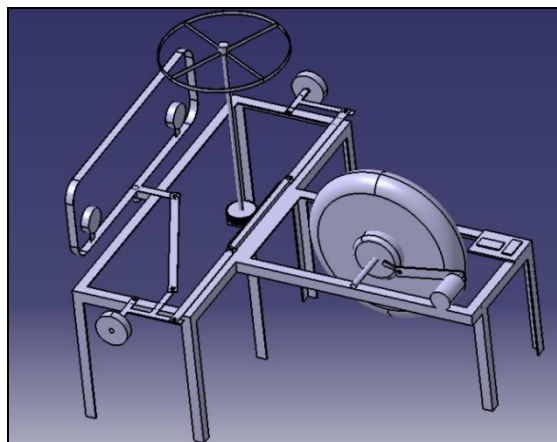
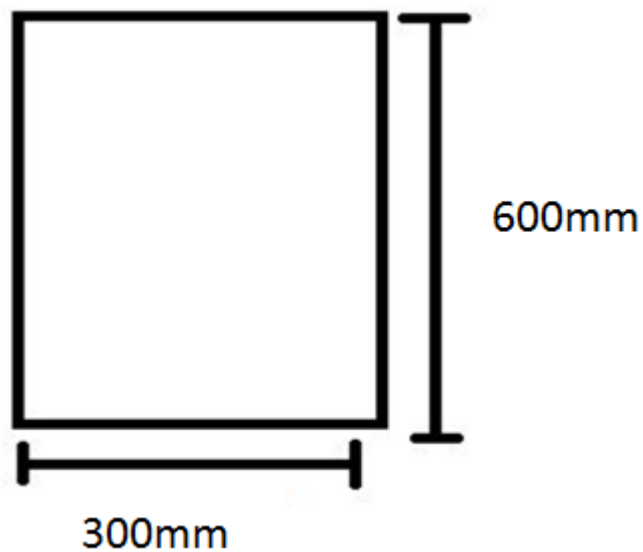


Fig. 4 Catia Model

V. CALCULATION

5.1 Hand brake calculation

Design of Frame:



Frame design for safety FOR 25*25*3 L angle mild steel channel
 $b = 25 \text{ mm}$, $d = 25 \text{ mm}$, $t = 3 \text{ mm}$.

Consider the maximum load on the frame to be 15 kg.

Max. Bending moment = force*perpendicular distance
 $= 15 * 9.81 * 300$

$M = 44145 \text{ Nmm}$

We know,

$M / I = \sigma b / y$

$M =$ Bending moment

$I =$ Moment of Inertia about axis of bending that is; I_{xx}

$y =$ Distance of the layer at which the bending stress is consider

(We take always the maximum value of y , that is, distance of extreme fiber from N.A.)

$I = bd^3 / 12$

$= 25 * 25^3 / 12$

$I = 32552.08 \text{ mm}^4$

$\sigma b = My / I$

$= 44145 * 12.5 / 32552.08$

$\sigma b = 16.95 \text{ N / mm}^2$

The allowable shear stress for material is $\sigma_{allow} = \text{Syt} / \text{fos}$

Where Syt = yield stress = 210 MPa = 210 N/mm²

And fos is factor of safety = 2

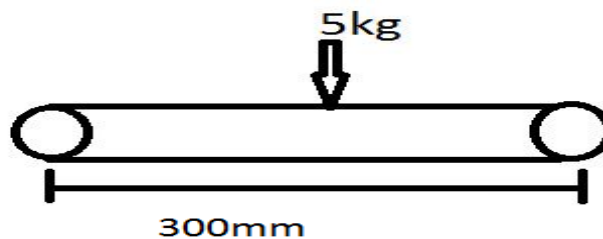
So $\sigma_{allow} = 210 / 2 = 105 \text{ MPa} = 105 \text{ N / mm}^2$

Comparing above we get,

$\sigma b < \sigma_{allow}$ i.e. $16.95 < 105 \text{ N / mm}^2$

So design is safe.

Design of Shaft:



Shaft design for safety FOR 300 mm mild steel

$L=300\text{mm}$

$D=15\text{mm}$

Consider the maximum load on the frame to be 5 kg.

