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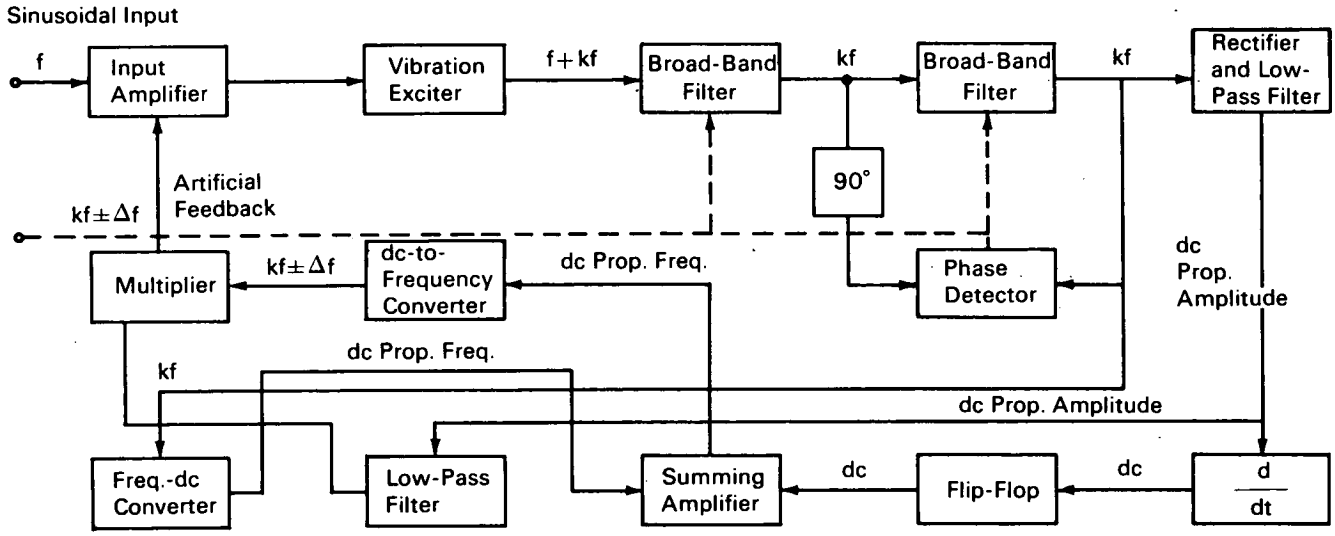
NASA TECH BRIEF

Artificial-Feedback System



Block Diagram of Artificial-Feedback System

Mechanical systems must be tested for determination of their dynamic frequency responses. Conventional vibrational equipment, such as a shake table, is driven by a hydraulic system powered by a variable-frequency electronic power supply. Vibrational frequencies (spurious harmonics) of the shake table, other than the fundamental, create errors and distort the test results. A technique was needed for elimination or reduction of the unwanted spurious vibrations.

A novel artificial-feedback system has been developed which suppresses spurious sinusoidal responses of any sinusoidally driven amplifier showing a time-dependent phase shift versus frequency function; the spurious responses need not be harmonically related.

The system is applicable to any sinusoidally driven amplifier, whereas fixed systems do not work with amplifiers showing time-dependent phase shift versus frequency functions. The method of tuning of the two broad-band filters (see fig.) is unimportant, as is the type of filter. It is necessary only to select a spurious-response component in such a manner that it may then be presented to the artificial-feedback loop control.

Believed to be new are the adaptive phase-control technique by which the phase is adjusted by change in the frequency of an external source of signals; the use of an artificial-feedback loop—one in which the amplitude and phase of an externally generated signal are controlled and employed as feedback; and the use of a differentiator and a multivibrator in the manner indicated to sense the correct phase relation in a feedback loop.

(continued overleaf)

The loop, shown as applied to a hydraulic vibration exciter system, can look on to any frequency higher than the input frequency, regardless of any harmonic relations. Thus this one loop seeks and suppresses the single largest spurious-response component generated by the hydraulic system.

All functions represented by blocks (see fig.) can be performed by relatively inexpensive analog- and digital-computer modules.

Note:

No additional documentation is available. Specific questions, however, may be directed to:

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Patent status:

No patent action is contemplated by NASA.

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