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The Dynamic Stress Analysis of a Viscoelastic Non-Cylindrical Coil Spring to Base Excitations with Consideration of End Effects

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This paper deals with a method for solving dynamic stress problems of a non-cylindrical viscoelastic coil spring subjected to base excitations. The analysis considers the effects of ends of the coil, and applies the three dimensional curved beam theory for obtaining the exact solution of the element of the coil. The resultant forces and the resultant moments in the vibrant coil are decided by means of the transfer matrix method for an arbitrary shape. Both the shear and the normal stresses are obtained by use of the curved beam theory as just mentioned. Numerical calculations have been carried out for two cases of a barrel spring and a hyperboloidal spring.

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The Design of Aluminium Bolted Flange Connections (3rd Report, Stress Analysis of Flanges with Full Face Gaskets)

Shigeru KOHMURA

Bolted flange connections with full face gaskets have commonly been used for low pressure piping. No stress calculation method is given in J. I. S. and A. S. M. E. codes. The analyses on stresses, bolt loads and gasket loads of this type of flange were made by taking into consideration the gasket properties and the flange bending flexibility. The experiments were performed under gasket seating and pressurized conditions by using integral flanges with a small size hub simulating the weld part in a pipe-flange ring junction. The flanges of 280 mm in outer diameter and 20 mm in thickness were made of aluminium alloy and steel. Two kinds of PTFE gaskets of 2 mm thickness were used for the tests. Calculated results showed a good agreement with the test results. It is clarified that the stress analysis of the flanges with ring type and full face gaskets can be performed on an identical basis.

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Improvement of Lubrication in Deep Drawing by Use of a Die with a Slightly Inclined Face

Yukio KOJIMA, Yasuo YOKOTA and Takaji MIZUNO

Using a specially designed die with a very slightly inclined face, the punch load is decreased to a lower level than that for the usual flat die. This is because the lubricant trapped on a slightly inclined die face enters on the die radius in the course of the punch stroke, so that friction on the die profile decreases. The punch penetration, at which point the decrease of the punch load starts, can be estimated by calculating the volume of lubricant initially trapped and the change in the intervening space between the die face and the deforming flange during the press. The increase in the limiting drawing ratio (LDR) is brought about by the decrease of maximum punch load, and it depends on the inclination of the die face. The experimental results show that the LDR is increased by about 0.15 at the optimum inclination.

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Critical Conditions in the Ironing Process of Thin Wall Metal Cups (3rd Report, Mechanisms of Fracture of Metal Cups)

Masami SAITO, Hiroyuki SAIKI** and Nozomu KAWAI****

The mechanisms of the fracture of metal cups during ironing process have been examined, using aluminum cups under various lubricating conditions on the die and punch surfaces. When the welding occurs, the cup ruptures even though the average axial stress in the cup wall at the die exit is far smaller than the tensile fracture stress (σ_{cr}) of the ironed wall with a smooth surface. This is mainly because of the ununiform distribution of the axial stress in the cup wall due to the partial welding. The surface damage of the ironed wall caused by welding has a little effect on the tensile strength of the ironed cup wall. In any case, the initial cracking arises at a point of the cup wall, where the axial stress reaches partially the tensile fracture stress σ_{cr}. The critical condition for the fracture during ironing process has been clarified.

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Piercing Sheet Glass Under High Pressure

Katsumi YAMAGUCHI, Kiyoshi ISOGIMI**, Eiji SHAMOTO* and Junichi KOJIMA****

Many kinds of recently developed materials are very hard and brittle and it is very difficult and expensive to process these materials. So it is necessary to develop an easier and more economical method to process these materials. As an example, punching holes in sheet glass was studied in this paper. Because punching holes in sheet glass by ordinary methods is impossible, this paper presents a method for punching holes in sheet glass under statical high pressure. This research confirmed that it is possible to punch holes in sheet glass, and clarified the conditions needed to obtain good holes without defects.

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Measurement of Surface Shape by Scanning Electron Micro-

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