UDC 6166:614:9

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APPLICATION OF NEW CONSTRUCTIONS OF SLIP BEARING WITH MOBILE SPRING INSERT FOR NAVIES OF TRANSPORT EQUIPMENT

Abstract

The design of a sliding bearing for reciprocating rotational motion with a movable spring liner is presented, which can be used in various units of transport equipment and process equipment. The working surfaces of the bearing operate in a selective transfer mode, thereby providing an effect of non-uniformity. The mode and uniformity of wear is achieved with the return-rotational movement of the shaft or outer ring due to the twisting and unwinding of the spring liner, braking occurs respectively on the inner or outer surface of the spring insert («ratchet effect») only in one direction, depending on the direction of winding the spring. In the process of work, the contact line on the working surfaces changes, which also leads to a decrease in their wear and tear. The process of manufacturing the bearing parts simplifies and simplifies the assembly process itself.

Keywords*: bearing, spring, insert, ratchet, interference, clearance, tuning.*

Studies of the mechanisms of NOF (normal oxidative friction), ST (selective transfer), and the phenomenon of friction nonconductivity (FN) (friction nonconductivity) are followed by two co-operating conditions for increasing the stability of the effect of non-use:

1. Activation of working surfaces by plastic deformation.
2. Suppression (restriction) of oxidation processes on the working surfaces of bearings.

In traditional bearings operating with a gap, these conditions are not met.

The probability of the appearance of gaps and interference in the conjugation can be determined using the Laplace integral theorem [1]. Thus, if the probability p of occurrence of event A in each variant is constant and different from zero and one, then the probability Pn (k_1, k_2) of the event that event A appears in n variants from k_1 to k_2 times is approximately equal to a definite integral

$$P_n(k_1, k_2) \cong \frac{1}{\sqrt{2\pi}} \int_{x''}^{x'} e^{-z^2/2} dz, \quad (1)$$

where e, and the probability of non-occurrence of the event q = 1-p.

In solving problems using the Laplace integral theorem, special tables are used, since the indefinite integral is not expressed in terms of elementary functions. The table for the integral is available in the reference literature [1].

Assuming the normal size distribution law, we determine the determination of the value of x in the interval from x1 to xi + 1 according to the formula:

$$P(x) = \Phi(x_{i+1}) - \Phi(x_i), \quad (2)$$

where the values of the function *Φ (x)* are the probabilities of finding a random variable x in a given interval.

Since we need minimum values of clearance gaps, we will use transitional plantings. In metrology, the conventional designation of the interference is N, the gap is Z.

In order to use the table of the Laplace function, the values of z_i and z_{i+1} having a size are converted into dimensionless quantities x1 and xi + 1. To do this, we define the standard deviation for the transitional landings:

$$\sigma_z = (Z_{p\max} - N_{p\max}) / 6, \quad (3)$$

Then the given intervals z_i and z_{i+1} are replaced by the quantities

$$x_1 = \left[Z_i - Z_m(N_m)\right] / \sigma_z,$$
$$x_{i+1} = \left[Z_{i+1} - Z_m(N_m)\right] / \sigma_z, \quad (4)$$

Here *Zm (Nm)* is the average gap-interference value determined for the selected landing using the formula:

$$Z_m(N_m) = 0.5\{ Z_{p\max}(N_{p\max}) + Z_{p\min}(N_{p\min}) \}, \quad (5)$$

The probability P (x) of the appearance of conjugations in the interval z_i (x_i) ... $z_i + 1$ (x_{i+1}) is determined by the formula 2.

Plantings of the conical spring liner do not obey the traditional method of planting, therefore it is suggested to introduce an original method for calculating such plantings. A design of a sliding bearing for reciprocating rotary motion is proposed in which these conditions can be met [2-5]. The new design of the slide bearing for the reciprocating-rotational motion (Figure 1) consists of a shaft 1, an outer ring 2 and a spiral insert 3 arranged in the form of a coil spring therebetween. The spiral liner is movable, conical with a cone angle of 1 to 5 degrees, wherein the diameter of the wire of the spring *d* is equal to half the gap between the diameter of the shaft D and the diameter of the opening of the liner *D + 2d*. In this case, it is installed with interference on the ends, and also with interference on the inner and outer surfaces to ensure the constancy of the «ratchet effect» [6,7].

