

RESTORATION AND REPAIR OF CHAIN TRANSMISSIONS

Тилавалдиев Бахтияр Тилавалдивиевич

старший преподаватель, Ферганский политехнический институт, г. Фергана, Узбекистан.

E-mail: bahtiyar57@mail.ru

ANNOTATION

This article discusses the application, purpose and main work performed to restore and repair emerging malfunctions of chain transmissions. Chain transmission is a mechanical transmission that transmits energy by rotation, consisting of at least two sprockets (master and slave) and a roller chain connecting them, through which torque is transferred from the drive sprocket to the slave. Chain transmissions are used to convert and transmit torque to energy consumers of machinery and equipment.

Keywords: sprocket, chain, gearbox, multiplier, torque, wear of chain drives, crushing and breakage of sprocket teeth, weakening of the landing of sprockets on shafts, gear chain links.

INTRODUCTION

The chain transmission, simultaneously with the transmission of torque, usually performs the function of a gearbox or multiplier. It requires strict parallelism of the axes of rotation of the gear sprockets, but does not require a strictly constant center distance between the gear sprockets, and when using a chain tensioner, it can generally operate with a constantly changing center distance. It has a constant gear ratio for each pair of sprockets, and the number of teeth of both sprockets in such cases is tried to be made mutually simple in order to ensure uniform wear of both the sprocket teeth themselves and the chain links. Also, the chain drive is used in variators, but the design specificity of such a chain transmission.

The chain drive works fine when the shafts carrying the sprockets are parallel and both sprockets are in the same plane. Under normal chain tension, there are no backlashes in its hinge joints.

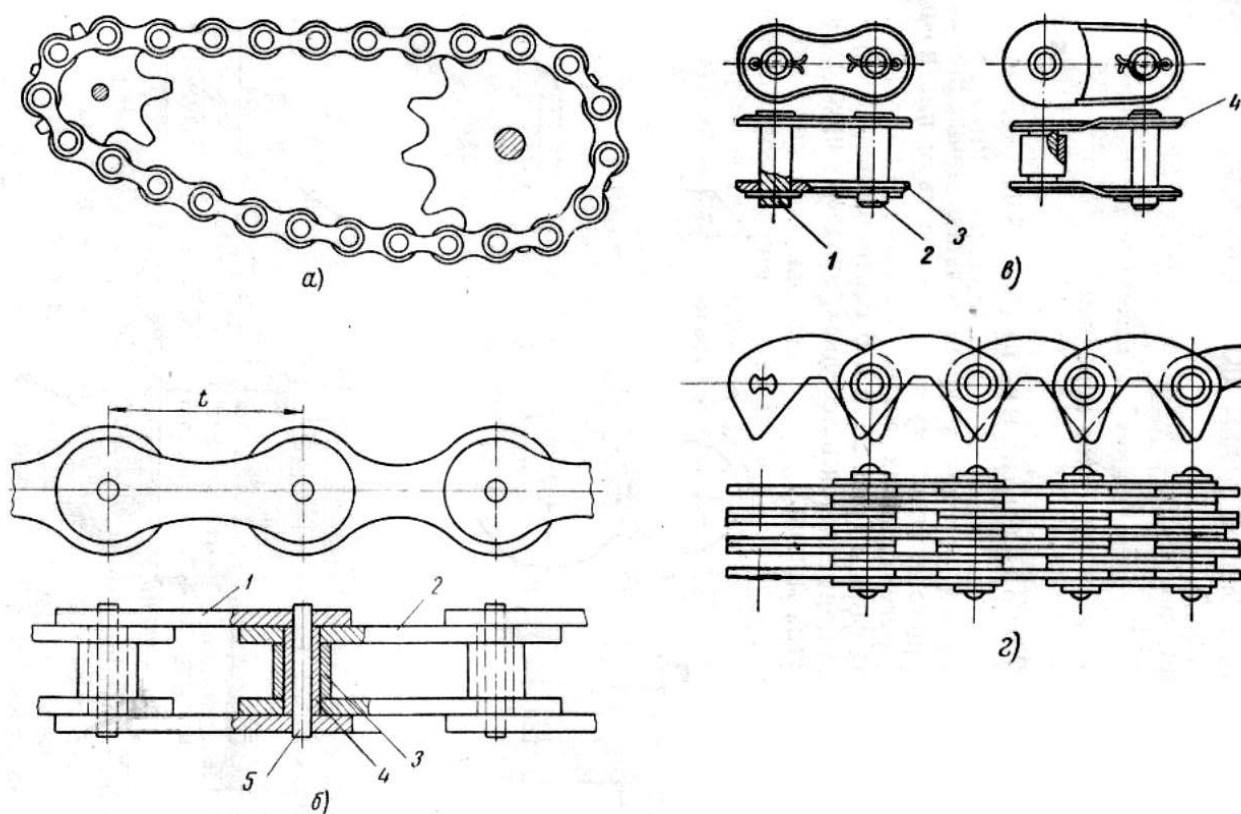
Chain transmissions are used to transmit rotational motion between shafts that are distant from each other. The chain drive is a closed metal hinged chain that covers two geared sprockets mounted on the shafts - the drive and the driven (Fig. 1).