Max. Bending moment = force*perpendicular distance
 $= 5*9.81*150$

$M = 7357.5 \text{ Nmm}$

We know,

$M / I = \sigma_b / y$

$M =$ Bending moment

$I =$ Moment of Inertia

$y =$ neutral axis

$I = \pi/64*15^4$

$=2485.05$

$\sigma_b = My / I$

$= 7357.5*7.5 / 2485.05$

$\sigma_b = 22.2 \text{ N/mm}^2$

The allowable shear stress for material is $\sigma_{allow} = \sigma_{yt} / f_{os}$

Where $\sigma_{yt} =$ yield stress = 210 MPa = 210 N/mm²

And f_{os} is factor of safety = 2

So $\sigma_{allow} = 210/2 = 105 \text{ MPa} = 105 \text{ N/mm}^2$

Comparing above we get,

$\sigma_b < \sigma_{allow}$ i.e. $22.2 < 105 \text{ N/mm}^2$

So design is safe.

Motor selection for wheels

Given

Diameter for wheels= 200mm

Weight of assembly with frame is= $5.72\text{kg}+1=6.72\text{kg}$

Torque required for motor

Torque= $\text{force}*\text{radius of wheel}$

$=400*0.005$

$=2 \text{ Nm}$

$=20\text{kgcm}$

So torque required for one motor is $=20\text{kgcm}$

Therefore we are selecting motor with 25 kgcm torque.

Power output of DC motor is $=\text{voltage} *\text{current}$

$=12*0.8$

$=9.6 \text{ watt}$

Power= $2*\pi*N*\text{torque}/60$

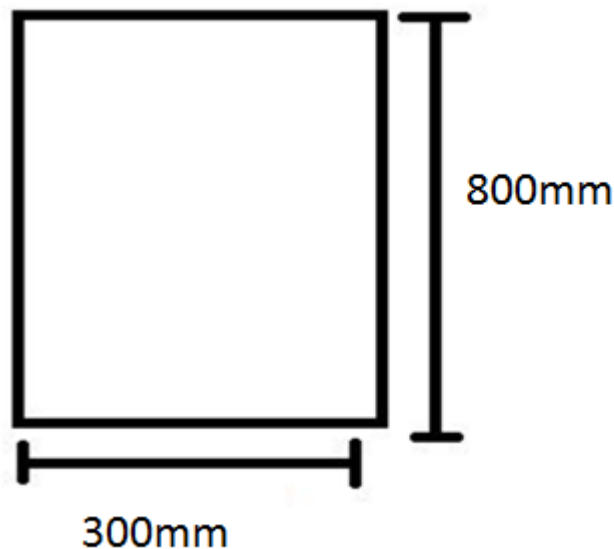
$$9.6 = 2 \cdot \pi \cdot N \cdot 20 / 60$$

$$N = 4.58$$

We are selecting motor with 10rpm

5.2 Head light alignment calculation:

Design of Frame:



Frame design for safety FOR 25*25*3 L angle mild steel channel

$b = 25 \text{ mm}$, $d = 25 \text{ mm}$, $t = 3 \text{ mm}$.

Consider the maximum load on the frame to be 15 kg.

Max. Bending moment = force * perpendicular distance

$$= 15 \cdot 9.81 \cdot 400$$

$$M = 58860 \text{ Nmm}$$

We know,

$$M / I = \sigma_b / y$$

M = Bending moment

I = Moment of Inertia about axis of bending that is; I_{xx}

y = Distance of the layer at which the bending stress is consider

(We take always the maximum value of y , that is, distance of extreme fiber from N.A.)

$$I = bd^3 / 12$$

$$= 25 \cdot 25^3 / 12$$

$$I = 32552.08 \text{ mm}^4$$

$$\sigma_b = My / I$$

$$= 58860 * 12.5 / 32552.08$$

$$\sigma_b = 22.60 \text{ N/mm}^2$$

The allowable shear stress for material is $\sigma_{allow} = S_{yt} / f_{os}$

Where S_{yt} = yield stress = 210 MPa = 210 N/mm²

And f_{os} is factor of safety = 2

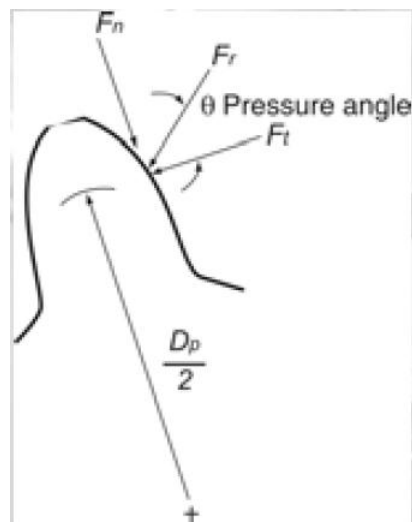
So $\sigma_{allow} = 210 / 2 = 105 \text{ MPa} = 105 \text{ N/mm}^2$

Comparing above we get,

$\sigma_b < \sigma_{allow}$ i.e. $22.60 < 105 \text{ N/mm}^2$

So design is safe.

