

# Design and Manufacturing of Versatile Driver

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**Abstract:** The driver may be less efficient for the operator or user and it may be difficult for the elderly or female to unscrew and tighten the screw. We developed a versatile driver that can increase the power and work efficiently by combining a ratchet wrench and a ball plunger in the driver.

## 1. Background and Purpose

In recent generations of convenience and smarter, it is true that the use of tools by hand is much less than in the past. However, we do not think the day when we will not use the tool completely will come in the future. Soldiers, housewife, children and elderly people, regardless of age and sex, use a screwdriver to tighten or loosen screws. Existing drivers, however, make them feel uncomfortable and burdensome for women, the older and those who are not familiar with tools.

In fact, DIY (Do It Yourself) furniture, which be made from semi-processed materials such as pillars, lathes, doors and tops, are in the market as a finished product and manufactured at a low price of 10-20% since 1997. It is quite inconvenience to use the existing driver in a narrow space during maintenance.

For this reason, we felt the necessity of a new driver that can be easily used by anyone in terms of physical aspects and safety, and we came up with an "Versatile Driver". The purpose of this design is to design and prototype a universal driver using the existing ballpoint pen and the new ratchet wrench principle.

The principles and analysis of the ratchet wrench and the ball plunger will help you understand how it works. Next, design each part using Auto-CAD. Then, prototypes be made through theoretical formulas and strength analysis is carried out using ABAQUS and HYPERMASH. Finally, we want to

make a product based on the design.

## 2. Concept and Idea SCREW DRIVER

The principle of the driver is the principle of the wheel. A shaft is a tool that be used frequently in our life by fixing a small wheel and a large wheel on one shaft and rotating together. The wheel be also called a "rotating lever" because the big wheel is connected to the center of the small wheel so that the wheels of both wheels rotate together and generate the power by changing the size of the wheel and applying the principle of the lever.

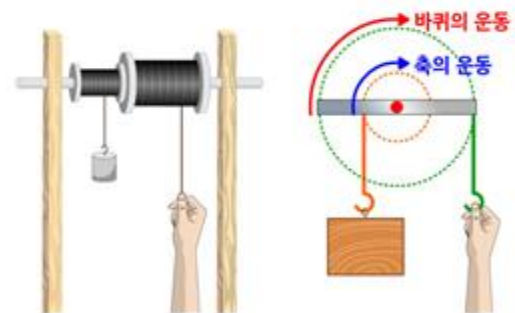


Fig.1 The appearance of the wheel.

The weight of the object multiplied by the radius of the small wheel is equal to the force pulling the line multiplied by the radius of the big wheel. If the ratio of the small wheels of the wheel to the radius of the large wheel is 1:2, the object can be lifted even if only half the weight of the object hanging on the small wheel. You can benefit from this power, but as with any other tool, you will lose as much as you travel. An object suspended on a small wheel must be pulled two times longer

than the actual moving height of the wheel. Because you have to turn more wheels as much as you see the power gain, you can see that the amount of work is the same as when you did not use the wheel.

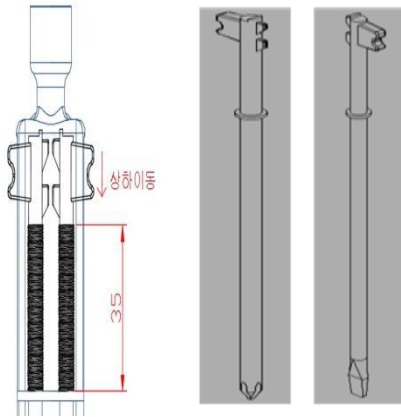


Fig.2 Component of Products.

### 3. Design and Functions

The "Versatile driver" of this product is made to be able to cope flexibly according to the situation because the cross shape bit and the straight shape bit are connected together.

In Fig.2, the inside of the main body frame is cross-shaped with one driver bit and the opposite driver bit is formed into a straight line, and the spring formed on each bit bar is fastened. It is a way to switch the beat easily like a multi-color

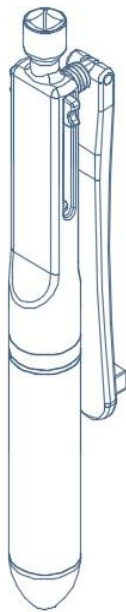


Fig.3 Versatile Driver Design.

ballpoint pen. If cross bits are used, only the cross bits are taken out under the frame, and when the date bits are used, only the date shape bits can be taken out to the bottom of the frame. If both are not used, the stability of the tool is also taken into consideration by designing to insert the pointed cross bit into the frame.

### 4. Problems and Future Work

In this paper, we propose a more convenient 'universal driver' by supplementing the disadvantages of drivers commonly used in industrial or general households. The principle of the driver is the tool which uses the principle of the axle. By complementing the disadvantages of the existing driver, it is possible to flexibly and promptly cope with work by applying a cross shape bit and a straight shape bit to a product. Also, women, children, and the old have difficulty in using strong hand tools. To solve these problems, we developed a product that can tighten screws with a small force by applying an auxiliary frame using the principle of lever. 3D modeling through Auto-CAD, CATIA and ABAQUS are used for designing each part. The material of the product are determined based on the stress, bending degree, and calculated the safety factor calculated during the design process. The material of the product is 4032-T6 aluminum alloy, making the product more portable by making a product that is hard and lightweight. In the future, the process of increasing the efficiency of work by applying the ratchet function to the auxiliary frame, which takes charge of the lever of the product, remains as a future task.