Рис. 1. Chain transmission

Characteristic of the wear of chain gears is the crushing and breakage of the teeth of the sprockets, the weakening of the fit of the sprockets on the shafts, the wear in the interface of the sleeve 4 and the axis 5, the weakening of the fit of the plate 2 on the sleeve 4, the wear of the roller 3 along the outer diameter, as well as in conjunction with the sleeve 4. As a result of wear and tear of transmission parts, the chain is stretched, the distance t between the axles increases, and a sharp noise and knocking appear in the transmission. Under these conditions, the chain can easily fall off the sprockets, the plates can break, the axis can break; Other undesirable consequences are also possible (Fig. 2).

Chain repair usually involves replacing old sprockets or old chains with new ones. In some cases, the sprockets are still repaired by welding the teeth with subsequent machining, as well as installing bushings in the mounting hole. A worn-out chain is repaired only when it breaks in an emergency. Then, if necessary, one or more new links are inserted, taken from another chain of the same design and the same pitch, and in the absence of such a possibility, several new plates and axes are made.

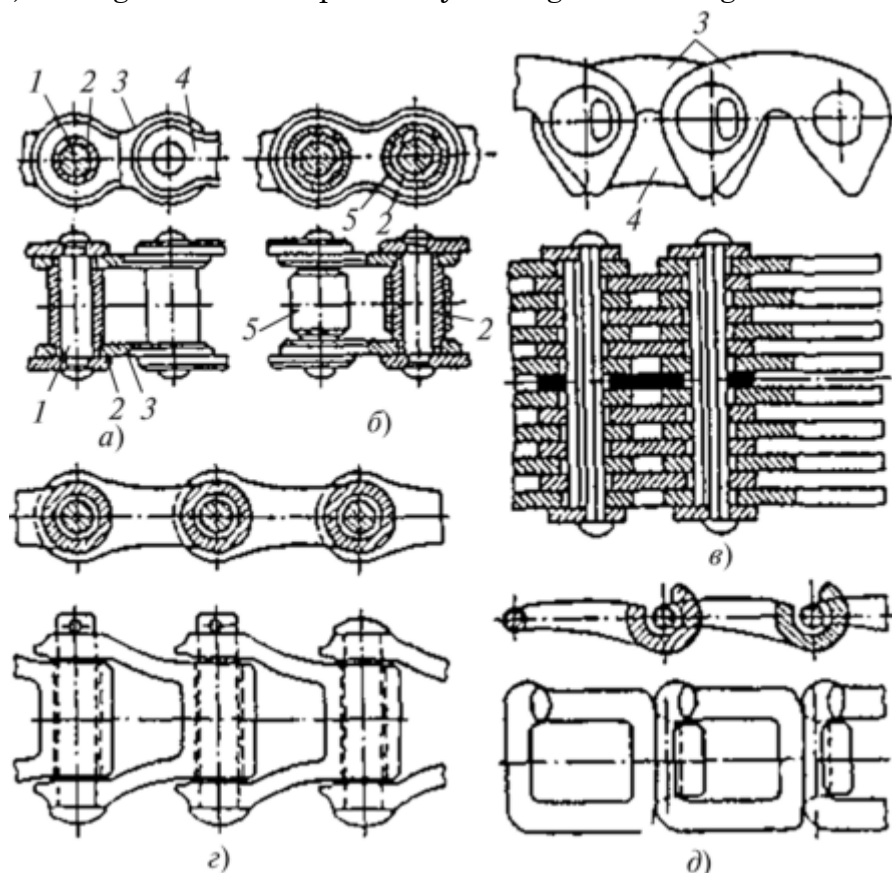


Rice. 2. Chain transmissions: a – motion transmission scheme, b – bushing-roller chain, c – bushing-roller chain lock, d – plate chain

It is rational to use chain transmissions when it is impossible to use gears - due to large center-to-center distances - and belt drives - due to the requirements of ensuring the constancy of the gear ratio. The most common use of chain transmissions with a gear ratio $i = 15$ for the transmission of power up to 100 kW at circumferential speeds up to 30 m / s.

Depending on the transmitted capacities and operating conditions, the following types of roller chains are manufactured: single-row (type PRL, PR) - normal, long-link lightweight, reinforced; double-row (PR type); multi-row (three- and four-row); with curved plates. The roller chain is

structurally different from the sleeve chain in that free-rotating rollers 5 are mounted on the bushings 2. Thus, sliding friction is replaced by rolling friction (fig. 3).



Rice. 3. **Transmission chains:** a - bushing; b - roller; c - toothed; g, d - pin and hook shaped.

