

A Mechanism for Seat Adjustment of Two-Wheeler Vehicles

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ABSTRACT: The use of two wheelers has increased in the last few years. In countries like India, China, Indonesia etc, there are large number of people using CVT or non-gear type two-wheeler, electric bikes and it is increasing day by day. However, there have been drawback: the seat of the vehicle comes at a certain fixed height. People of different heights find it difficult to adjust it to this condition and as a result they are not comfortable while driving the vehicle. The described mechanism provides a method to change the height of the seat by allowing a simple vertical motion so that people of varying height can adjust the seat as per their need. The size and cost of the mechanism are kept economical and the mechanism can be installed in any two-wheeler vehicle.

KEYWORDS: Mechanism, adjustable seat, two wheelers.

I. INTRODUCTION

The CVT type two-wheeler vehicles or scooters used today all over the world mostly comes with a fixed seat. They are provided with no provision for seat adjustment. Even the height of all the vehicles is not the same. Due to this not all the people are comfortable with these vehicles. Currently there are large number of people facing this difficulty and with no solution provided they are forced to drive like that. These large number of people mostly include those with a shorter height. To reduce this difficulty an effort has been made in the described mechanism.

The mechanism is designed to cater the need of providing vertical motion to the seat of any such two-wheeler without occupying much space or increasing the weight. It should also not have any effect on the overall performance maintaining the ergonomics of the vehicle. Considering all these constraints a simple mechanism is designed to serve the desired function with minimum number of components. The mechanism consists of a screw, hex nuts, support frame for the seat inside which two nuts are placed, bearings, circular rubber knob for rotary movement, support frame of C-Section for connecting the whole assembly on the chassis of the vehicle. The bearings are press fitted on this frame and it is firmly welded to the chassis member of vehicle. As per the design of chassis this frame can be used in variety of two-wheelers. The main component of this mechanism is the screw. The screw has threading up to some length on upper side followed by plane diameter cylinder till the bottom end. The length up to which, threading is provided is decided by the total amount of vertical displacement needed and may vary for different models. For proper fit of bearing and rubber knob the remaining length of screw is kept plane cylindrical. The rubber knob is used to transfer the hand force to the screw. The rubber knob used can be any low cost, durable rubber which has good grip on surface. This knob is designed to be moved by hand and a small window will be provided in vehicle panel to access the knob.

The mechanism mainly consists of a power screw, a power screw is a simple device which converts rotary motion to linear motion. This property of power screw is used for providing motion to the seat in vertical direction. The designed screw is placed in vertical position below the extreme front end of the seat. The screw is supported at two points through the bearings which are fitted in the support structure denoted as frame 2. A supporting hollow rectangular frame denoted as frame 1 is designed to transfer the linear motion of screw to the seat, this frame is connected through bolts to the hinge of the seat. This allows the hinge and seat to move by same amount and as a single unit. The frame 1 consists of two standard hex nuts welded on inner side which allows the frame to slide up and down the screw. The

International Journal of Innovative Research in Science, Engineering and Technology

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Vol. 8, Issue 9, September 2019

screw rotates in the bearing without having any linear movement. Initially the frame 1 is at the top end of the screw with the lower nut fitted on the screw. This position is the maximum height to which seat is raised. Beyond this position the seat cannot be lifted, this is the position provided by the company. When any person wants to lower this height of the seat, by rotating the rubber knob towards left side the screw will rotate in anticlockwise direction. As a result, the nut and the frame 1 will begin to slide down the screw linearly. This will lower the seat by desired amount. When the seat is lowered to required position the rotation of gear knob is stopped. Due to the friction in screw and nut threads the position is locked. Then to raise the seat back to original or for slight adjustment the knob is rotated towards right side. This will rotate the screw in clockwise direction and the nut along with frame will slide up. Thus, by simple rotation of screw the seat height can be easily adjusted.

