

Assembly-Friendly Construction of Fasteners

The construction parts for mechanical parts joining in mass-series production have to meet the specific criteria for high degree of mechanization and automatization. Especially automotive industry and electrical engineering place high demands on fastening materials this way. For all assembly parts in automatic assembly line have to be possible to transport them directly to assembly, location to install them properly and control them. These, not simple, requirements require the development of new assembly-friendly fasteners or the modification of the current ones. To this actual topic the provided article is devoted. The issue will be on the innovation of thread forming screws according to standard DIN 7500, known on the market by its commercial name Taptite®.

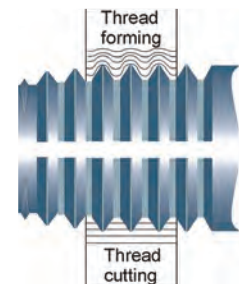
Features

The Taptite screws were developed in 1961 and are characterized by triangular diameter of thread part and by forming threads (Fig.1 and 2) whose task is to create internal thread into the material in chipless way and enhance assembly this way.

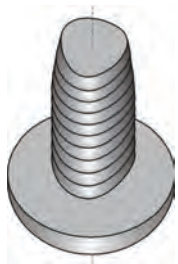
- one assembly direction.

The standard heat treatment of thread forming screws is the case hardening. In recent times the induction partial hardening of the screws forming threads is advanced. (Fig. 4) shows partially hardened area and progress of micro-hardness in this area with maximum on the surface and smooth decrease into the material core. The supporting threads remain in their original, natural state.

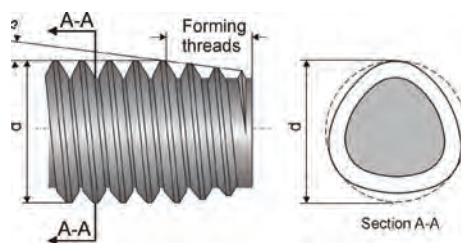
The induction hardening, about the advantages of which we referred in Fastener World No. 146, was tested within the practice and some companies have already used it in series. The induction heating can be concurrently replaced with laser beam or electron radiation. The advantages of previously mentioned methods are: they do not need any external hardening medium because the hardening process proceeds by swift heat escape from the surface into the cold screw core.



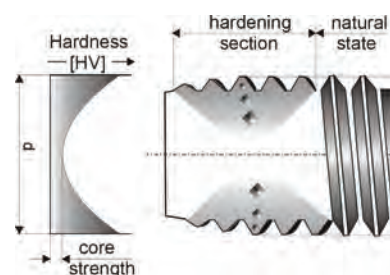
▲ Fig. 3



▲ Fig. 1



▲ Fig. 2



▲ Fig. 4

Such a construction has several advantages:

- the chipless production of regular metric or inch threads,
- there is no play in the mating threads,
- it resists loosening caused by vibrations,
- nut-free joint,
- high joints solidity due to uninterrupted grain flow when thread forming (Fig. 3),
- low assembly costs because there is the cancelled operation of thread cutting and the costs accompanied with that (i.e. controlling, tools, etc.),
- triangular shape of the screw reduces friction during thread forming,

Innovation

It's understandable that for over 50 years since there are thread forming screws, the development has continued with the aim to optimize the thread shape and drive form. Thanks to that, nowadays, there are millions of such screws produced mainly for automotive industry and electrical engineering use in various modifications every year.

Despite all those, the Taptite screw cannot be regarded as an absolutely ideal assembly part which would fully fulfill the requirements of automatic assembly. Pre-drilling of the hole causes the problems which is one of the assembly conditions. It should be expected into the future that the unification of drilling a hole and assembly into one technological operation will occur as it happened with popular screws teks according to

DIN 7504. So, the self-drilling version of thread forming screw Tritex (Fig. 5) will be created. It can be produced either by soldering a mini-drill or by forming from one piece and functional and working surfaces will be partially hardened (Fig. 6).

Features of Tritex Screws

- The Tritex screws are characterized by the specific differences compared to Taptite:
- they are longer by the length of a mini-drill
- some chips are produced during assembly
- they are not appropriate for use into the blind holes

Remaining features are identical. The above mentioned imperfections are compensated with the following advantages:

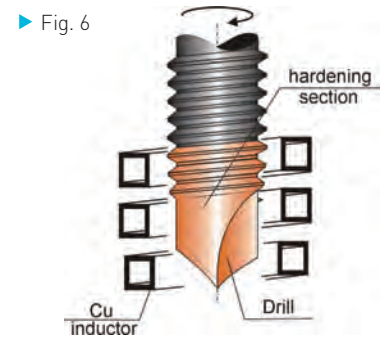
- elimination of a separate drilling operation and associated costs,
- a proper hole size is always drilled,
- no problem with positioning in automatic assembly,
- exclusion of collision at the entering of the screw into the assembly hole.
- bigger length can be an advantage in the case of short screws ($L \leq D$) which could get stuck in the feeder canal while their automatic transporting from vibrational container towards the assembly place.

Conclusion

Current mass-series production is characterized with a high level of automatization. The assembly parts, including fastening material have to adapt to this trend. One of these parts is also a forming thread screw Taptite or it's a self-drilling alternative – Tritex. Each variant has its own advantages and disadvantages. So, the constructor has to carefully consider their technical capability and economic efficiency. ■



▲ Fig. 5



► Fig. 6