kpiece have great influence on machinability. At the first stage, the lubricating ability of various non-metal materials was tested at an elevated temperature (700～800°C). At the second stage, a mixture of ferrous metal powders and non-metal additives was sintered, and a cutting test of these sintered materials was done. The coefficient of frictions at the tool-chip interface in cutting were examined, and the most effective additives were found. The conclusions obtained in this experiment are as follows: (1) The coefficients of friction at the tool-chip interface are able to reduce effectively by adding non-metal materials as an inclusion. (2) It is estimated that the most effective additives are lithium oxide, boron nitride, glass and tellurium oxide. Glass and boron nitride are the most prospective materials for improving machinability.

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A Study on Strength Design Methods of Plastic Gears (Ist Report, Calculation Method of Fatigue Strength Due to Strain Energy)

Naohisa TSUKAMOTO, Tokihiko TAKI** and Noriteru NISHIDA**** The design methodology in terms of plastic gears is essentially based on those developed for steel gears, in spite of the fact that various kinds of design methodology have been proposed for plastic gears in recent years. Recently, several problems have been pointed out in relation to this design methodology since there are several experimental evidences, none of which can be clearly explained by the existing methodology. Therefore Tsukamoto, one of our co-workers, has performed many experiments and has proposed an entirely new strength formula, adopting the quantity referred to as the product of the contact period of teeth and loading torque, based on experimental results. The present study is aimed at establishing a practical gear strength design formula by developing Tsukamoto's thory, which is not sufficiently clear in its physical definitions. In this report, a calculation method of the fatigue strength of a gear due to strain energy is proposed.

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Roll-finishing of Involute Helical Gears in Crossed Axes System (3rd Report, Tip Relieving of die-Wheel)

Ichiro MORIWAKI, Takashi OKAMOTO*, Aizoh KUBO** and Masakatsu FUJITA*** A crossed axes system is capable of roll-finishing under lower loading than a conventional parallel axies system, and a fairly good tooth form can be obtained. However, it is difficult to keep a smooth engage-ment between die-wheel and work-gear so that an interference between the tooth tip of the die-wheel and the tooth root of the work-gear can easily occur, so a roll-finished tooth flank has a small pit near the tooth bottom. In this report, in order to make this pit smaller, a relieving was given to the tooth tip of the die-wheel. According to experimental results of roll-finishing by such a die-wheel, the amount of a tip relieving must vary properly in the longitudinal direction. Then a fairly good roll-finished tooth form without any pit can be obtained by a crossed axes system.

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Conical Involute Gear (4th Report Gear Grinding)

Ken-ichi MITOME The three grinding methods of a conical involute gear are described and it is proved that a conical involute gear can be ground practically. Niles-Type Taper Grinding, in which a Niles-Type gear grinding machine is used, is based on the principle of generating the gear by the generating rack and is the best method to grind a gear with a small cone angle. Table Sliding Taper Grinding, which is based on the principle of Table Sliding Taper Hobbing, is useful for grinding a gear with an arbitrary cone angle. Inclining Work-Arbor Taper grinding, which is based on the principle of Inclining Work-Arbor Taper Hobbing, is the most useful method for grinding a gear with a constant cone angle.

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Improvement of an Automatic Internal Gear Pitch Tester with a Microcomputer-Aided Interactive Centering Function

Masafumi SAKAMOTO and Yoshimi TAKEUCHI In order to reduce the measuring time of an automatic internal gear pitch tester which had been developed in the preceding study, improvement of the measuring device and review of the measuring method were carried out. By changing the allowance of positioning accuracy from 1 μm to 10 μm, the relationship between the adjusting time of the indicator and the allowance of positioning accuracy of the reference indicator were studied. Measuring accuracy is hardly dependent on the allowance of positioning accuracy. This leads to a considerable reduction in the measuring time. It is experimentally proved that this device enables one to measure the pitch error of internal gears with high repeatability and reliability in a short time.

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The Characteristics of Bolted Joints with Tap Bolts Subjected to External Bending Moments (The Case Where a Clamped Part is T-Flange with a Full Face Metallic Gasket or a Filler Plate)