



## Design and fabrication of manually operated floor cleaner

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**Abstract :** Mechanically operated floor cleaner is a system that enables cleaning of the floor by the help of mechanical machine elements. The present work targets to use mechanically operated floor cleaner for large floor in house-hold purposes and office floors. The cleaning purpose is specifically carried out by continuous relative motion between a scrubber and the floor surface. During the cleaning and moving operation of vehicle a propulsion mechanism such as driven gear wheels and guide wheels for the dry tracking on the floor surface to be cleaned, supply of water is done by water tank, scrubbing action is done by the scrubber directing water towards rear end. Preferably, a sweeper mechanism is mounted on the body forwarded by propulsion mechanism and operated for sweeping of the floor surface. A pair of bevel gears is used to govern the motion of system which takes the input from the wheels and feeds it back to the brush.

**IndexTerms –** Guide wheels, bevel gears, disc brush, bearings, manual cleaning, gear speed ratio, etc.

### I. INTRODUCTION

Cleaning is the essential need of current time. Cleaning machines are very useful in cleaning floors, outside ground, inhospitals, houses, auditoriums, bus stands and public places etc. Many researchers have done so many works in evaluation of design of cleaning machine to give better outcomes, but many researchers were operating their machine with the help of any external source like electrical energy, but this machine has been designed in such a way that it can be operated by manual power and there is no need of electric energy or any other energy. For the above said purpose the manual power is transferred from the guide wheels through rotating shafts to bevel gear and it result to rotate the disc brush and floor cleaning work is performed, which makes this machine completely manually operated without any external source of energy, and its manufacture and design is also cheaper in cost and reliable for everyone. It is capable for the cleaning purpose of both dry and wet floor and easily transfer from one place to other due to its light weight and simple design. Also, a benefit is that it is environmentally friendly. The components have been used in designing this mechanically operated floor cleaning machine are steel bar, bevel gear, wheel, wooden clips, bearing, rod, wiper, chain socket, gear. Building maintenance is often characterized by an infinite series of drab, unclean, time- consuming, and unpleasant duties such as floor washing.

### II. METHODOLOGY

The system is assembled with a pair of existing wheels that rotates with the help of a shaft. The shaft and wheels are joined together. The wheels provide power to the gear through the chain mechanism, and the bevel gears are connected perpendicularly. The help of bevel gear rotates the brush. The revolutions start to move when we exert forces on this machine manually. As the wheel starts spinning, it becomes straightforward to move it forward or backward, and as the lower end of the machine is installed with a brush, the brush starts operating, cleaning the surface where it is interacting.

#### a. Bevel gear mechanism

A Bevel gear mechanism is a way of transmitting mechanical power from one shaft to another shaft. The pair of bevel gears are used in this mechanism is shown in the fig. 1, it is used to give power to the wheels.

Two wheels made of plastic material with dimensions of 200 mm in diameter and 30mm in thickness were fitted on the backside, as shown in fig. 2. One ball bearing of outer diameter 50mm was fitted on the front side for 360-degree rotation, as shown in fig. 2. A bevel gear has its axis perpendicular to each other, and the standard value of the gear ratio is 1:2. This gear is used for increasing the speed of the rotating disc brush; in this machine, the bevel gear's diameter is 35mm.

#### b. Bearings

There are two essential functions to which bearings are supposed to perform, and the bearing used in the machine is shown in fig.2 (a). These are:

- Motion transfer takes place, i.e., they guide and support components that move/turn relative to one another.
- Transmission of forces.

A cleaning brush (portable disc brush) with inner and outer diameters of 5 inches and 10 inches, respectively, was used, as shown in fig. 2(b). The cleaning brush is installed at the extreme lower portion of the machine and mounted with the bevel gears, which rotates it with the help of a chain and sprocket unit. The main work of the brush is to clean the floorsurfaces.



