Visual Inspection Fasteners: Self-diagnostic Bolt, Nut & Washer

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Nuts and bolts are used in tightening mechanical parts and structures from bridges to escalators. However, due to vibration and movement, nuts and bolts can become loose, resulting in serious accidents. At present, spring washers and nylon locking nuts are the most common devices for preventing screws from loosening. Yet, it is difficult to detect with the naked eyes if they fail to tighten. Based on simple frictional mechanics and spring principle, the “Visual Inspection Fasteners: Self-diagnostic Bolt, Nut and Washer” were hence designed to deal with the two main sources of accidents including the “untightened bolts and nuts” and “loose bolts led by vibration of machinery”. Self-Diagnostic Bolts and Nuts show if the bolts and nuts are tightened while Self-diagnostic Washer alerts the operators to the loosening of bolts that may lead to accidents, reminding them the need for maintenance of the machinery (i.e. tightening of bolts and nuts). With designs based on simple principles, our products are of low costs and reusable. They are also proven to be performing well under different circumstances after several experiments. In our prototype, when the tightening force of the bolt is less 5 N, the warning zone of Self-Diagnostic Washer will be shown, visually alerting the user to carry out maintenance immediately.

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