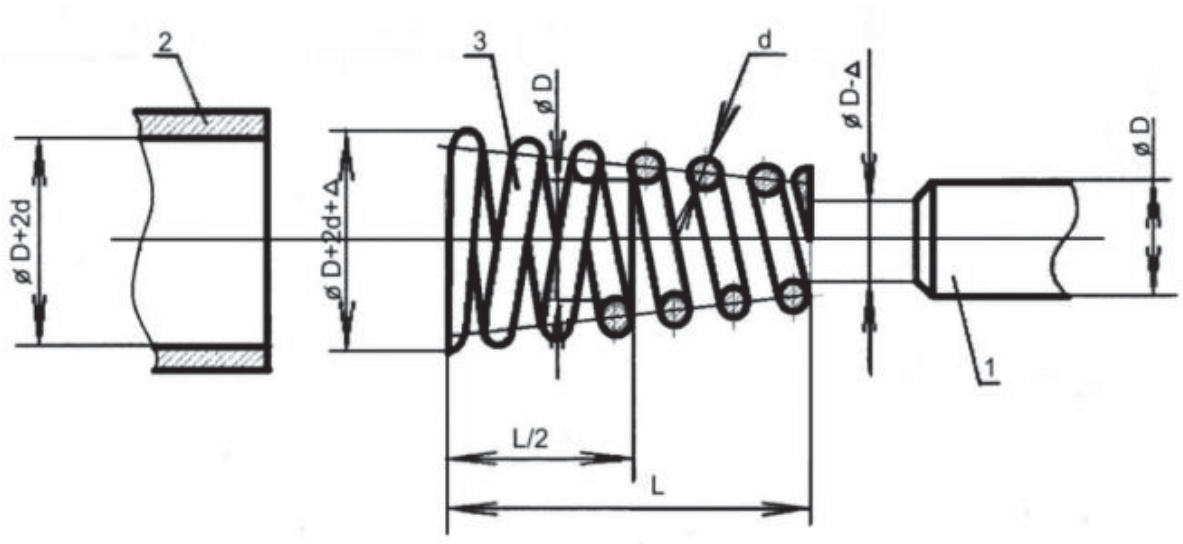

Figure 1 -Conical sliding bearing for reciprocating rotary motion

The main difference between this bearing and the traditional one is to provide an elastic tightness instead of a gap on its working surfaces. The bearing is provided with a movable liner in the form of a helical coil spring (intermediate member), which in the oscillatory mode is forced to rotate only in one direction and thus uniform wear and distribution of the lubricant is achieved. The front suspension of most GAZ models is independent, lever type, on twisted cylindrical springs, working together with two telescopic shock absorbers and a stabilizer of lateral stability. It is mounted on a detachable crossbeam and represents an independent unit. To facilitate the management of the car, the pivot pin is mounted on two needle bearings protected from dirt by rubber rings, and the axial force is perceived by a thrust ball bearing sealed with a special seal (Figure 2) [8 9].

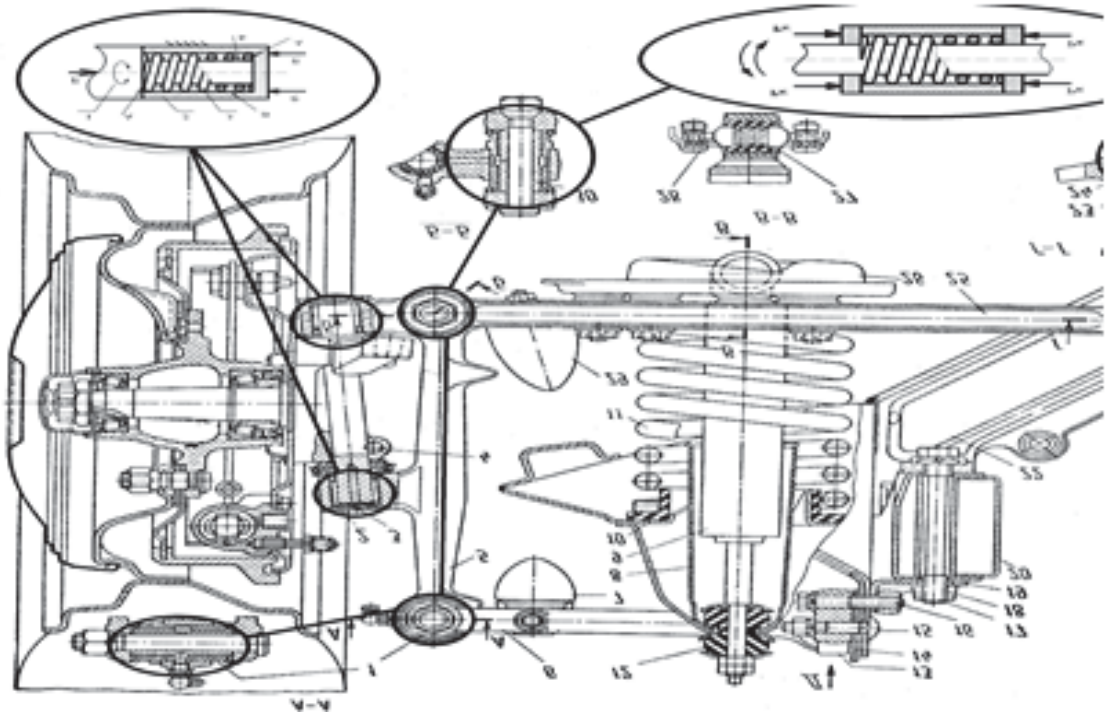

Figure 2 - Front suspension of GAZ vehicles with possible options for replacing existing hinge units with new design hinges

Such a bearing can be widely used instead of needle bearings of cardan shaft and kingpin suspension, silent blocks of suspension, shock absorbers, steering joints, instead of bearings of powerful electric contactors and in other hinge units operating in a return-rotational mode, as well as during repair of worn out components (for example cross-pieces) (Figure 3).

