Messages from Modern Inventors to the Next Generation

Season 2

4. *Self-Locking Nut* – Mr. Katsuhiko Wakabayashi, President, HARD LOCK Industry, Co., Ltd.

A “screw” is used to hold together objects. For safety reasons, it is crucial that the screw does not loosen, that is, the two objects do not come apart.

“Nuts that do not loosen” were developed by Mr. Wakabayashi and are used in such places as transmission towers, nuclear power plants and bullet train cars – where “there would be trouble if the screw came loose” – and keep our lives safe.

Actually, the principle used in this product came to Mr. Wakabayashi in a flash when he was looking at an object that had existed since ancient times in Japan.

What inspired you to become an inventor/researcher?

When I was in the fourth grade of elementary school, I was evacuated to the countryside from the city because of the war. One day, I saw a woman planting soybean seeds in a field and painfully stretching her back each time she bent over to plant a seed, and I wondered if there wasn’t an easier way to plant seeds. I came up with the idea of drilling equally spaced small holes on the outside of a round can, which I saw lying nearby, and of rolling the can on the field with both hands to neatly plant seeds on the ridges in the field. So I made this gadget on a trial basis right away. The grown-ups around me were delighted and highly praised the gadget. I also made a small-sized air blower after seeing grown-ups having difficulty in starting a fire in a furnace. The grown-ups were also very impressed with this air blower, and one of them made the same air blower and handed them out in the neighborhood. Seeing people rejoicing, a sense of joy welled up within me, and this

memory was imprinted in my mind as a child. This feeling has lasted in my mind all these years and has been the primary basis for my present development of products.

What specific ideas and difficulties have you faced as an inventor/researcher?

"Hard Lock Nuts" came into being out of the sheer desire to escape from customer complaints about loosened nuts. At the time, I was spending my days thinking night and day about the perfect self-locking nut that could withstand any kind of shock or vibration. Then one day, when I saw wedges used for a gate (i.e., *torii*) at a Shinto shrine, I suddenly hit upon an idea. I envisioned that by applying the principle of the wedge, which has been used in wooden architecture over the years since ancient times, it might be possible to create a self-locking nut that could withstand any kind of shock or vibration. After much trial and error, I gave up on realizing the idea with a single nut and came up with the idea of using two different nuts, a concave nut and a convex nut, with one serving as a wedge and the other as a hammer. The upper nut with the concave bottom was screwed onto the lower nut with the convex top. The convex top of the lower nut served as a wedge and with the eccentric structure on the top surface of the lower nut, force was generated not only in the vertical direction but also in the lateral direction, which resulted in creating a powerful self-locking effect. This is how the "Hard Lock Nut that absolutely does not loosen" was developed.

Hard Lock Nut

What gives you joy as an inventor/researcher?

The research on the "Hard Lock Nut" took a whole year involving hundreds of different ideas until the goal was finally accomplished. Since I was able to genuinely understand that developing an idea into a product could only be accomplished when you do not give up halfway through and persistently keep on carrying out research, the joy that filled my heart was that much greater.

"No pain, no gain." I think life itself is hidden in this proverb, and the way of life implied by the proverb is inevitable for those engaged in R&D. You cannot develop new things while taking it easy.

I believe that you are able to perceive something new through winning over the battle against yourself at all times and facing various situations in carrying forward your research step by step.

When you reach the stage where you are able to glimpse a new thing, more than 50% of the groundwork for development has been set, and as a result, what should be done will become apparent. It is then the stage to confirm these things. You will still suffer much at this implementation stage in the battle against yourself, but at the root of this suffering, you can imagine the joy you will feel when the product is finished and people being delighted to use the new product. So you will not waver in pursuing your goal, and the temporary suffering gradually changes to pleasure.

The joy you feel upon completing the development of a product through hard work is like walking on air and cannot be expressed in words. The accomplishment gives you the greatest pleasure and joy when you consider the fact that the product will be for the good of the world and humanity.

What message would you like to give to future generations?

Sufficient preparation is required to develop an idea into a product. As part of the preparation, I have a basic philosophy that I follow, which is “Cultivate open-minded creativity to create things from nothing and develop the results.”

What I mean by “cultivate open-minded creativity” is that in preparation for developing an idea, you need to tentatively accept everything and foster yourself so that you can respond to various environments.

