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International Engineering Research Journal (IERJ), Volume 3 Issue 4 Page 6880-6884, 2022 ISSN 2395-1621

# ISSN 2395-1621



# Design and Fabrication of Car Towing Machine

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# ABSTRACT

When the vehicle stop working in a middle of the road it can cause many problems like traffic or accident. In order to shift the vehicle aside of the road or carry to repair station we need to call the towing van/truck. By using Remote operated car towing machine we can shift the car to the side of the road without any use of towing vehicle and it require less effort. The main purpose of our project is to design and develop car towing machine, which is used to shift the car from one place to another place.

Keywords: Scissor Jack, E-Bike motor, Wiper motor, Chain sprocket etc

## I. INTRODUCTION

Towing may be as simple as a tractor pulling a tree stump. The most familiar form is the transport of disabled or otherwise indisposed vehicles by a tow truck or "wrecker." Other familiar forms are the tractor-trailer combination, and cargo or leisure vehicles coupled via ball or pintle and gudgeon trailer-hitches to smaller trucks and cars.

In the opposite extreme are extremely heavy duty tank recovery vehicles, and enormous ballast tractors involved in heavy hauling towing loads stretching into the millions of pounds. Necessarily, government and industry standards have been developed for carriers, lighting, and coupling to ensure safety and interoperability of towing equipment. Historically, barges were hauled along rivers or canals using tow ropes drawn by men or draught animals walking along towpaths on the banks. Later came chain boats.

Today, tug boats are used to maneuver larger vessels and barges. Over thousands of years the maritime industry has refined towing to a science. Aircraft tow one-another as well. Troop and cargo carrying gliders are towed behind powered aircraft, which remains a popular means of getting modern leisure gliders aloft. There are many safety considerations to properly towing a caravan or trailer / travel trailer starting with vehicle towing capacity and

# ARTICLE INFO

# **Article History**

Received: 10<sup>th</sup> May 2022 Received in revised form : 10<sup>th</sup> May 2022 Accepted : 13<sup>th</sup> May 2022 **Published online :** 13<sup>th</sup> May 2022

ranging through equalizer hitches to properly and legally connecting the safety chains.

Towing of cars and trucks is a unique in industry. Tow truck vehicles are most often to use in industry these days. The main aim of our project is to design and develop car towing machine which is helpful shift the car from one place to another place. Regular jack can only lift the car in same position but remote operated car towing machine can not only lift the vehicle but also it can shift the vehicle from one place to another place.



#### **Problem Statement:**

In 2006, Master Lock did their annual study on towing safety to see how many Americans tow their cargo correctly. The study, Towing Troubles included responses from trailer owners across the country and found that while the majority of trailer owners believe they know what they're doing when it comes to towing, most were lacking the proper education.

Master Lock reported that 70 percent of trailer owners did not fully know the correct way to tow their cargo. An important factor in towing safety is tongue weight, the weight with which the trailer presses down on the tow vehicle's hitch. Insufficient tongue weight can cause the trailer to sway back and forth when towed. Too much tongue weight can cause problems with the tow vehicle.

When the vehicle stop working in a middle of the road it can cause many problems like traffic or accident.

# II. METHODOLOGY

1. Raw materials: A raw material is the basic material used in the productions of the goods, finished products. The term "raw material" is used to denote material which is unprocessed.

2. Marking: Marking is the process of making visible impressions on the metal surface so that required operations can be carried out as per the dimensions

3. Cutting: The raw material cut into the required dimensions using a grinding bar cutter. Metal cutting is done by a relative motion between the work and piece and the hard edge cutting tool, which is multi point cutting tool.

4. Welding: The assembly of base table is done by the process of welding. In this case the process is done by "Arc Welding". Arc welding is type of welding that uses a welding power supply to create an electric arc between an electrode and the base material to melt the metal at the welding point. They can use either direct or alternating current, and consumable or non-consumable electrode.

5. Drilling: Drilling is easily the most common machining process. Drilling involves the creation of holes that are right circular cylinders. This is accomplished most typically by using the twist drill. The chips must exit through the flutes to the outside of the tool. The cutting front is embedded within the work piece, making cooling difficult. The cutting area can be flooded, coolant spray mist can be applied, or coolant can be delivered through the drill bit shaft.

6. Hand Grinding: Hand Grinding is the finishing process used to improve surface finish, abrade hard materials, and tighten the tolerance on the flat and cylindrical surface by removing the small amount of material. In grinding the abrasive material rubs against the metal part and removes the tiny pieces of material.

