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SPRZĘGŁO PNEUMATYCZNE Z OSIOWO-ODKSZTAŁCALNYMI MIESZKAMI GUMOWO-KORDOWYMI

Streszczenie: W artykule opisano nowatorską konstrukcję sprzęgła pneumatycznego z osiowo-odkształcalnymi mieszkami gumowo-kordowymi, umieszczonymi na obwodzie koła o określonym promieniu. Taki sposób usytuowania mieszków zapewnia możliwość pełnego wykorzystania ich znamionowego skoku. Gwarantuje również płynne przenoszenie momentu obrotowego. Istotną zaletą sprzęgła jest także możliwość automatycznej zmiany jego sztywności skrętnej, co zapewnia skuteczne unikanie stanów rezonansowych.

Słowa kluczowe: sprzęgło, sprężyny pneumatyczne, patent

TANGENTIAL PNEUMATIC FLEXIBLE SHAFT COUPLING WITH AXIALLY DEFORMED FLEXIBLE ELEMENTS

Summary: The paper presents a newly developed pneumatic flexible shaft coupling. Rotatable mounting of support bodies enables the flanges of pneumatic flexible elements to be parallel in the full extent of the coupling's twist, so it is possible to fully utilize the stroke of the pneumatic elements given by their manufacturer.

Keywords: shaft coupling, air-springs, patent

1. Introduction

Currently produced, conventional flexible shaft couplings use metal or rubber flexible elements to provide flexible torque transfer. An important parameter of flexible shaft couplings incorporated in mechanical systems with periodically alternating torque is

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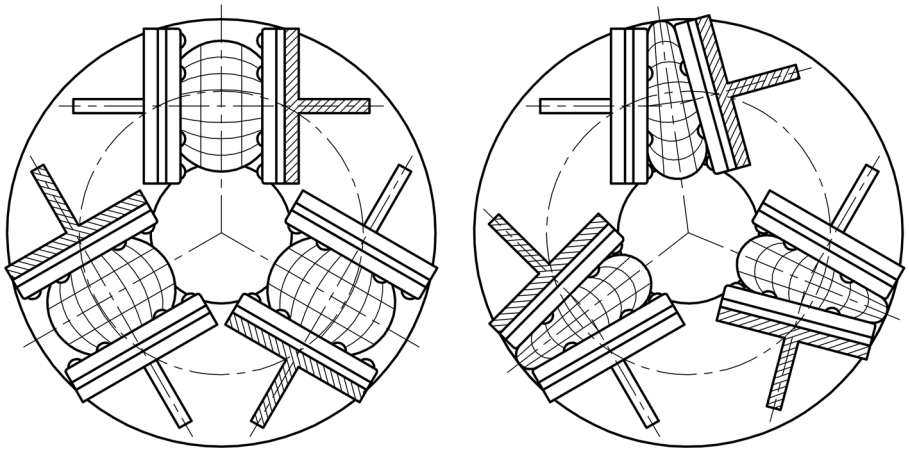
their dynamic torsional stiffness because it affects the natural frequency of torsional oscillation of the mechanical drive system [1].
For tuning the mechanical system in terms of torsional vibration, it is necessary to select a flexible shaft coupling with a suitable dynamic torsional stiffness which can no longer be changed by ourselves. But the mechanical parameters of these couplings are constantly changing due to aging and wear of their flexible elements, which can cause that the system will be no more properly tuned [1].
The disadvantages of the above-mentioned flexible shaft couplings can be eliminated by using pneumatic flexible elements (air-springs) in which the flexible transmission of the torque is ensured by compressed gaseous medium [2, 3], (Fig. 1).



a) b)

Figure 1. Tangential pneumatic flexible shaft coupling,
a) – in neutral position, b) – in maximum deformed position

The pressure of the gaseous medium in these flexible elements can be adjusted. This makes it possible to suitably adapt the dynamic torsional stiffness of the coupling to the actual operating mode of the mechanical system. A further advantage of these pneumatic elastic elements is that the gaseous medium is not subject to aging or wear [3].
This article presents a new type of pneumatic flexible coupling to which a patent application has recently been filed and a protection by means of a utility model has been given [4].

