

Phenomenon Called Thread Alias from the Snail to IT Revolution

by Jozef Dominik

Fig. 1

“Those who are enamored of practice without theory are like a pilot who goes into a ship without rudder or compass and never has any certainty where he is going.”

.....Leonardo da Vinci

“Screw connection is not a soulless monster but a living organism with its own life”.

.....Screw's axiom

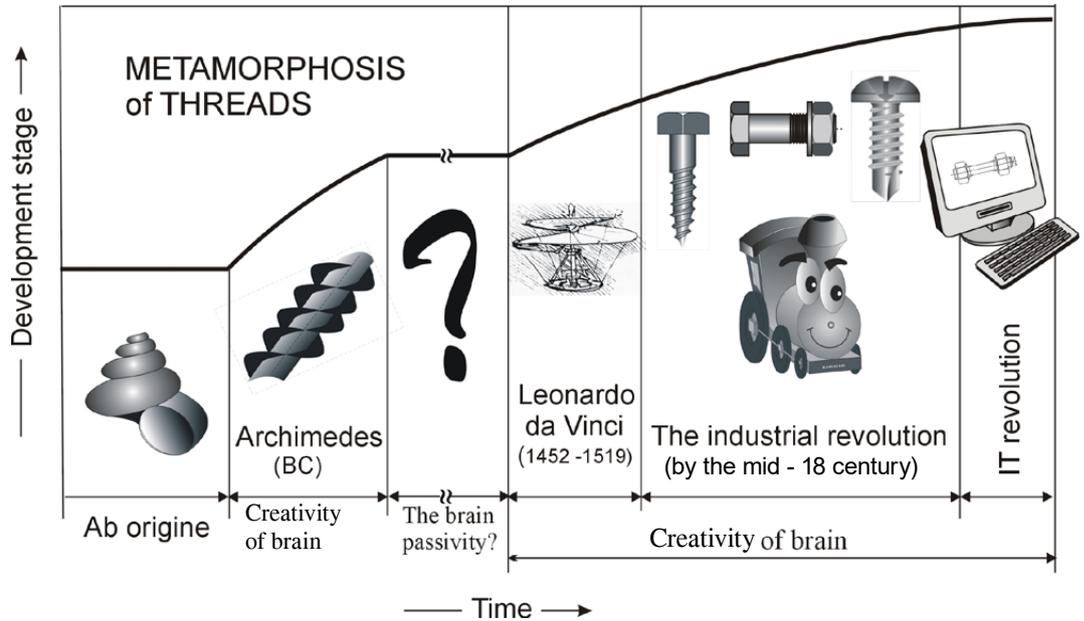


Fig. 2

How It All Started?

In particular, it should be emphasized that the characteristic screw element - thread (spiral)-is an autochthonous geometry pattern; it means it was not invented, but was, similar to a circle for example, observed by nature and exists ab origine. These spirals are everywhere in nature, right from human DNA to the galaxies, from simple to complex substances. It is therefore not surprising that a person noticed this and began to use it to his advantage (Fig. 1).



At first, it was Archimedes' timid attempts at a transport screw. As if a long period of darkness had come until the ingenious inventor Leonardo da Vinci and inventor of book printing Johannes Gutenberg (15th - 16th century). The book “Museum Würth, Schrauben und Gewinde” (printed Thorbecke, 1992) states that Archimedes also knew a wooden screw (Fig. 2) for pressing olive oil, which can also be included in the category of transport screws.

But the greatest boom was recorded during the industrial revolution by the 18th century which requested the so-called fixing screws (Fig. 3).

It can be said that the threaded fastening joint was born of the industrial revolution. Since then, it has undergone a respectable development in the field of geometry, materials, heat and surface treatment.



Fig. 3

Reflection on the Current Situation

It should be noted that even at the beginning of the 21st century, no one came up with any better solutions. And that is the most surprising statement.

We return for a moment to the graph in Fig 1. This graph shows that the development took place in certain, consecutive stages. If we omit the first stage ab origine, which does not fall within the scope of this article, then the sensitive receptors of human imagery are most irritated by the disproportionately long stage of development, here called “brain passivity”. The question is why, when as known, at the beginning of the 1st millennium according to Christian doctrine existed nails. This historical important time period seems to be little explored.

