step toward analyzing the contact pressure and the friction for various combinations of packing, this paper describes the mechanical properties of various asbestoid and graphitic packings. A testing method to determine the normal to axial pressure ratio K, the coefficient of friction μ and the axial pressure-strain relation $P_z-|\varepsilon_z|$ is presented. The experimental equations for there values, K, μ and ε_z, are found as functions of the axial pressure P_z.

$$K=K_0P_z^a,\ \mu=\mu_0P_z^b,\ |\varepsilon_z|=E_0P_z^c,$$

where K_0, a, μ_0, b, E_0 and c are material constants.

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Sealing Characteristics of Gland Packing (2nd Report, Analysis of the Distribution of the Contact Pressure and the Frictional Force in Tightened Packing)

by Hisao TASHIRO and Fusahito YOSHIDA*** This paper presents a method to calculate the distribution of the contact pressure between some packings and the stem, the change in the height of the piled-up packings and the axial-frictional force at a given gland pressure, for various combinations of asbestoid and graphitic packings. The analytical contact pressure between the graphitic packings and the stem is greater than that of asbestoid packings, because the value of the normal-to-axial pressure ratio of the graphitic packing is larger than that of the asbestoid one. The contact pressure on the packings tightened initially under the free-stem condition, and at the pushing and pulling of the stem, is larger than that tightened under a fixed-stem condition. The reaction pressure at the opposite side of the gland, the displacement of the packings and the axial-frictional force, under pulling and pushing of the stem, were experimentally obtained. These experimental observations agree fairly well with the analytical results.

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Gear Train Classification Method for Simplifying Automatic Transmission Calculations

by Yoshikazu TANAKA, Nobuteru HITOMI In order to simplify the calculation of automatic transmission planetary gear trains, it is useful to classify both the various combinations of the rotational members in the gear train and the oberlapping gear ratios. It was found when applying this method to two sets of planetary gears that the third gear becomes the direct drive. Whereas it is possible to build a 5-speed transmission with two planetary gears, this calculation method shows that only 4-speeds are practical. Therefore, three planetary gears should be used is constructing a 5-speed transmission.

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Study of the Characteristics of Heat Radiation from Ball Screws (1st Report, The Experiment for Evaluation of the Effect of External Forced Cooling)

by Nobuo OBUCHI and Jiro OHTSUKA It is the purpose of this paper to evaluate the cooling effect on the ball screw by external forced cooling using oil, when the ball screw is rotating, and to determine what cooling conditions satisfy and maintain the required accuracy of the ball screw. Therefore the transient temperature changes on the center axis of the ball screw are measured, and the heat transfer coefficient α is calculated using the measured values obtained when the revolution speed of the ball screw is 0～1 500 rpm and the quantity of oil per unit area and time is 0～0.17 $m^3(m^2\cdot min)$. In addition, the empirical formula is derived from the results of α in the experimental regions on the basis of the appearance of oil flow.

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The Effect of Lead on the Static Characteristics of a Hydrostatic Screw and Nut

by Yuichi SATO The effect of the magnitude of lead on the static characteristics of hydrostatic screws and nuts has been examined theoretically. By using the lubrication theory, the governing equation for pressure distribution between the flanks of external and internal threads has been derived. The effect of the magnitude of lead on the load capacity and the flow rate is investigated theoretically. Consequently, its effect is shown to be negligibly small for most screws and nuts.

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Critical Conditions in the Ironing Process of Thin Wall Metal Cups (2nd Report, Effects of Lubricating Conditions on Welding Behavior)

by Masami SAITO, Hiroyuki SAIKI**, and Nozomu KAWAI**** An ironing test of aluminum cups has been carried out under various conditions of lubrication of the punch and die. The surface appearances of the ironed cups are divided into five classes according to the intensity and the amount of damage caused by welding, i. e. rubbed surface (bright surface), scratched surface, gouged surface, surface with microtearing and surface with micro-tearing and cracks. The extent of the damage has a good positive correlation with the frictional coefficient μ_d on the contact surface between the die and the material for each lubricating condition on the punch. As the viscosity of the lubricant on the punch increases, indicating the decrease of μ_p, the