

Preliminary classification of mechanical transmissions with gearing by means of the third element and motionless axes

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The idea of using provisional elements in mechanical transmissions refers to Leonardo da Vinci. But those transmissions were detail explored only from the middle of the last century.

The first mechanisms with gearing by means of a provisional element appeared in patent literature at the beginning of the XX century, but practical application in equipment of those years were not widely adopted.

Despite long-term history, a question of classification of mechanical transmissions with gearing by means of the third element still remains open.

Many authors [1–4] dealt with an issue of classification of transmission of this type, however the classification signs established by them lead to a number of contradictions in this connection, the same scheme of transfer can be carried to two or more types [5].

Passing directly to classification of mechanical transmissions with gearing by means of the third element we will note that the provisional element in this work is meant as rotation elements (a ball or rollers). Transmissions with motionless axes of rotation of the wheels are considered.

All mechanical transmission with gearing by means of the third element and motionless axes are broken out into two categories: 1) mechanical transmission with provisional elements; 2) mechanical transmission with provisional rolling elements.

The transmissions, in which the provisional elements are set to cage (Fig.1 and 2) relating to the first group. The provisional elements fulfill a function of tooth wheels. Designs of transfers of this group are very various, but in the kinematic scheme, it does not differ from the transfers with involute, spiroid, etc. in types of gearings.

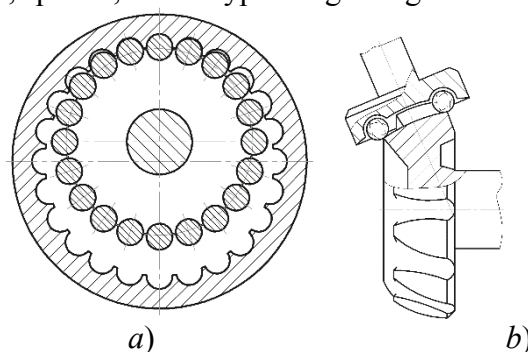


Fig. 1. Mechanical transmission with provisional elements: a) with parallel axes; b) with the crossed axes

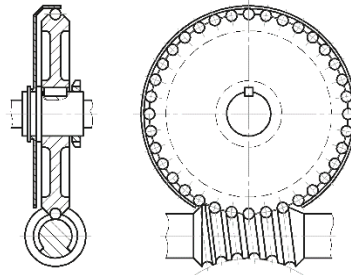


Fig. 2. Transmission with provisional elements and crossing axes of shaft

The transmission relating to the first group is classified by the properties similar for classification of transfers with involute gearing: arrangement of axes, the form of a surface of wheels, shape of a tooth (provisional element), etc.

Mechanical transmissions on the basis of gearing by means of a provisional element belongs to the second group, in the kinematic relation it significantly differs from transfers on the basis of involute, spiroid, essentric-cycloidal and other gearing types.

In the simplest execution transmission with provisional rolling elements represents the differential mechanism (Fig. 4) consisting of cogwheels – 1 and 2, provisional rolling elements – 3 and a separator – 4. One of cogwheels or a separator can act as the leading link. The movement is removed from two other free links, thus one of free links can be motionless, and then gear transmission works by the principle of a reducer or the animator. One more feature distinguishing transmissions with provisional rolling elements from all others is opportunity to unite in itself gear and frictional transmissions (Fig. 5).

The transmission with provisional rolling elements presented in Fig. 5 consists of a frictional wheel – 1, a cogwheel – 2, provisional rolling elements – 3 and a separator – 4. The separator – 4 is executed with longitudinal grooves in which provisional rolling elements– 3 are located. The rolling path executed on a frictional wheel – 1 is similar to the paths, which are carried out on rings of ball-bearings. The design of transmission (Fig. 5), excludes mutual shift of a frictional wheel – 1, a cogwheel – 2 and a separator – 4.

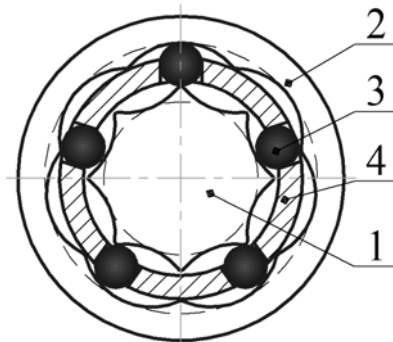


Fig. 4. Tooth gearing with provisional rolling elements and parallel axes: 1) cogwheel; 2) cogwheel; 3) provisional rolling elements; 4) separator