If Leonardo da Vinci compares practice without theory to cruising without a rudder and compass, then it applies twice to the industrial revolution. Screw connections are no exception. This is also confirmed by the screw theorem, according to which a bolted joint is governed by its own complicated life. Only those who know and respect this life can count on a reward in the form of security and reliability. Thanks to the enormous progress in science and research, it has been possible to create highly sophisticated and high-quality connecting elements. It was also the merit of the work by Gerhard H. Junker, published in 1969, “The New Criteria for Self-Loosening of Fasteners Under Vibration,” which was of great importance to the safety of bolted joints. This article presented for the first time a test apparatus for testing the vibration resistance of screw joints. This system is based on the principle of variable radial stress of a certain frequency and amplitude (a). The principle is shown in Fig. 4.

Of the many, at least the new locking system for fastening of car wheels is mentioned here (Fig. 5). The advantage is the easy replacement of the locking ring (blue in the picture), while the nut itself can be used almost infinitely long.

And we could continue with advances in the development of materials and their heat treatment (Fig. 6) and anti-corrosion protection.

With the advent of a new wave of industrial revolution, characterized by the use of computer technology and developing a Finite Element Method (FEM) it was possible to study the stress distribution after tightening (Fig. 7).

The FEM method made it possible to understand where the critical points for the occurrence of fatigue fracture are located. This was important information for the designer to be able to take the necessary measures.

What to Say in Conclusion?

Symbolically, there is a snail in the title of this article. Indeed, the development of bolted joints began timidly, at a snail’s tempo. At first the industrial revolution came and with it the soft development of the technology of joining with threaded fasteners. And the current IT revolution has entered it very significantly. It is difficult to predict which direction future developments will take. One thing is certain, however. Threaded joints were, are and will remain, an irreplaceable structural element. The following aphorism goes well with the meaning and mission of the threads:

Thread = The Bread for Industry Revolution!

Fig. 4

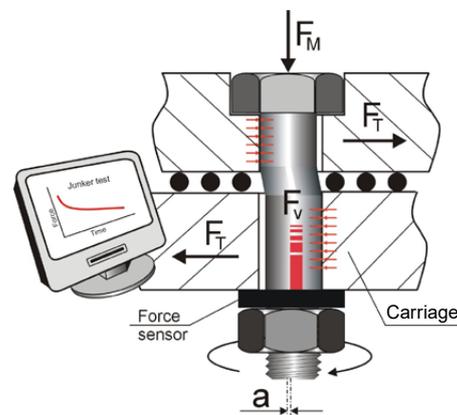


Fig. 5

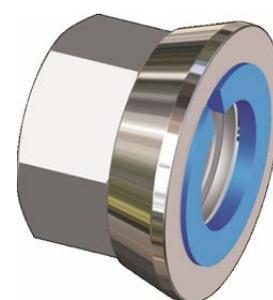


Fig. 6

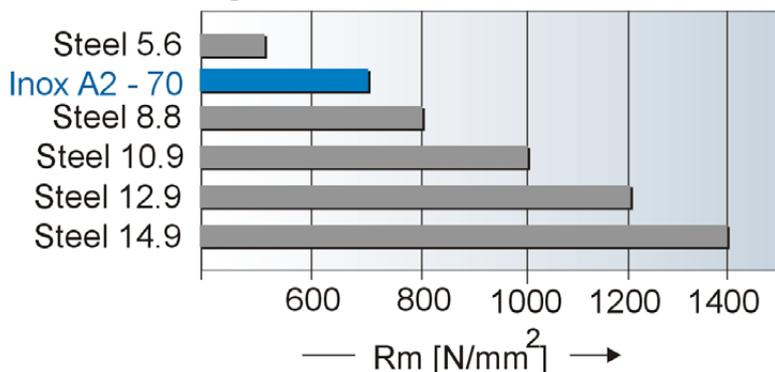


Fig. 7

