

Novel wood screw

IDEA NATIONAL THIRD

Mahabir Choubey (48) living in Kashipur village in Purulia, West Bengal has a family consisting of his wife, two daughters and a son. Presently he earns his living from a small business of courier franchisee and battery charging. In spite of financial hardships, he has tried to give proper education to his children-his son is doing his B-Tech in Computer Science, his eldest daughter has completed her Physics honours and his youngest daughter is in the 11th standard. He remembers that at times circumstances were so strained that he had to sell all their jewellery and mortgage their land to make both ends meet. His monthly income is Rs.1600-2000.

Genesis Mahabir's innovative idea is based on the elasticity of materials- wood in this case. His logic is that when a screw is driven into wood, some wood is pushed away which tends to return to its original state. This exerts an opposite force on the screw (though weak) due to which the screw gets loosened over time. This phenomenon is accentuated if the wood is in a state of constant vibration and therefore the conventional screw sometimes comes out automatically. To mitigate this 'natural' tendency, Mahabir thought of making some grooves in the screw. This would allow some wood to occupy this space thereby reducing the opposite force and rendering a locking mechanism at the place of the grooves. Mahabir felt that the screw should be made with both threads and grooves, so that it will have increased grip due to the threads that cut into the wood and the wood in the grooves would provide extra locking. Based on this idea a prototype was later made.

The Innovative idea

The innovation is a wooden screw, which has combined the features of the conventional wooden screw (threaded

conical front) and metal stud (constant pitch intermediate thread). The novel screw thus comprises a head portion provided integrally with the body portion. The screw is tapered at the tip and the remaining portion possesses constant diametrical threaded pitch like the conventional metal screw/stud. The thread portion has a combination of common threads being provided on the body portion along with special kind of threads being provided at an inclination with respect to the common thread. There is also an unthreaded portion along the constant diametric length like the stud used in engine heads. The heads are slotted so that they can be driven by a screw driver. Due to the use of Seller's / ACME type of threads, stress concentration becomes less and thus reduces subsequent failure (cracks) that occurs in the wood.

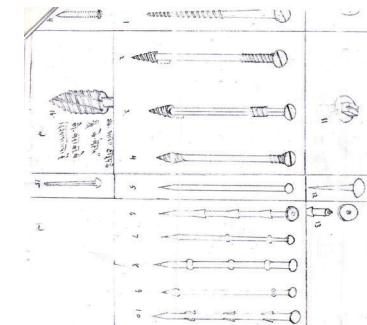
Advantages

The tapered and threaded head of this screw facilitates easy movement into the work piece. This screw has an advantage of cutting its own threads when it is being screwed in for fastening purpose. Less effort is required to drive it in. Whereas



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in the conventional screw, considerable force or pressure is required to drive the screw into any wooden structure. There is also greater possibility of the wood cracking around the place where the screw has been driven into the wooden structure. But in Mahabir's screw, due to the use of Seller's /ACME type of threads, stress concentration becomes less and thus reduces subsequent failure (cracks) that occurs in the wood. This novel screw will also not become loose after some time, as it is broader at its tip and the cross sectional wedges around the screw (3-4) give it a better locking mechanism or grip. On the other hand, in the novel screw, even if the head breaks, the screw can be pulled out due to modified head configuration. A combination of inclined thread provides better gripping capacity and it requires no tapping unlike conventional metal screw. In the conventional screw, sometimes the groove in the head of the screw breaks and it becomes impossible to fix a screw driver on the screw. This becomes even more irksome if the head of the screw breaks after it has been driven into the wood and then it becomes almost impossible to pull out the screw again. On the other hand, in the novel screw, even if the head breaks, the screw can be pulled out due to modified head configuration. A combination of inclined thread provides better gripping capacity and it requires no tapping unlike conventional metal screw.