#### **III. PROPOSED DESIGN**







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# **IV. CALCULATION**

#### **Power Calculation**

**Torque = Force X Radius Spur gear** 

Human force required for rotating the disk = 225 NWhere,

Radius of spur gear (ro) = 75 mm,

**Torque = Force** x **Radius** 

= 225x 75

 $= 16875 \ N - mm$ 

4odel	Nominal Voltage	Nominal Power	No-load Current ≤ A		Stall Current ≤ A		No-load Speed rpm		Stall
			Low Speed	High Speed	Low Speed	High Speed	Low Speed	High Speed	≥ N.m
D1733	DC12V	150W	2.5	4.5	65		25 ± 5	35 ± 5	95
2D2733	DC24V		1.5	2.5	35				

**Table. 4.1 Motor Description** 

A worm gear is used when a large speed reduction ratio is required between crossed axis shafts which do not intersect. A basic helical gear can be used but the power which can be transmitted is low. A worm drive consists of a large diameter worm wheel with a worm screw meshing with teeth on the periphery of the worm wheel. The worm is similar to a screw and the worm wheel is similar to a section of a nut. As the worm is rotated, the worm wheel is caused to rotate due to the screw like action of the worm. The size of the worm gear set is generally based on the centre distance between the worm and the worm wheel. If the worm gears are machined basically as crossed helical gears the result is a highly stress point contact gear. However normally the worm wheel is cut with a concave as opposed to a straight width. This is called a single envelope worm gear set. If the worm is machined with a concave profile to effectively wrap around the worm wheel, the gear set is called a double enveloping worm gear set and has the highest power capacity for the size. Single enveloping gear sets require accurate alignment of the worm wheel to ensure full line tooth contact. Double enveloping gear sets require accurate alignment of both the worm and the worm wheel to obtain maximum face contact.



#### SELECTION OF BEARING

Spindle bearing will be subjected to purely medium radial loads; hence, we shall use ball bearings for our application.

Selecting; single Row deep groove ball bearing as follows; Series 62

ISI No	Bearing of Basic design	d	D1	D	D2	В	Basic capacity				
20BC02	6003z	17	10	35	30	9	10000	6550			

Table. 4.3 Specification of Bearing

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P = X F + Y F a For our application F a = o P = X F r Where F r = 204.5 N As; F r < e → X = 1 P = F r

Max radial load = F r = 204.5 N P = 204.5 N

Calculation dynamic load capacity of bearing L = (C) p where p =3 for ball bearings When P for ball Bearing For m/c used for eight hr. of service per day; L h = 12000- 20000 hr. But; L = 60 n L h L = 600 mrev Now; 600 = (C) 3 = (204.5)3 C =1724.8 N As the required dynamic capacity of bearing is less than the rated dynamic capacity Of bearing; Bearing is safe

Bearing



Fig. 4.4 Roller contact Bearing

## Design of Torque Transmitting Of Shafts (D):-

Design of Power transmission shaft considering fatigue load. Shaft material

Selected as C30 steel, diameter 10.80 mm, subjected to rotating bending

Fatigue Loading, fatigue factor =1.612 Assuming

K size = 0.85 K Surface = 0.83 K Reliability = 0.896Se' =  $0.5 \sigma$  ultimate = 245 mpa

 $Se = k \ size \times k \ surface \times k \ reliability \times 1/k_S \times se$ This fatigue strength calculated is less than endurance strength of standard C 30

Steel, shows that the design is safe. Power transmission consists of the following

Arrangements:-

- Motor with Standard specification
- Stepped pulley arrangement
- Leather trapezoidal section V belt to connect Motor driver shaft and driven shaft Vertically for better stability





Fig. 4.5 simply supported beam of shaft

 $Y_{max} = FL^{3}/48EI$ = **0.00249 mm** E= Young's Modulus N/mm<sup>2</sup> L=40 mm assumed  $\Sigma$  b e n d i n g = M/z (4) M= Moment, z= Section Modulus mm<sup>3</sup>  $\Sigma$  b e n d i n g = **79.66 N/mm<sup>2</sup>** 

## **MOTOR SPECIFICATIONS:**

Wiper Motor – Voltage = 12 V, Current = 1 Amp, Speed = 40 RPM

Power = 
$$V*I = 12$$
 W

$$P = \frac{2* \pi * N * T}{60}$$
$$12 = \frac{2* \pi * 40 * T}{60}$$

T = 2.8648 Nm

## V. CONCLUSION

The screw jack scissor lift was simple in use. It can also lift heavier loads. Material handling and providing comfort to the operator was our main motivation behind the developing this lift. With such design of scissor lift, the complexities in a design and fabrication time was reduced.

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