

Technology Offer

Coupling part

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Diese neuartige schraubenfreie Kupplung, die auch als Überlastungskupplung eingesetzt werden kann, bietet die Möglichkeit ohne zusätzliches Werkzeug zwei drehbare Elemente auch unter extrem engen Bedingungen, spielfrei und kraftschlüssig mit hoher Präzision miteinander zu verbinden. Bisher auf dem Markt bekannte Kupplungen sind aufgrund ihrer Größe für Anwendungen im Bereich der Elektronik, der Optik, der Messtechnik sowie der Präzisionstechnik ungeeignet. Wohingegen dank der neuen Technologie, die am Max-Planck-Institut für Sonnensystemforschung in Göttingen entwickelt worden ist, Wellen oder Achsen eines Bauteils schon mit Radien ab $> 0,5$ mm über diese neuartige Kupplung einseitig oder beidseitig mittels eines einfachen Steckmechanismus verbunden und auch wieder gelöst werden können. Ein Anwendungsbeispiel stellt eine Motorwelle als treibendes Teil und die Welle eines Dreh-Positionssensors als angetriebenes Teil dar.

Background

The demand for coupling components, which are applicable in extremely tight conditions, is enormous. Apart from the objective for usage in tight conditions, space- saving, high precision assembly and easy handling realised in one coupling component is a challenging task. Existing coupling parts on the market are not applicable for every electronic, optical and precision mechanical application due to their size. Moreover, free access and additional tools are required for the connecting process.

Technology

Here we present a single coupling part for rotatable waves and axes that overcomes all the aforementioned drawbacks ensuring a safe closure mechanism. The coupling part includes a flexible spring element, which can be moved onto the flat ends of the waves or axes unilaterally from one or both sides in an easy and reusable manner (Fig. 1). The flat edges of the waves are fixed within the coupling part by one or two tensioned flexible spring elements (Fig. 2), whereby the contact pressure of the spring element effects the free of play coupling resulting in a transmittable torque. Thus, the thickness and width of the spring element determines the stiffness and therefore the free of play transmittable torque.

Free play of coupling

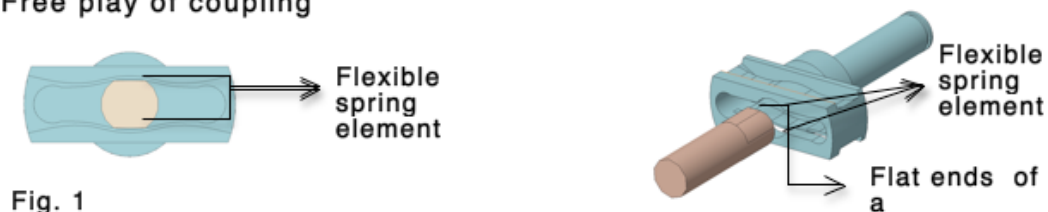


Fig. 1 : Cut view of the spring element (4,5). **Fig. 2**: Coupling part, consists of flexible spring elements as fixtures and drilling holes (8) for a better centric alignment. Waves or axes show a flat end edge, which can slide inside the coupling part, where it will be held by the flexible spring elements.



In order to achieve a centric alignment of the waves and axes the coupling part shows drilling holes on both sides in a certain size. Furthermore, the angular misalignment between two waves can be balanced by an elastic element positioned within the connecting part.

To address the need of an additional overload protection an overload clutch has been developed in this context. For this purpose, the flat edges of the shafts must be matched to the spring elements in order to achieve a desired transmittable torque. The formation of 8-fold or even 12-fold edges offers a latching function in each direction when a preset torque is exceeded. This function can be realised for one or even both directions (Fig. 3).

Fig 3. shows an application for an optical system, in which a rotatable mirror is connected to a potentiometer acting as a precise position sensor. Fig. 4 shows the change of the angle of rotation between the beforementioned potentiometer and the rotatable mirror with a given torque using a 0,2 mm thick bronze spring element. Only from a torque of about 15 mN*m a slight angle of rotation error occurs in this special case.

Advantages

- Easy handling with one single coupling part without any screws
- Usable for rigid and flexible systems
- Free of play transmittable torque
- Connecting length is variable
- Connecting mechanism on one or both sides
- Connecting part is useful for rotatable waves or axes with radii around $> 0,5$ mm
- Applicable in extremely tight conditions
- Cheap manufacturing process:
 - Plastic injection molding
 - Metal casting process
 - 3-D printer
 - Milling / Mechanical treatment
- Applications:
 - Mechanical connecting element
 - for the automotive industry
 - for the sensor technology
 - for the coupling technology
 - for the space ("Solar-Orbiter")

Patent Information

German patent application filed in Mai 2018.

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