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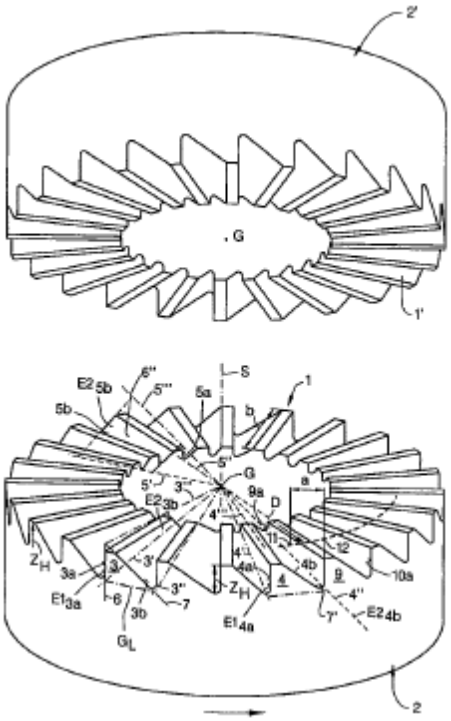
(54) Title: MACHINE ELEMENT WITH HIRTH-TYPE SERRATIONS

(57) Abstract:

The invention relates to a machine element with Hirth-type serrations, characterized in that individual serration elements are configured asymmetrically.



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Machine Element with Hirth Toothing

The invention relates to a machine element with Hirth toothing for a positive-locking connection to a second machine element having complementary toothing.

Hirth toothing designs have been known for a long time as construction elements for a wide variety of different purposes. Reference is made to the Voith company brochures G 749 9.92 1500 as a representative example. Thus, for the purpose of transfer of torque on a machine element, the basic idea of Hirth toothing designs is to design all the geometric lines of a spur gearing in a wedge shape and to have them merge centrally at one point. The result is thus a gear rim running in the circumferential direction with teeth extending in the radial direction, relative to the central axis. The design of two machine elements to be coupled together, having mutually complementary Hirth toothing designs, making it possible to create a form-fitting, self-centering connection between the two, wherein the Hirth toothing designs as such are used as a space-saving part element with a high precision of parts or as a fixation element with a high repeat precision. The possible uses of such connecting elements are quite varied and are not limited to specific examples of use. Use in general mechanical engineering is conceivable, for example, for connecting high-speed compressors and turbine rotors to the rotor shaft, gear wheel sets or crankshafts. An increase in power can be achieved here with the same volume in cases where traditional screw connections, for example, flanges, hubs and shafts have reached or even exceeded the limit of transfer capacity. With such a connection, it is also possible to achieve an increase in volume and weight in cases where the space is already greatly limited.

Assembly is very simple because of the centering effect and components designed in this way are also very easy to replace.

For implementation of a torque transfer and compensation of the axial forces occurring because of the resulting circumferential force, the connection between two machine elements having mutually complementary Hirth toothing designs is usually prestressed axially. To this end, means for enabling axially tension on the two machine elements to be coupled to one another are additionally used for the positive-locking and self-centering connection. Axial stress is understood to refer to the creation of a stress with at least one component in the direction parallel to the axis of rotation of the machine elements. Means that may be considered include mainly screw connections as well as tension anchors. In addition to causing an additional increase in weight, these also cause an increased need for installation space, which must already be calculated into the design of the connection in advance in accordance with the intended purpose.

Therefore, the object of the invention is to improve upon a positive-locking connection by means of Hirth toothing, such that the aforementioned disadvantages are avoided, in particular due to the fact that the increased requirements with respect to a minimum design space and weight can be met. The structural complexity is to be minimized as much as possible.

The approach according to the invention is characterized by the features of claim 1. Advantageous embodiments are defined in the dependent claims.

Thus, a Hirth toothing design and/or a machine element provided with a Hirth toothing design for transfer of torque to another second machine element, which is provided with a complementary Hirth toothing design is designed by implementing a positive-locking connection between the two in such a way that at least one or at least individual ones of the toothing elements are designed to be asymmetrical, i.e., to have an asymmetrical geometry with regard to the tooth profile.

Hirth toothing is understood to refer to teeth, which are preferably used on rotating components and are designed so that the geometric lines of the spur gearing are designed with a wedge shape and are merged centrally at a point located on the axis of symmetry and/or the axis of rotation of the machine element. The teeth per se form a splined gearing, in which the individual flanks can be described essentially by means of a plane. The teeth per se are arranged in the circumferential direction of the rotating component. The individual toothing elements extend in the radial direction, based on the axis of rotation, and the flanks are each aligned in the circumferential direction. The height of each tooth is different with respect to the height and dimensions of the individual gearing elements and the dimensions of the teeth, as seen in the radial direction from the axis of rotation. The teeth are designed to be inclined relative to the central midpoint and/or to the axis of rotation.

The embodiment of the individual gearing elements with an asymmetrical geometry offers the advantage that, depending on the choice of the direction of rotation, either

1. a part, which can be compensated by the positive-locking and self-centering connection of the Hirth toothing in a part of the axial force occurring in the transfer of torque due to the circumferential force can be compensated by the positive-locking and self-centering connection of the Hirth toothing, wherein this part is a function of the number of compensation points, i.e., the suitably designed tooth elements and/or the geometry of the individual tooth elements;

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