During operation, the parts of the chain transmission wear out. Due to the wear of the hinges and the stretching of the plates, the chain is pulled out, so it is necessary to periodically adjust its tension force. Tension can be performed by changing the center-to-center distance, shifting one of the gear sprockets, as well as using special tension sprockets or rollers.

A characteristic sign of wear of chain transmissions is the crushing and breakage of the teeth of the sprockets, the weakening of the fit of the sprockets on the shafts, the wear in the interface of the sleeve 2 and the roller 1 (see Fig. 3), the weakening of the fit of the plate 3 on the sleeve 2, the wear of the roller 5 along the outer diameter. As a result of wear and tear of the transmission parts, the chain is stretched, a sharp noise and knocking appear in the transmission. Under these conditions, the chain often jumps off the sprockets during operation, There are breakage of the plates and fracture of the rollers.

Sprockets of chain transmissions, depending on the service purpose of the latter and their dimensions, are made composite and solid. The sprockets of sleeve and roller chains have a small width, they are usually made of two parts - a hub and a disc with teeth. These parts, depending on their material, are connected by rivets, bolts or welding. The sprockets of gears and gears with shaped link chains have a large width. These stars, as a rule, are made solid. Chain drive repairs are usually performed by replacing defective sprockets or chains with new ones.

A worn-out chain is repaired only in the event of an emergency break. Depending on the degree of damage, one or more new links are installed in the broken chain. The latter can be taken from another circuit of a similar design with the same pitch. In the absence of such a possibility, several new plates, links, bushings are made.

Sprockets are subject to restoration if the wear of the teeth in thickness reaches 0.8 ... 1.5 mm depending on the pitch. The recovery coefficient is in the range of 0.2 to 0.9. In sprockets, in addition to tooth wear in thickness and width, the surfaces of the hub holes, keyways and threaded holes for the locking bolt also wear out.

When repairing, worn-out sprockets are most often replaced with new ones. In some cases, sprockets with a diameter of more than 120 mm are repaired by surfacing with subsequent milling processing, or a new ring gear is made and welded to the trimmed hub of the worn sprocket. However, these methods of repair in most cases are economically unprofitable.

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