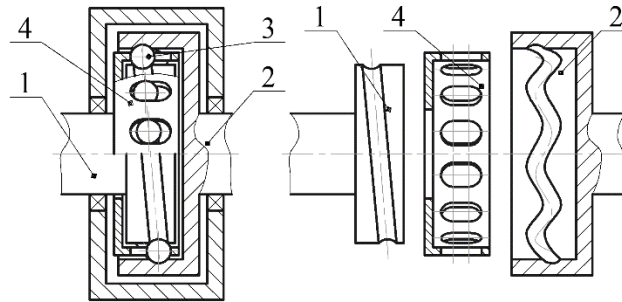


Fig. 5. Frictional tooth gearing with provisional rolling elements: 1) frictional wheel; 2) cogwheel; 3) provisional rolling element; 4) separator

Noted features of transmission with provisional rolling elements (a differentiation of the scheme and possibility of association of frictional and gear transfers) led to emergence of a set of constructive schemes that in turn complicates classification of transmissions of this type.

In this regard we consider expedient the second group to break into three subgroups: a) the frictional one; b) the frictional and tooth one; c) the tooth one. Each subgroup of transmission with provisional rolling elements are classified by the standard signs: spatial arrangement of axes, type of form-building surface, etc.

The rolling bearings and a reducer executed according to the scheme of the rolling bearing belong to subgroup 1) of this classification. The transmission described in work [6] can be as an example.

The transmission with provisional rolling elements as a part, of which both frictional and cogwheels are available (Fig. 5). The transmissions with provisional rolling elements in which transmission of the movement from one cogwheel to another is produced by means of a provisional element (Fig. 4). The scheme of classification of mechanical transmissions with gearing by means of the third element is given in Fig. 6. This classification covers the existing transmissions on the basis of gearing by means of the third element, and also those, which have no yet constructive embodiment.

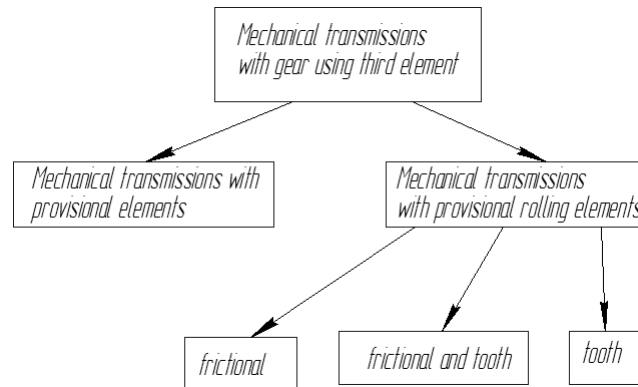


Fig. 6. Classification of mechanical transmissions with gearing by means of the third element

The offered classification is not considered perfect, but the comparison of different views has to help finding the ways to solve the problem of classification of the mechanical gear transmissions by means of the third element.

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The Use of Thorium in Compact Reactors

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Introduction

The implementation of the thorium fuel in nuclear power industry is dictated by several factors: thorium reserves in the world exceed uranium reserves in 4 - 5 times. Thorium deposits are more accessible than uranium deposits. This is especially important for Russia: explored uranium reserves in Russia will be enough only for 20 years, and there is sufficient amount of thorium resources in the fields near Novokuznetsk and Tomsk (Tugansk deposit of thorium, titanium, zirconium).

From the point of view of the use of fissile nuclides, the advantage of thorium to uranium is refractoriness of thorium: only at 1400-1500 ° C the crystal lattice of thorium begins to undergo phase transitions. This allows the reactor to operate with thorium fuel at higher temperatures. Thorium energy industry, unlike uranium, does not produce plutonium and transuranic elements. This is important both from an environmental point of view and from the point of view of non-proliferation of nuclear weapons (Selection weapon actinides out of uranium fuel allows to create a nuclear weapon for the "rogue states" and terrorists).

Only one of the thorium isotopes (Th-232) has a sufficiently long half-life with respect to the age of the earth, so virtually all of the natural thorium consists only of this nuclide. ²³²Th is not divided by thermal neutrons by itself, but the absorption of a neutron by thorium-232 leads to the formation of uranium-233, which has a high probability to emit neutrons by dividing the flux of thermal and intermediate neutrons. Therefore its role inside the nuclear reactor is the same as that of ²³⁸U: by absorption of neutron, they are converted into secondary thermal neutron fissionable nuclides. [1]

Thorium-232 is the best "resource" isotope in compare with uranium-238 for the reactors that works on thermal neutrons. Uranium-233 emits more than two neutrons counting on one of the captured primary neutron for a wide range of reactors with thermal neutron spectrum.