



RESTORATION AND REPAIR OF SHAFTS OF MACHINERY AND EQUIPMENT

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Annotation

This article describes the main work performed on the restoration and repair of emerging shaft malfunctions. Shafts are the main parts of internal combustion engines and various equipment. Shafts are used to convert and transmit torque, gears, pulleys, half couplings.

Keywords: shaft, torque, installation, dismantling, wear value, shaft journals, shaft diameter, clearance, restoration with metallization, gears, pulleys, half couplings, keyways.

Shafts are the most common and critical elements of machinery and equipment. Shafts transmit torque to gears, pulleys, half couplings and other parts through keys, splines and tapered surfaces. The shafts themselves rotate in the rolling and sliding supports. Repeated mounting and dismantling of shaft-coupled parts on interference landings leads to wear of the seats. The appearance of gaps disrupts the alignment of the shafts, causing emergency wear of the mechanism.

Sliding supports wear out the shaft journals, and oil seal packings intensively reduce the diameter of the shaft. Alternating dynamic loads deform the splines and keyways, causing backlash and shocks during reverses.

The choice of method for restoring cylindrical surfaces largely depends on the amount of wear, which is equal to the difference in the diameters of the unworn and worn parts.

With slight wear, the method of repair dimensions is sometimes used, if strength allows it and if the modification of the mating part does not require a lot of money and time. The dimensions of low-responsibility small-sized shafts can be restored by metallization. Chrome plating is used to build up shafts, measured in fractions

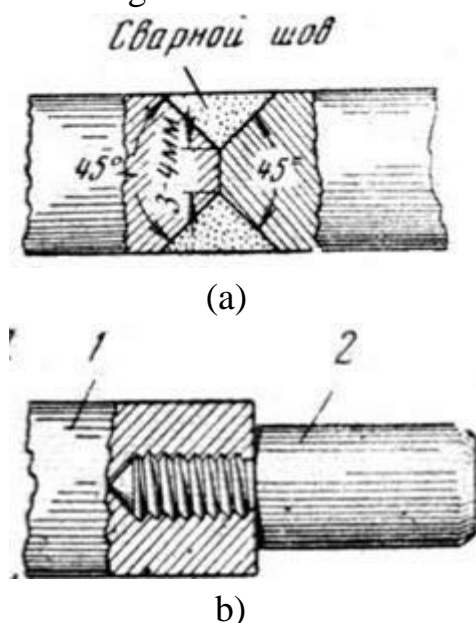
of a millimeter. Badly worn trunnions and shaft journals are most often restored by surfacing. Before surfacing, worn surfaces are cleaned of dirt and then degreased. Since the thickness of the deposited layer after processing should be at least 1.5–2 mm, surfaces with wear in diameter of 0.5–0.6 mm are pre-grinded. Before surfacing, all possible measures are taken to remove heat from the shaft in order to protect it from overheating, warping and the occurrence of thermal interfaces.

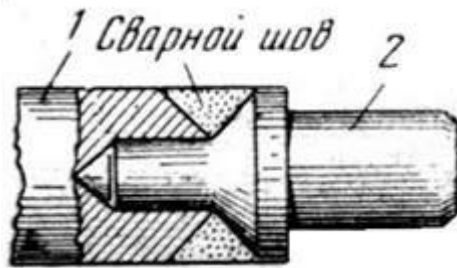
Worn keyways can be restored by the following methods:

- 1) the introduction of the repair size by increasing the width of the groove by no more than 15%, which, when assembled with the mating part, will require the use of a stepped key;
- 2) milling the new groove at a certain angle to the old one;
- 3) by fusing the wall of the groove or brewing it completely, and then milling it to the specified dimensions.

The keyways of the shafts are processed on milling machines. Worn shaft threads are removed on a lathe, and then a smaller diameter thread is sharpened or the machined area is welded to obtain the same thread dimensions. The quality of the thread is checked by a thread gauge, threaded gauges.

Shafts arriving for repair with cracks and breakdowns are rejected. Low-responsibility shafts that carry small loads can be repaired by welding a crack or welding broken parts, the ends of which are processed into a cone (Fig. 2, a). Sometimes such shafts are repaired by adding a new part to replace the broken one, attaching it on a thread or welding (Fig. 2, b, c).





c)

Rice. 2. Repair of broken shafts by welding

a – welding of shaft ends; b - installation of the trunnion on the thread;

c - welding of the carved thread of the trunnion; 1 – shaft; 2 - trunnion.

One of the most expensive parts of machines with a crank mechanism is the crankshaft. It converts the rotational motion of the engine into the reciprocating motion of the pistons of the internal combustion engine. The main defect of these shafts is the wear of the working surfaces of the main and connecting rod journals.

Due to large overloads or improper operation, the crankshaft may have permanent deformations of bending or torsion. The shaft to be repaired is subjected to careful control. With the help of magnetic flaw detectors, first of all, the presence of cracks is detected. Micrometers determine the magnitude and unevenness of the wear of the journals, for which diameters in two mutually perpendicular directions are measured in sections near the journals. The bending of the shaft is checked on prisms.

The journals of the crankshafts, the ovality and taper of which exceed the norms, are processed to the repair size by grinding. The shaft journals are also restored by surfacing under a layer of flux with subsequent normalization. After turning, the necks are hardened with high-frequency currents, ground and polished.

After the final quality control of the repair, the crankshafts are balanced. The lubrication channels of the shafts are pressed with oil.

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