To reduce the number of rotations to be given to the knob and thus to give greater output of nuts linear motion the screw used has multi start threads. This enables the nut to cover larger distance per revolution of the screw rotated by knob. The knob also serves as a force multiplier, the hand force applied to the knob gets multiplied by the distance equal to the radius of knob and this increased force is then transmitted to the screw.

The mechanism is designed for maximum economy, the number of components used are kept minimum, standard and locally available parts are used, due to this the weight and the cost of the mechanism are comparatively lower. Under loaded condition the whole weight of the seat and the driver is supported by the screw, the screw is designed considering this load. The mechanism operates manually so that the driver has to come down from the vehicle and adjust the seat height as needed. The reason for not using any motor is that adding a motor makes the mechanism automatic, which means that people would just adjust the mechanism in loaded condition that is while sitting on the vehicle. This would then require a motor of such high capacity of lifting the load, also the screw used is to be designed for high wear and more superior material. This would have led to a high increase in the cost. Also adding a motor and its electric circuit to the battery would make it complex heavy and difficult to be modified for different types of two-wheelers. This means that for every different model a specific mechanism has to be designed for example-design of electric circuit would be different for electric vehicles and non-electric vehicles. So custom parts are needed to be manufactured increasing design and overall cost. Unlike that the mentioned system is designed with standard components so that the mechanism can be used for any vehicle. This is the major advantage of the mechanism that it can be fitted to any such vehicle type already designed and in use as well as to new designs.

II. RELATED WORK

There are few models of different brands which offer a solution to the fixed seat. One such solution has an arrangement provided below the seat in the storage compartment which is also manually adjustable. But in this solution the direction of lifting the seat and accessing the storage compartment is reversed. In most of the two wheelers the seat has a hinge joint below its front end due to which it swivels about front end. But this model works opposite to that of most of the vehicles. It has a hinge joint at the rear end, lifting the front part of the seat. This makes the mechanism complex as it has to accommodate the locking mechanism for the seat. This makes the design complicated and cannot be applied to any model, it is specific to the model. Unlike this the proposed mechanism is universal and can be applied to wide range of models of different brands and different manufacturing. Also, it does not affect any other part or system of the vehicle. Specially the designed seat angle remains unaffected as the hinge moves along with the seat.