Current status

NIF has filed a patent application on his behalf for the novel screw(06/KOL/2004, 06/01/2004). NIF has also sanctioned him a sum of Rs.4, 366 from the Micro Venture Innovation Fund for prototype development and testing of the Novel Wooden screw. Pull out test on this novel screw was carried out by the Applied Mechanics Department, L.D. College of Engineering, Ahmedabad and the results show that there is an improvement in this screw in terms of holding capacity (therefore there is an observed increment in pullout load) as compared to the M.S. Normal screw.

A plethora of ideas

Mahabir Choubey is a man of action with a very progressive and innovative mind. Though he has

studied only till the seventh standard, he has a reasonable understanding of some of the scientific principles and technological developments. From childhood he refused to accept imposed concepts and rules unquestioningly. He had developed new ideas and fabricated some models/prototypes in the past-including an analog Robot (this analog automated device was developed by him towards the end of the 70s/early 80s when transistors and ICs were not much in use). He also experimented with running two-wheelers by Hydrogen in the mid 80s (definitely ahead of time), but couldn't pursue it further for various reasons. A serial innovator, Mahabir's mind is always buzzing with ideas and that too in diverse fields.

A number of his ideas are detailed below:

Smokeless Oven

The innovator has developed a smokeless oven with a narrow neck made of three units joined together whereby the smoke is let out through an exhaust chute without discomfiture to the user. Inlet holes for air flow and subsequent cleaning of soot and deposits are located at the bottom and the heat is captured effectively in the belly shaped pot interior. A top component with a narrow neck for guiding the heat and reducing the smoke along with a bottom stopper for the stove is provided. Locally available clay is used and the exhaust could be a tin/metal pipe. The basic unit would cost Rs 12 as per the innovator. This device would reduce the problem of smoke entering the eyes and pollution and would thus make a significant difference to the health and comfort of women who generally use the stove.

A method of minimising friction in bearings

In conventional ball bearings, steel balls are placed in the annular space between two annular metal rings. The balls are kept separated from each other and held in place by thin metal foil, called separator. During motion considerable friction occurs between the metallic foil and the balls. This raises the temperature of the bearing beyond the desired limit and it increases the requirement of lubrication. Mahabir's idea is to introduce small size rollers in place of the conventional separators.

He feels that this will reduce friction as well as lubrication requirement due to point contact between the roller and balls.

An indigenous recordable stethoscope

Concerned about the fact that medical facilities are not always easily available in rural areas, Mahabir got the idea of making a local stethoscope –using a plastic/ metal funnel with a condenser microphone installed inside it. The microphone socket would be attached to a tape recorder and the heart beat is recorded in the tape recorder in a cassette. This cassette can be taken to the doctor and the patient doesn't need to be moved. He feels that even an ECG can be taken by connecting this recorded sound to the relevant machine.

Improved bricks

Mahabir had noticed that the bricks, used to make houses in his area, are made from yellow soil with which sand and water are mixed. These bricks are dried and then baked in a furnace. But it has been observed that these bricks are not very strong and disintegrate easily. So his idea is that if soda is mixed with the raw material, the bricks will become stronger and long-lasting. He thought of this idea by looking at the method of making glass.

Spreading the innovative spirit

Such is his passion for rationality, creativity and scientific temper that he spearheaded a youth science movement in his area –mainly with his own money, despite his limited income. The main objective of this movement is to popularise science and create awareness about science among the masses. The movement is also involved in recognising young talents (in diverse fields like science, arts, sports and so on), challenging age-old superstitions prevalent in the region as well as preserving local history and culture. Mahabir has also developed a photo- archive of Jain relics and some fossils too and some of the findings were endorsed by relevant experts. Mahabir feels, *"In villages there is no internet, modern facilities etc hence why people with ideas cannot go further"* and that has inspired him to do his bit in the service of society. His work has been featured in various newspapers such as Ananda Bazaar Patrika, Purulia Samachar etc

Mahabir also has a suggestion that there should be a fund which can help innovators when they are in dire financial crisis (not necessarily just for innovations, but for other livelihood emergencies). From his own experience he feels that such a support system is very much needed for the survival of innovators.