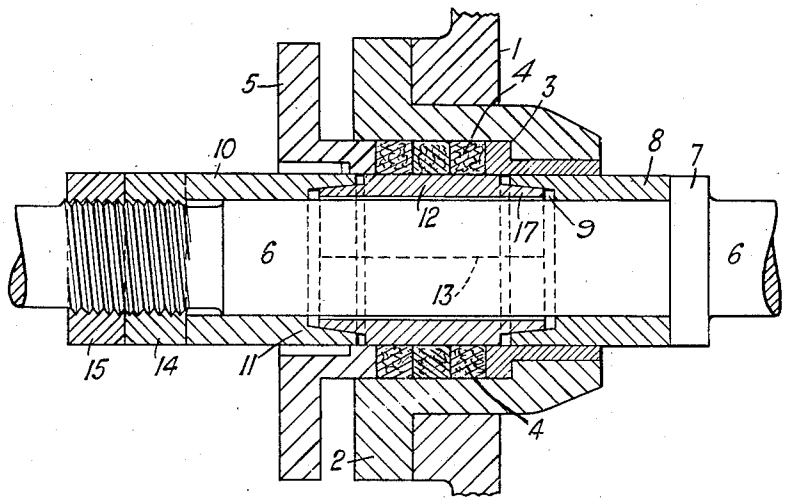
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RENEWABLE SLEEVE ASSEMBLY FOR ROTARY PUMP SHAFTS

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## RENEWABLE SLEEVE ASSEMBLY FOR ROTARY PUMP SHAFTS

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1 Claim. (Cl. 286—7)

This invention relates to renewable sleeves for the shafts in way of the glands in rotary feed pumps, particularly pumps operating with stuffing boxes subject to high pressures.

In the use of stuffing boxes in rotary pumps subject to high suction pressures it has been found requisite to maintain a considerable pressure between the packing in the stuffing box and the shaft to prevent the leakage of an undue amount of liquid to the exterior of the stuffing box. This pressure between the stuffing box packing and the shaft gives rise to wear of the shaft, and such wear increases with the pressure to which the stuffing box is subjected. It is common practice to fit a renewable sleeve coaxially around the shaft in way of the stuffing box packing so that any wear caused by the packing occurs on the sleeve which can be replaced at considerably less cost than the shaft; further, such a sleeve can be made of a much more wear-resistant material than the shaft which must carry the torque necessary to drive the pump impellers.

The replacement of renewable sleeves of known construction requires the dismantling of the internal parts of the pump; frequently it is necessary to dismantle the suction or discharge pipework and valves, and, in some cases, the driving motor.

Where the pump is driven by a steam turbine, it is often necessary to remove the steam and exhaust connections of the turbine and to open up the turbine to permit the shaft to be removed for the purpose of changing the renewable sleeves. These operations require a good deal of time and labour, with attendant cost, and in many pumping installations the lack of availability of the pumping and associated equipment during such operations is an extremely serious and costly disadvantage, and is frequently very inconvenient.

The necessity for changing the renewable shaft sleeves in way of the stuffing boxes arises frequently in the use of rotary pumps which are operated at high suction pressures such as are experienced, for example, in boiler feed water pumps and boiler circulating pumps used in connection with forced circulation boilers.

The object of the present invention is to provide means whereby the renewable sleeve in way of the stuffing box packing is reduced to a minimum amount of material and can be replaced without dismantling any parts of the pump or driving unit other than the stuffing box glands and without disturbing any of the piping or other connections to the pump or its driving unit.

The present invention consists in a renewable sleeve assembly for a rotary pump shaft and stuffing box, including an easily renewable longitudinally split sleeve which is maintained in position on the shaft by means carried by the shaft and engaging the ends of said split sleeve.

Thus, the renewable split sleeve may be held in position by two circumferentially continuous sleeves disposed one at each end and arranged to grip the split sleeve, the three sleeves being held together axially between an abutment on the shaft and a nut.

In the accompanying drawing the figure is a section through a pump stuffing box and shaft showing a renewable sleeve assembly in accordance with the invention.

Referring to the drawing, the pump casing 1 is provided with a detachable stuffing box 2 which, however, may be formed integral with the casing 1. The stuffing box 2 is provided with a neck ring 3 and accommodates several turns of packing 4 which are maintained in position by a gland 5. The pump shaft 6 is provided with a shoulder 7 against which abuts one end of an inner cylindrical sleeve 8, the opposite end of which is provided with an annular conical recess 9. A similar cylindrical sleeve 10 is arranged at the outer end of the gland and is provided at its inner end with an annular conical recess 11. Between the inner sleeve 8 and the outer sleeve 10 there is interposed a split sleeve 12, machined at the ends to form two conical portions 17 which are gripped in the conical recesses 9 and 11 formed in the circumferentially-continuous cylindrical sleeves 8 and 10. The halves of the sleeve 12 have abutting longitudinal faces at 13 which are held tightly together by the grip of the sleeves 8 and 10. The bore of the sleeve 12 may be slightly larger in diameter than the shaft 6, as shown, to ensure that the faces 13 shall make contact. Coaxial relation of the shaft 6 and the halves of the sleeve 12 is ensured by the sleeves 8 and 10.

Force exercised by the nut 14 through the sleeve 10 causes the recesses 9 and 11 in the sleeves 8 and 10 to grip the cones 17 on the sleeve 12, so that the faces 13 are pressed into contact and the sleeve 12 is restrained in coaxial relation with the shaft 6. The depth of the recesses 9 and 11, and the length of the cones 17 relative to the taper are such that the contact between the sleeves 8 and 10 and the sleeve 12 is made on the tapered diameters only.

With the tapered construction shown, axial movement of the nut 14 ensures an adequate

force to ensure tightness between the faces 13. Moreover, the removal of the sleeves 10 and 12 is greatly facilitated, since a slight axial movement releases the grip on the sleeve 12.

Slackening back of the nut 14 is prevented by a locking nut 15. It will be seen that, if the nuts 15 and 14 and the sleeve 10 are moved outwards, the sleeve 12 can be removed and replaced without disturbing any parts other than those mentioned and the gland 5. The sleeve 12 is the only component of which renewal is necessitated by wear due to the pressure of the packing 4.

What I claim is:

In combination with a rotary shaft, a stuffing box, packing within said stuffing box, a sleeve surrounding the shaft between the packing and the shaft, the ends of the sleeve being tapered conically, a circumferentially-continuous annulus carried by the shaft at each end of the sleeve, said annuli having conical recesses mating with the tapered ends of the sleeve, an abutment on the shaft beyond one end of the sleeve which is engaged by the annulus at that end of the sleeve, and a nut threaded onto the shaft beyond the other end of the sleeve and holding the sleeve and the annuli together axially and in sealing relation on the shaft, the sleeve being split so that when the nut and the annulus adjacent thereto are backed off the sleeve may be removed without being slipped off an end of the shaft.

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