2. Proposed flexible shaft coupling

Proposed tangential pneumatic flexible shaft coupling with axially deformed elements (Fig. 2) consist of a driving *(1)* and a driven hub *(2)* flexibly connected via pneumatic flexible elements *(3)*. The pneumatic flexible elements are attached to support bodies *(4)*, which are rotatably mounted on a pins *(5)* solidly connected to the corresponding hub. The axes of pneumatic flexible elements are perpendicular to axes of pins. The support bodies are fixed to pins with washers *(6)* and split pins *(7)*. The rubber shell

(8) of flexible element is firmly connected to support body with flanges *(9)*. Compressed gaseous medium is fed into the compression space of the coupling via a filling valve *(12)*. The coupling's compression space consists of inner spaces of pneumatic flexible elements mutually interconnected with inner spaces of support bodies. The pressure of gaseous medium holds the unloaded coupling in neutral position (Fig. 2). Under load by torque, it comes to angular deflection between driving and driven hub and consequently to axial deformation of pneumatic flexible elements (Fig. 3). The angular twist causes compression of gaseous medium providing torque transmission.

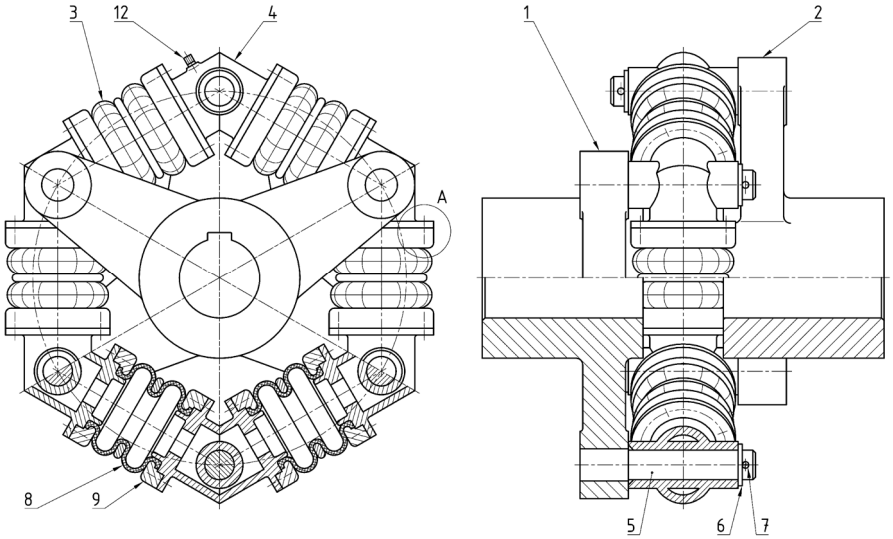


Figure 2. Tangential pneumatic flexible shaft coupling with axially deformed flexible elements – neutral position (unloaded coupling) [4]

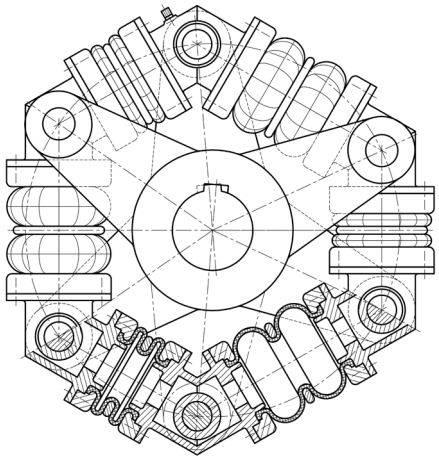


Figure 3. Tangential pneumatic flexible shaft coupling with axially deformed flexible elements – maximally deformed position (fully loaded coupling) [4]

While in the case of conventional tangential pneumatic flexible shaft couplings (with fixed support bodies), the flanges of the elements are tilted during twisting (Fig. 1.b), the support bodies of proposed coupling are automatically turned to the equilibrium position so that only axial deformation of the elastic elements occurs (Fig. 3). Since the flanges of the pneumatic flexible elements are parallel in the full extent of the coupling's twist, it is possible to fully utilize the stroke of the pneumatic elements given by their manufacturer.
Another advantage of this type of coupling is that the entire assembly of flexible elements connected by the support bodies can be easily withdrawn from the pins, which allows easy and quick assembly and disassembly of the whole coupling as well as the flexible elements themselves.

Conclusion

Tangential pneumatic flexible shaft coupling with axially deformed elements can be applied in systems of mechanical drives. It allows flexible torque transmission, and thanks to the ability to change its torsional stiffness, ensures the tuning of these systems in various operating conditions. In addition, the rotatable mounting of the supporting bodies allows the stroke of the pneumatic flexible elements to be fully utilized. Tangential pneumatic flexible shaft coupling with axially deformed elements will therefore increase the technical level and reliability of the mechanical systems in which it will be applied.

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