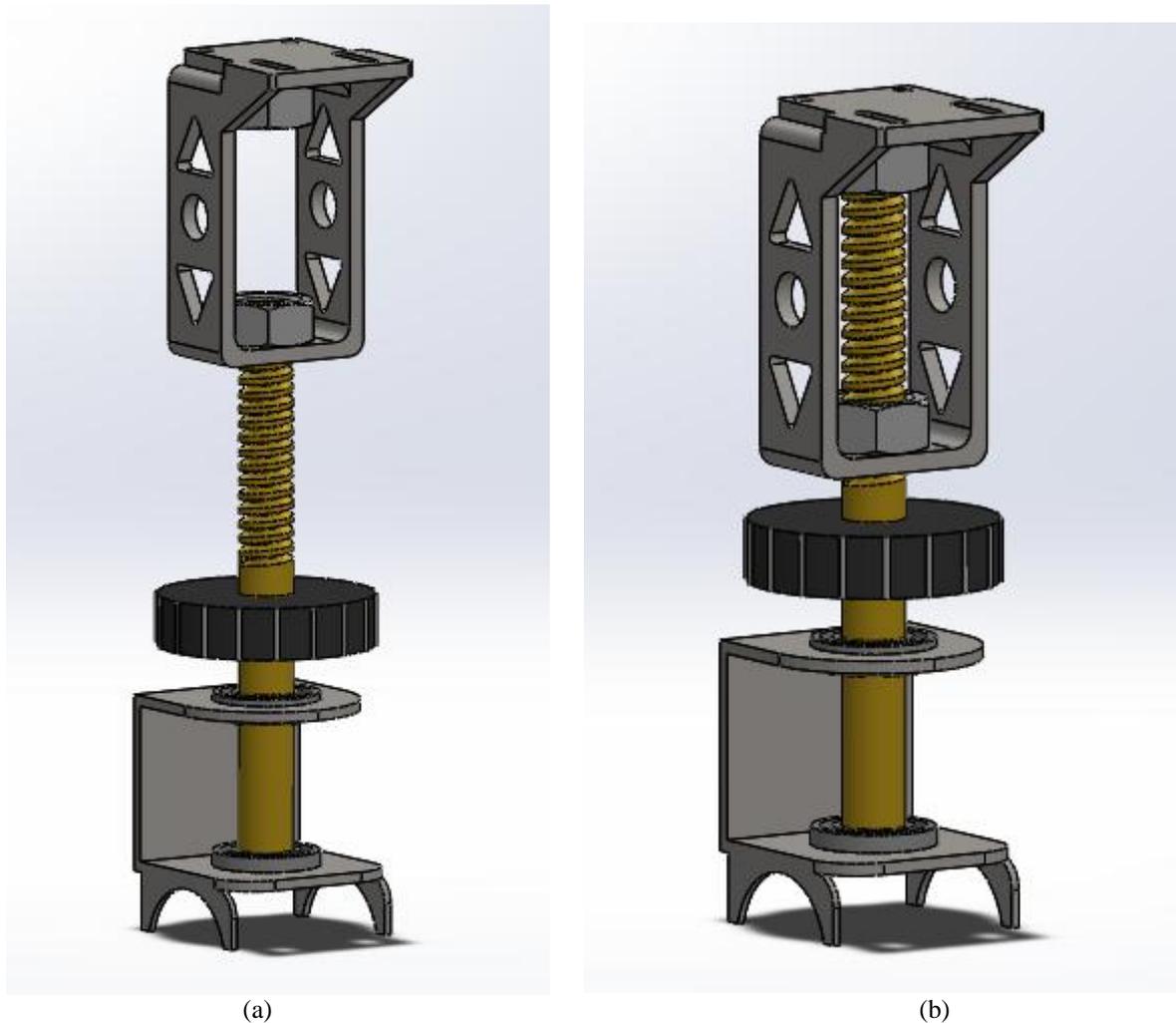


Fig.a. Shows the Frame 1 at maximum height position
Fig.b.Shows the Frame 1 at minimum height position

III. EXPERIMENTAL RESULTS

In order to validate the mechanism, the load taking members of the mechanism were analysed on an analysis software.

To study the actual behaviour of the mechanism following sample design calculations were used, accordingly analysis was done and the results of the same are shown in below diagrams. These diagrams include stress diagram, deformation diagram and factor of safety diagram. The following is a sample calculation but the mechanism can be designed for different loads depending on design requirement.

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Vol. 8, Issue 9, September 2019

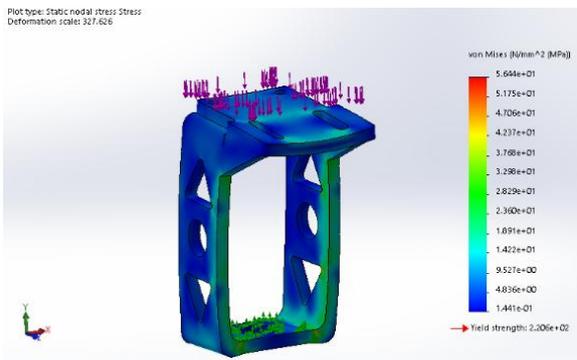
Given: load= $W=2000N$

Material- 40C8 plain carbon steel for screw, factor of safety 2, double start thread with pitch of 1.5mm.

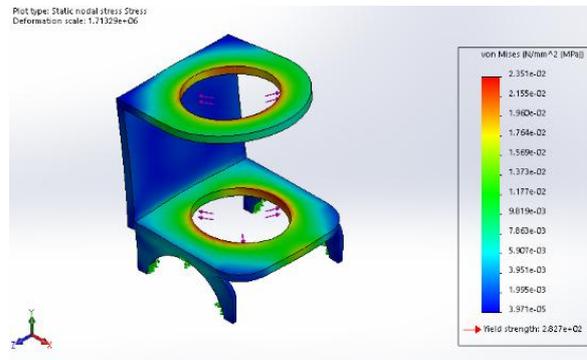
Assuming angle of friction=1.5

Based on above conditions the screw selected is of 10mm diameter, whereas efficiency of the screw is 40%.