Rack & Pinion (this all formulas are taken from R.S.Khurmi)



In rack and pinion following parameters are used:

f_t = transmitted force

f_n = normal force

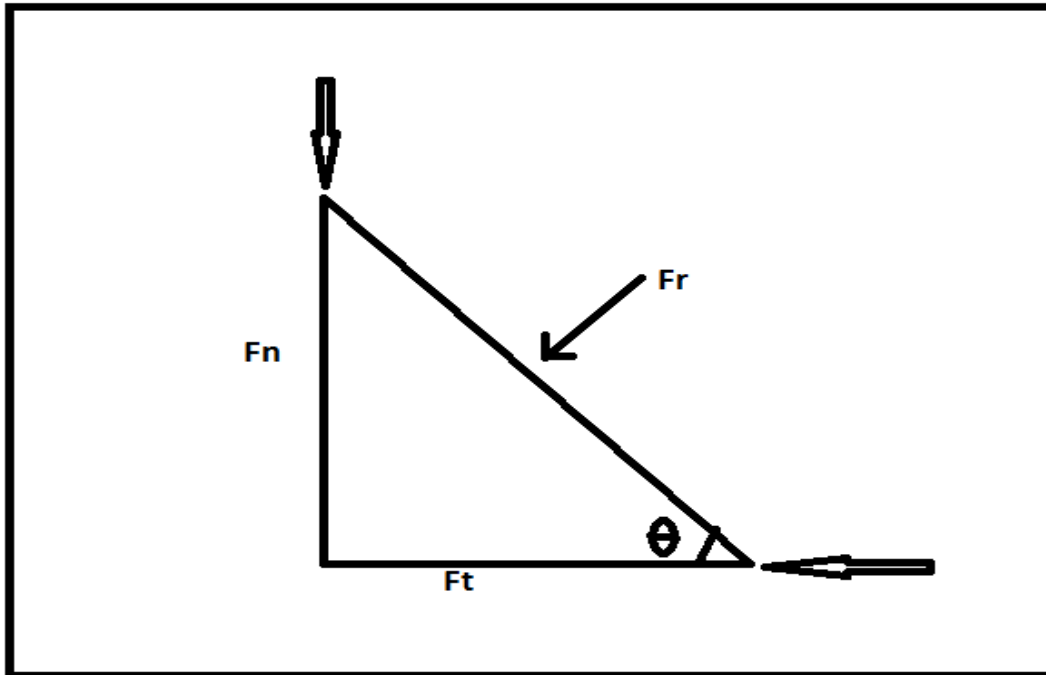
f_r = resultant force

θ = pressure angle

(It is the angle between the common normal to two gear teeth at the point of contact and the common tangent at the pitch point. It is usually denoted by ϕ . The standard pressure angles are 14.5° and 20°page no 1025-khurmi gupta)

Pressure angle = 20° (in this calculation we are assuming the pressure angle and this is the standard pressure value of the pinion in khurmi gupta reference book.)

Here we are using trigonometric concept. In the above diagram shown by three forces like transmitted force (F_t), normal force (F_n) and resultant force (F_r) then there will be one trigonometry geometry is created shown in following figure:



From the above diagram following formulas are created:

$$\tan\theta = \frac{\text{opposite side}}{\text{adjacent side}} \dots\dots\dots \text{(This is the trigonometry rule. Use above diagram)}$$

$$\tan\theta = \frac{F_n}{F_t}$$

Therefore;

$$F_n = F_t \tan \theta \dots\dots\dots (1)$$

But,

f_t = tangential force (weight of human)

$$= 60 \text{ kg}$$

$$f_t = 60 \times 9.81$$

$f_t = 588.6 \text{ N}$

Therefore above f_t value add in equation no (1)

$$f_n = 588.6 \times \tan 20^\circ$$

$f_n = 214.23 \text{ N}$

$$\cos\theta = \frac{\text{adjacent side}}{\text{hypotenous side}}$$

$$\cos\theta = \frac{f_t}{f_r}$$

therefore;

$$f_r = \frac{f_t}{\cos \theta} \dots\dots\dots(2)$$

$f_r = 626.38 \text{ N}$

Power (P) = $\frac{\text{Work}}{\text{time}}$ (3).....(this is the standard formula of the power. here finding the power of rack and pinion because how much of energy is using in rack and pinion)

$$P = \frac{\text{Force} \times \text{displacement}}{\text{time}}$$

$$P = \frac{588.6 \times 0.050}{1} \dots\dots\dots \text{(Here assuming the time and displacement)}$$

