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Method for ultrasonic welding of parts with spatial configuration of joining zones

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The technical problem that the invention solves is the need to provide constructive solutions for the construction of sonotrodes that can be used for welding complex parts with spatially arranged joining zones, which can usually only be made in a plane, these types of sonotrodes representing solutions for given industrial applications.

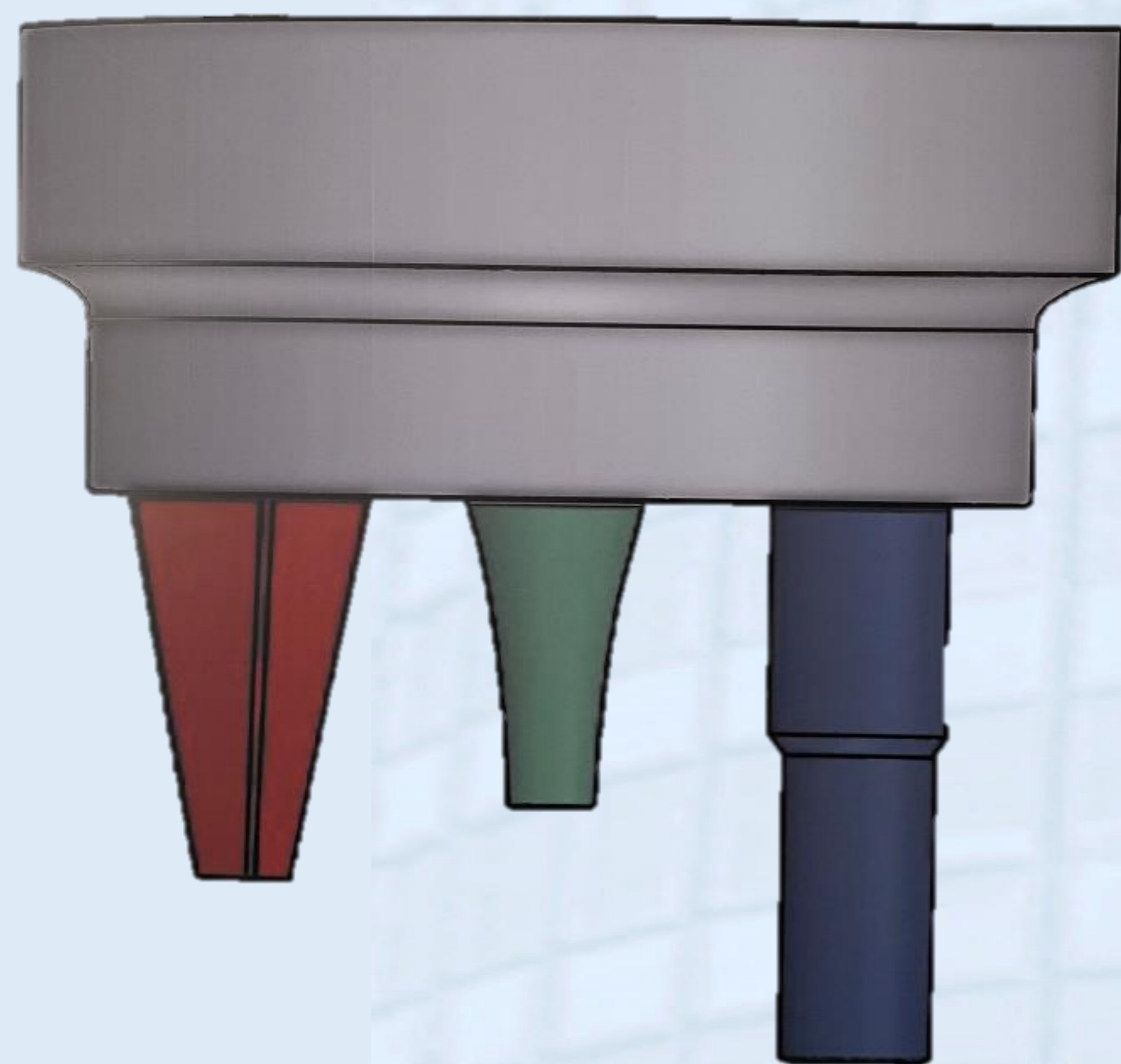


Figure 1. Constructive solutions of a sonotrode

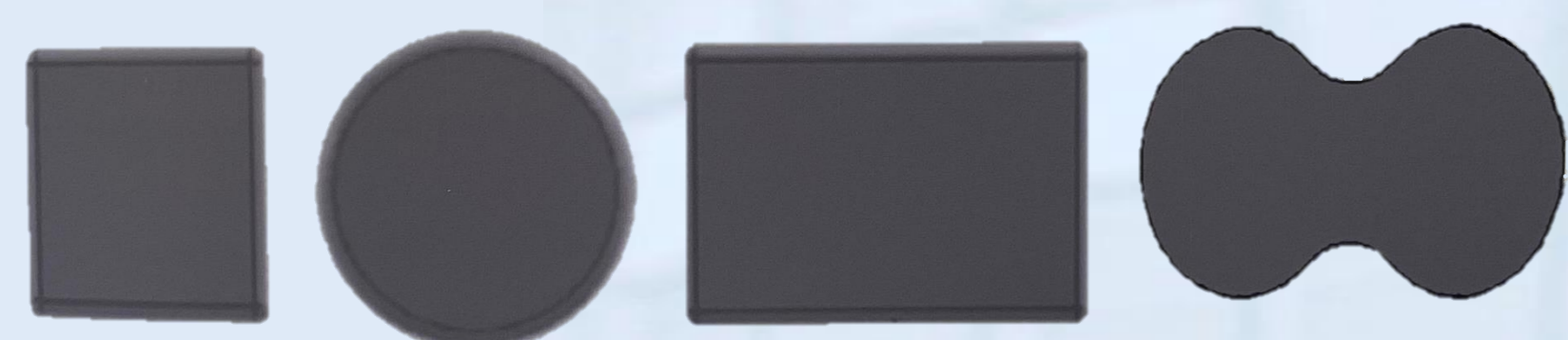


Figure 2. The active area of the weld pin

The method is applicable for the whole frequency range of the ultrasonic field. The pin length, which provides a sonotrode for ultrasonic welding of workpieces with spatial configuration of joint zones, i.e. their tolerance field, is limited by the resonant frequency of the sonotrode.

A method for ultrasonic welding of workpieces with spatial configuration of joining zones, according to the invention relates to constructive solutions of a sonotrode consisting of an equalizing body (1) and a number of welding pins (2,3,4), *figure 1*.

The shape of the equalizing body of the sonotrode is determined by the shape of the workpiece, and the number of pins and their shape, arrangement and dimensions are related to the spatial configuration of the joining zones of the workpiece.

The active area of the weld pin, shown in *figure 2*, may be square (1), circular (2), rectangular (3), or complex (4) in shape, which is dictated by the application, i.e. the type and size of the joint area.

The pins are mechanically coupled to the equaliser block by means of threaded nipples. The construction solution is a modular solution, so there is the possibility of replacing only the worn part or parts of the pins when necessary.

The sonotrodes must provide a constant working value of the ultrasonic microvibration amplitude at the pin active zone level, specific to the welding operations to be performed.

Advantages:

- Makes it possible to simultaneously weld parts with spatial configuration of welding zones under joint quality conditions;
- Increases work productivity, compared to the situation where welding could only be performed in plane and more operations were needed to weld parts with spatial configuration of joining zones;
- These specialized sonotrodes, thanks to the constructive solution of the method, allow the replacement of worn parts in the sonotrode composition with new ones and the containment of welding operations with the same sonotrode;
- The solution makes it possible to obtain new sonotrode configurations for welding parts with spatial arrangement of welding zones by replacing the pins at the level of the equalizer block;
- Welded joints can be made for a wide range of polymeric materials as well as metallic or composite materials.