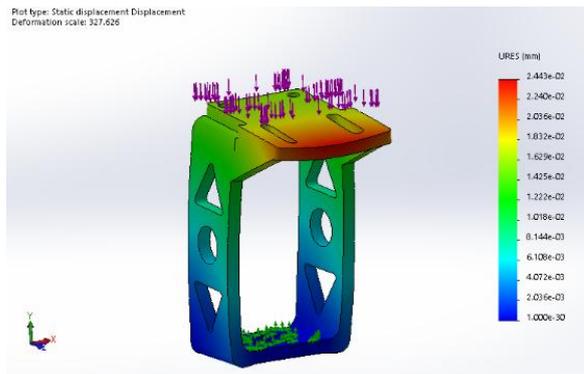
The following Figures shows the results of analysis performed under given load, how the designed screw function under the given load is indicated by the stress in the body, deformation produced, and factor of safety condition in the component. In Figs. 1, 2, 3, (c) shows the stresses in different components. (d) shows the deformation produced in the component. (e) shows the factor of safety



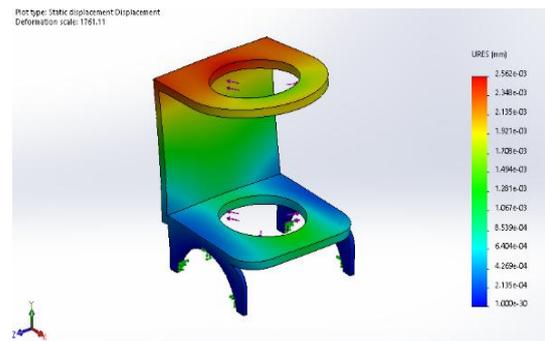
1(c)



2(c)



1(d)



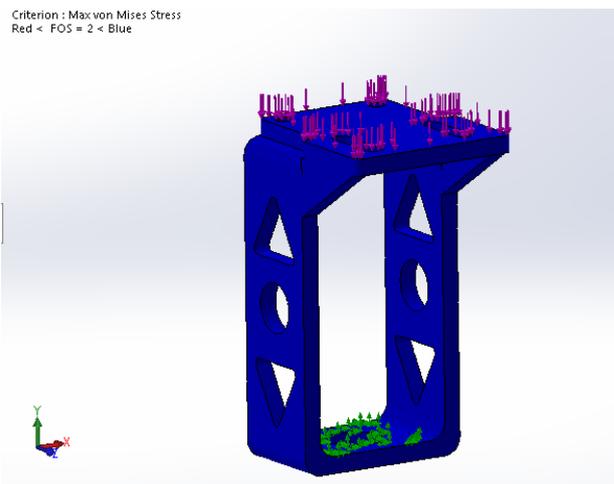
2(d)