$P = 29.43 \text{ watt}$

$$P = \frac{2\pi NI}{60} \dots\dots\dots(4)$$

$$T = \frac{P \times 60}{2\pi N}$$

$$T = \frac{29.43 \times 60}{2 \times 3.142 \times 30} \dots\dots\dots \text{(Here assuming the minimum rpm value=30)}$$

$T = 9.3 \text{ N.m.}$

$$T = f_t \times r \dots\dots\dots(5)$$

$$r = \frac{T}{f_t}$$

$$= \frac{9.3}{588.6}$$

$r = 0.015 \text{ m}$

$r = 15 \text{ mm}$ (This is the radius of pinion)

Therefore;

$$D = 30 \text{ mm}$$

Using Lewis form factor,(this formula shown by maximum bending stress occurs at the tangent point on pinion)

$$\sigma_t = \frac{f_t \times P_d}{y.b} \dots\dots\dots(6)$$

Let,

P_d = diametrical pitch (It is the ratio of number of teeth to the pitch circle diameter in millimetres.

It denoted by p_d . mathematically,)

$$P_d = \frac{T}{\frac{D}{18}} \dots\dots\dots (7)$$

$$= \frac{30}{D}$$

$$P_d = 0.6 \text{ mm}^{-1}$$

Then, above value use in equation no(6)

$$\sigma_t = \frac{f_t \times P_d}{\frac{y \cdot b}{30 \times 0.308}}$$

$$\sigma_t = 38.22 \text{ N/mm}^2$$

$\sigma_{allow} = \frac{S_{ut}}{f_{os}} \dots\dots\dots (8)$ (this is the standard formula for finding the design is safe or not. and here S_{ut} value depend upon the material. And this is the standard value for M.S material)

$$= \frac{210}{2}$$

$$\sigma_{allow} = 105$$

So $\sigma_t \ll \sigma_{allow}$

So design is safe.

$$m = \frac{D}{T} \dots\dots\dots (9)$$

$$= \frac{30}{18}$$

$$m = 1.66$$

Then the module of pinion = 1.66

Also The module of rack = 1.66

Pinion dimension,

$$\text{Outer Dia.} = d_o = 2m + D \dots\dots\dots (10)$$

$$= 2 \times 1.66 + 30$$

$$d_o = 33.32 \text{ mm}$$

$$\text{Root dia.} (d_r) = D - (2m + 2C) \dots\dots\dots (11)$$

$$= 30 - (2 \times 1.66 + 2 \times 0.25)$$

$d_r = 26.18 \text{ mm}$

Addendum, $A_d = m$ (12)(Addendum meaning- the radial distance from the pitch circle of a pinion to the crests of the teeth or ridges.)

$$= 1.66$$

Dedendum, $D_d = m + c$ (13)(Dedendum meaning- he radial distances from the pitch circle of a pinion to the bottom of the tooth space or groove.)

$$= 1.66 + 0.25$$

$$D_d = 1.91$$

$D_d = 2 \text{ mm}$

Linear displacement of rack for one rotation of piston,

$$L = \pi m \times T \text{ (14)}$$

$$= \pi \times 1.66 \times 18$$

$$= 94.44$$

$L = 100 \text{ mm}$

Maximum length of rack is 100 mm.

Width of rack is 10m.





VI. ADVANTGES AND APPLICATION

ADVANTGES

1. Manual attempt in enticing the hand brake is reduced hence absolutely heading off human errors, reduce the guide paintings
2. Even though the motive force forgets to pull the hand brake in normal vehicle, the driving force can be in any critical situation however through the use of the concept of computerized handbrake device, there may be no opportunity of risk due to the fact by means of placing the ignition transfer OFF, the hand brake machine automatically receives locked.
3. Automatic Headlight alignment is a fee powerful answer for the problem of night time injuries occurring throughout two manner roads.
4. Improves parking overall performance on hilly slopes.
5. Simplified Installation is viable.

VII. APPLICATION

1. Four wheeler utility for parking functions on hill slopes.
2. This system can be utilized in heavy obligation automobiles including buses, vehicles etc.
3. To act as steerage fog headlamps in foggy regions.

VIII. CONCLUSION

The gift current commonplace light frameworks in automobile do not provide brightening the precise manner on bend streets. The theme of this assignment is guiding managed (or directional) headlights, that are commonly a specific association of headlights fitted to street automobiles next to the usual low shaft/high bar headlights and their detail is that they turn with the guiding, so the driver of the vehicle can see the curve, what he is in reality transforming into.

In this assignment we've got investigated that some of the parking injuries appear because of loss of attention on pulling the hand brakes on slopes. So we did the undertaking of automated hand brake device to avoid such injuries. The electromechanical parking brake enables with automated parking brake utility based totally on engine ignition condition. Our device assures secure parking on slopes and hill starts.

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