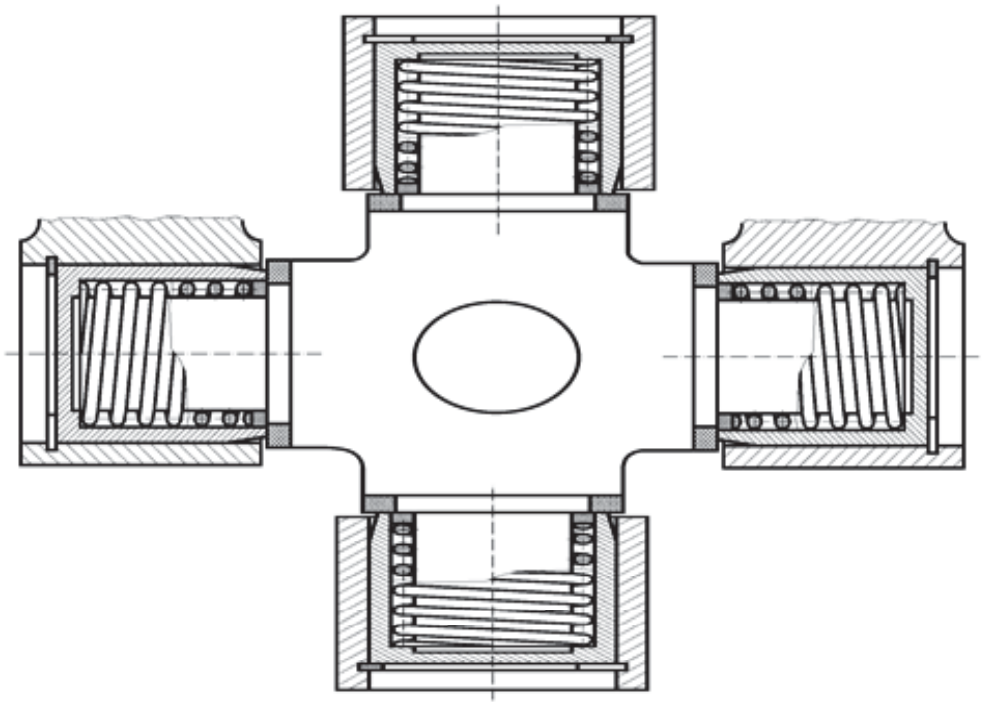

Figure 3 - Diagram and appearance of the modernized crosspiece of the car

Conclusion:

- the use of an elastic spring liner ensures the ease of assembly of bearings - there is no operation for picking up bearings with needles by a selective principle;
- the jamming of the bearing is eliminated, because when the gripping occurs on one of the surfaces, the gap on the other surface automatically increases;
- the uniformity of wear is increased due to the «ratchet effect» of the spring liner and the lubricant distribution is improved due to the effect of «oil-carving thread»;
- easier repair and restoration of units, a new bearing design allows the use of old worn parts;
- easier assembly and replacement during repair in operation;
- the bearing is interchangeable with the serial units operating in a return-rotational mode.

The work was carried out within the framework of the grant financing of the scientific project IRN: AP05133348 «Functional tuning of tribosupply of transport equipment and technological equipment using new energy-saving technologies to increase their service life».

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ТҮЙІН

Көлік техникалары мен технологиялық жабдықтардың әртүрлі бөліктерінде пайдалануға болатын жылжымалы серіппелі люктің көмегімен кері айналмалы қозғалысқа арналған жылжымалы мойынтіректі жобалау ұсынылды. Тіректің жұмысшы бөліктері селективті беру режимінде жұмыс істейді, осылайша біркелкі емес.

РЕЗЮМЕ

Представлена конструкция подшипника скольжения для возвратно-вращательного движения с подвижным пружинным вкладышем, который может быть использован в различных узлах транспортной техники и технологического оборудования. Рабочие поверхности подшипника работают в режиме избирательного переноса, за счет чего обеспечивается эффект безызностности.

УДК 665.633:66.097

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УСОВЕРШЕНСТВОВАНИЕ ПРОЦЕССА КАТАЛИТИЧЕСКОЙ ИЗОМЕРИЗАЦИИ КОМПОНЕНТОВ БЕНЗИНА, ПРИМЕНЯЕМОГО В ПРОИЗВОДСТВЕ

Аннотация

Изомеризация бензиновых фракций - это процесс соединения линейных углеводородов в соединения с разветвленной цепью, которые имеют более высокое октановое число. Изомеризация приводит к получению соединения с иным расположением атомов или групп, но при этом не происходит изменение состава и молекулярной массы соединения. Технологический процесс изомеризации предполагает использование катализатора с определенными каталитическими, физико-химическими и устойчивыми к действию каталитических ядов характеристиками. Установка изомеризации позволяет извлекать из состава бензинов низкооктановые легкие фракции, производя изомеризат, который, в свою очередь, позволяет увеличить выход автомобильных бензинов из перерабатываемой нефти с повышенным октановым числом, с одновременным уменьшением содержания ароматических углеводородов, бензола и олефинов.

В статье приводятся общая характеристика, содержание, практическая значимость процесса каталитической изомеризации.