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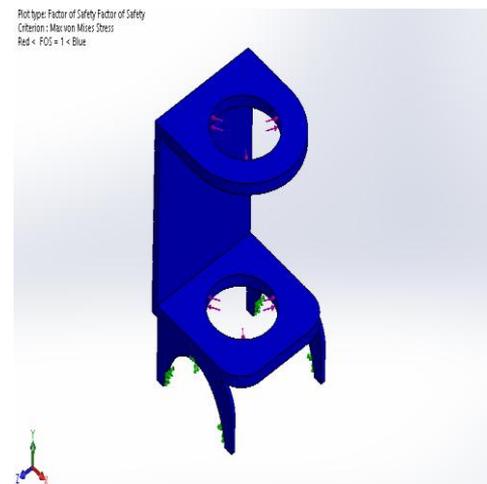
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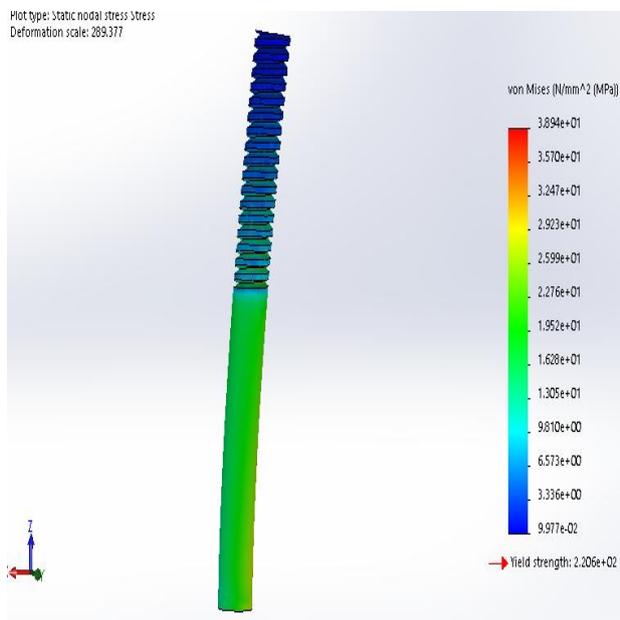
Vol. 8, Issue 9, September 2019



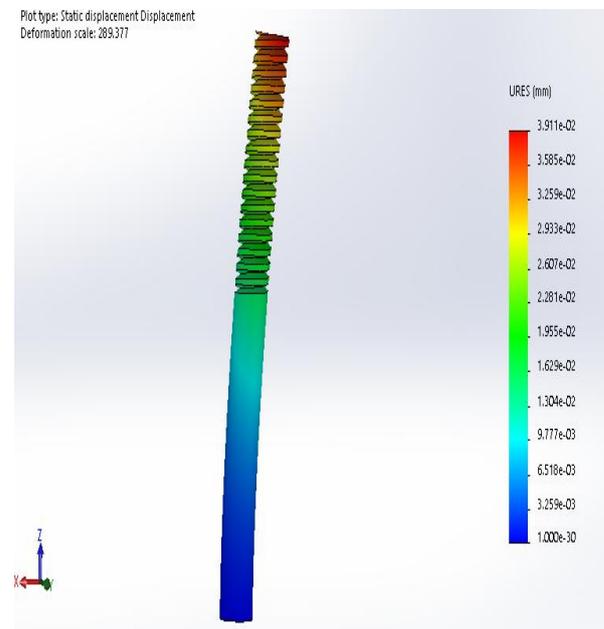
1(e)



2(e)



3(c)



3(d)

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Vol. 8, Issue 9, September 2019

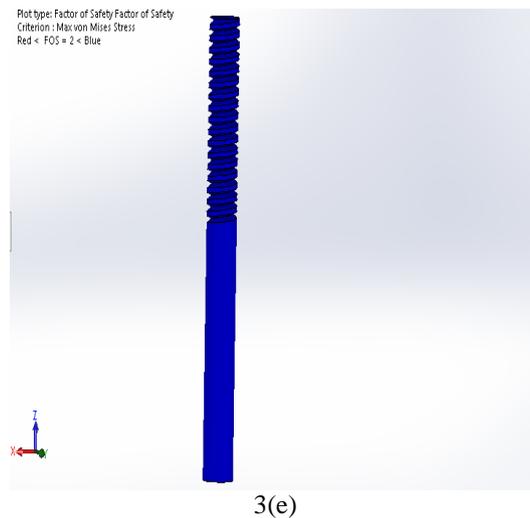


Fig.1. Analysis of Frame 1

Fig.2. Analysis of Frame 2

Fig.3. Analysis of Power Screw

IV. CONCLUSION

We have designed a simple, effective and economical mechanism that can be fitted to any model with minute changes, also the mechanism can be used for already designed and in use vehicle as well as for future vehicles. The mechanism can also be made automatic in future.

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