Fig 1. Bevel gear

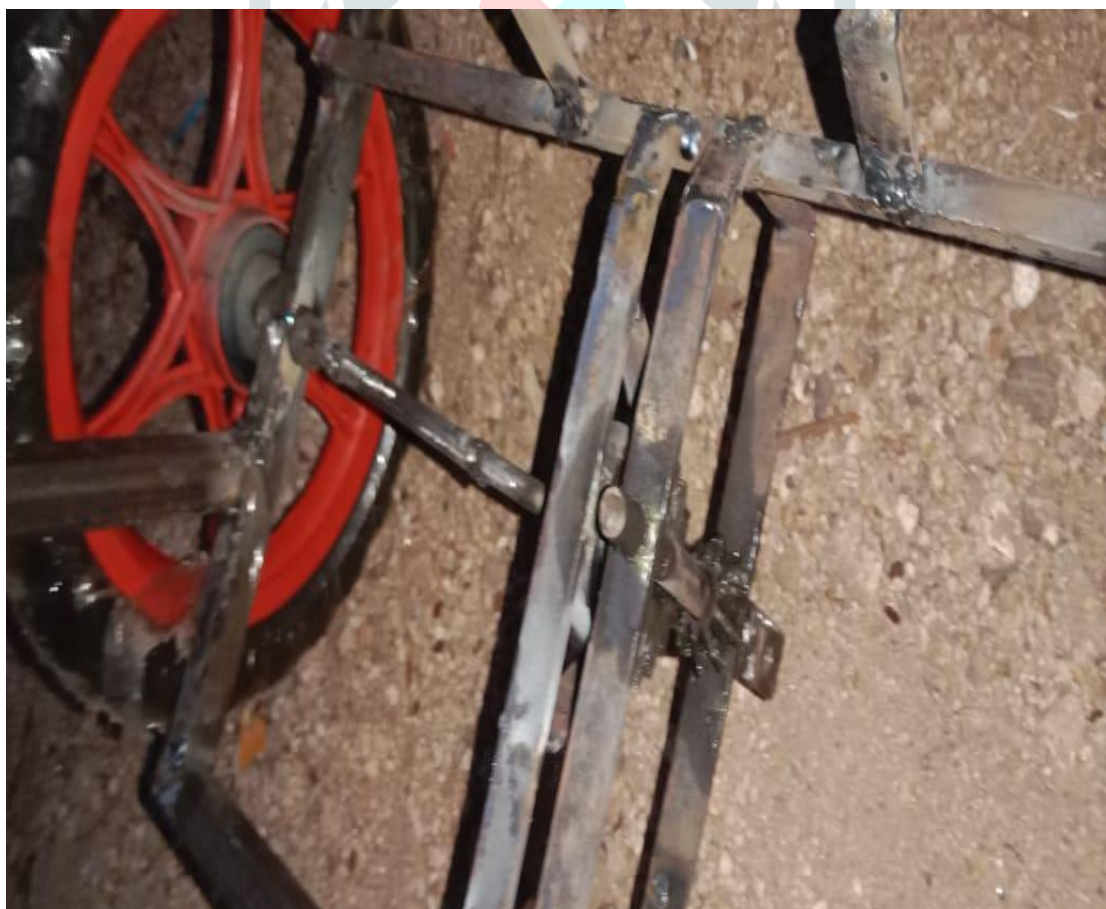


Fig 2. a) Roller bearings b) Pro-lite disc brush of 300mm diameter





**Fig 3.** Assembly of bevel gears



**Fig 4.** Coupling of wheel to bevel gear



Fig 5. Automatic floor cleaner with a water tank fitted above



Fig 6 . 10 liters Water tank mounted on chassis

### III. APPLICATIONS

- a. It is used for Floor cleaning Purpose.
- b. It is used for hospital cleaning.
- c. To clean bus stand areas.
- d. To clean railway station floor areas.



e. It is used to clean for all suitable areas.

#### IV. RESULTS AND DISCUSSION

Normal speed of humans = 1.4m/s

D = diameter of wheel = 200mm = 0.2m

V = Velocity of humans = 1.4 m/s =  $\frac{\pi DN}{60}$

Therefore, N = 134 rpm (Gear wheel)

N<sub>1</sub> = rpm of large gear wheel

N<sub>2</sub> = rpm of small gear wheel

T<sub>1</sub> = no. of teeth in large gear wheel = 20

T<sub>2</sub> = no. of teeth in small gear wheel = 10

VR (Velocity Ratio of Gear Drive) =  $\frac{N_1}{N_2} = \frac{T_2}{T_1}$

T<sub>1</sub> = number of teeth in gear = 20

T<sub>2</sub> = number of teeth in pinion = 10

Gear ratio =  $\frac{T_2}{T_1} = \frac{N_1}{N_2} = \frac{10}{20} = 0.5$

$$N_2 = \frac{N_1 \times T_1}{T_2} = \frac{134 \times 20}{10} = 268$$

N<sub>2</sub> = 268 RPM

So, N<sub>2</sub> is the speed of the brush which cleans the surface.

#### V. CONCLUSION

The present machine has been designed in such a way that it may work manually which has many advantages like it is environment friendly, low cost, reduces human effort and time. It is a good option in current scenario because as we can see energy crisis or energy shortage is in limelight all over the world. It is capable to operate easily by the help of hands with negligible risk. The mechanically operated floor cleaning machine can be used in place of room cleaning and reduces the human effort. It effects

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