“Create things from nothing” means that coming up with ideas involves things that cannot be seen. Combining product A with product B will result in a completely new product C. In other words, the choice of different products to combine determines whether the end product is good or bad.

“Develop the results” refers to adding value to ideas and elevating them to something effective.

In short, ideas are already present but invisible, and new products appear through various combinations of these unseen ideas. Nevertheless, I believe it is essentially important to be curious about everything around you and earnestly work on developing ideas that please people.

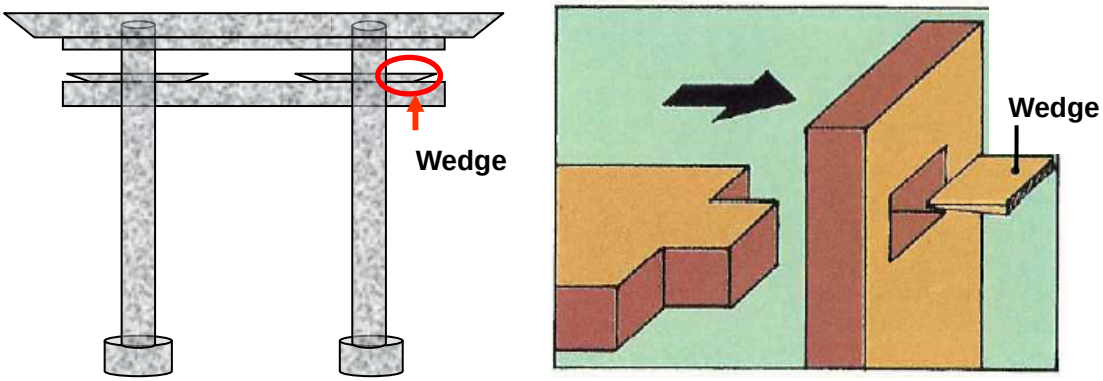

Diagram of the Principle of a Wedge used in Torii Gates

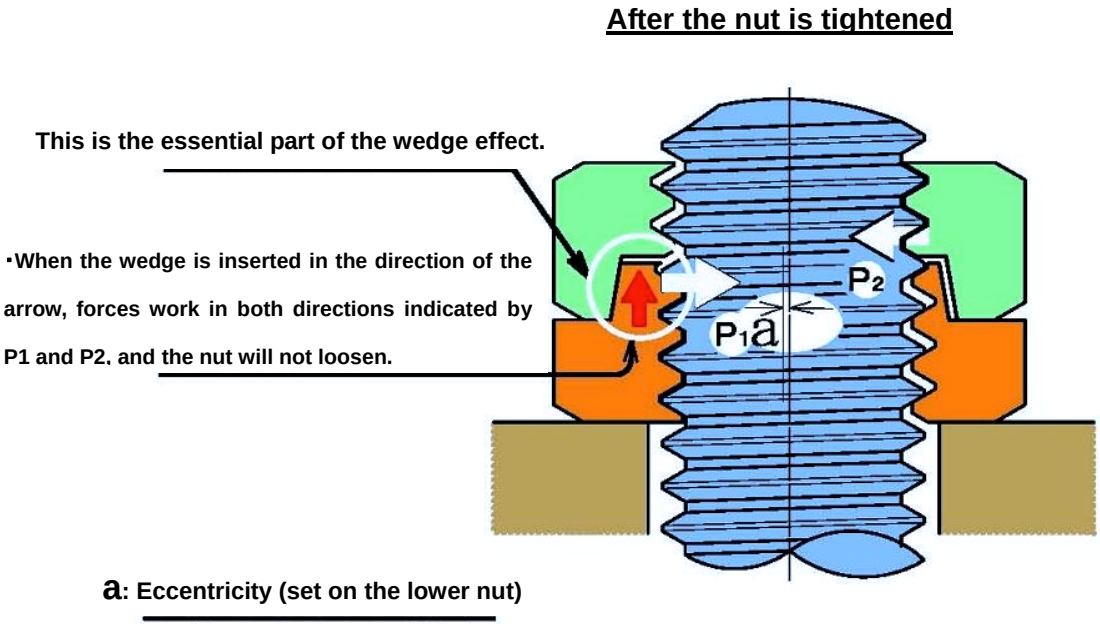

Diagram of the Principle of Hard Lock Nut