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References


D I S C U S S I O N

D. H. Pletta

The equations represented in this paper are based on the assumption that the "large diameter end" of the conical spiral spring "is fixed," and that the load-deflection characteristics will change if the spring is also supported on a flat plate or on inactive coils. The writer would like to comment on the effect of these and other boundary conditions on the behavior of springs.

Generally, the end coils for helical compression springs of constant radius are tapered and the seats ground. When the ends are closed the free or active coils are seated on tip contact points very near the tapered ends of the wire. The inactive turns twist and bend and increase the deflection of the spring by adding about 0.4 equivalent active turns. The bending results from load eccentricity, even when the spring is compressed between parallel plane surfaces, and produces a sinusoidal variation in the deflection unless the number of active coils is approximately \( n + 0.5 \) where \( n \) is an integer. This effect is most noticeable in short springs where the stress augment can amount to as much as 30 percent.

It would appear that such sinusoidal variations would also develop in conical spirals for eccentric axial loads since the end seats would seldom be fixed. The dead or seated coils would increase the deflection as they do for helical springs and compensate for increased stiffness resulting from a decrease in the number of active coils with load.

The writer would be interested in learning whether the authors know of any tests on conical spirals similar to those noted above for helical springs in which stress augments and sinusoidal variations in deflection were measured. Such tests would confirm or invalidate the accuracy of the assumption regarding fixation of the ends.

Authors' Closure

The spring deflection will be changed if the end conditions of the spring are changed as pointed out by Professor Pletta.

A curve similar to the sinusoidal curve, for the deflection at any point along the wire, also will be produced in conical spiral springs when an eccentric axial load is applied. This aspect of the problem was investigated extensively by the authors and appears in the first of three reports prepared early in 1961 for International Business Machines Corporation.

The authors are not aware of published experimental data on conical spirals for which sinusoidal variations in deflections have been measured.