B73-10214

NASA TECH BRIEF

Goddard Space Flight Center

Apparatus for Measuring Static Coefficient of Friction Under Compressive Loads

A standard conventional test apparatus that measures the static coefficient of friction between two bodies is shown in Figure 1. This mechanism is satisfactory for testing under low stress conditions.

For testing under high stress conditions, a new apparatus has been designed and built, employing the design shown in Figure 2. This new apparatus has been used to measure the static coefficient of friction of bodies under compressive stress of up to 600 psi (4.1×10^6 N/m^2).

The new apparatus includes a load cell attached to a rigid structure. A crosshead directly beneath the cell is connected to a constant-speed electrical motor. A crossarm supported by the crosshead serves as a platform on which the bodies are tested. Test data are recorded on an X-Y recorder which is connected to the load cell and the motor.

Before measurements are initiated, the body (test specimen) is placed between the two mounting plates which have been machined to the proper surface finish from material to be tested. The four bolts on top of the plate/spring assembly are then adjusted until the desired compressive load is reached. A special index mounted on the side of the assembly shows how much the spring must be compressed to obtain the desired load.

The test procedure for both the conventional and the new apparatus is the same: The crosshead motor is switched on, and this allows the crosshead to move down, away from the load cell. The resulting tension on the filament applies horizontal force to the upper body. After this force reaches sufficient magnitude to overcome friction between the two bodies, the upper body begins to translate toward the pulley. This translation comes in spurts because, as the upper body moves, the filament tension is temporarily relaxed and then is applied again by the crosshead.

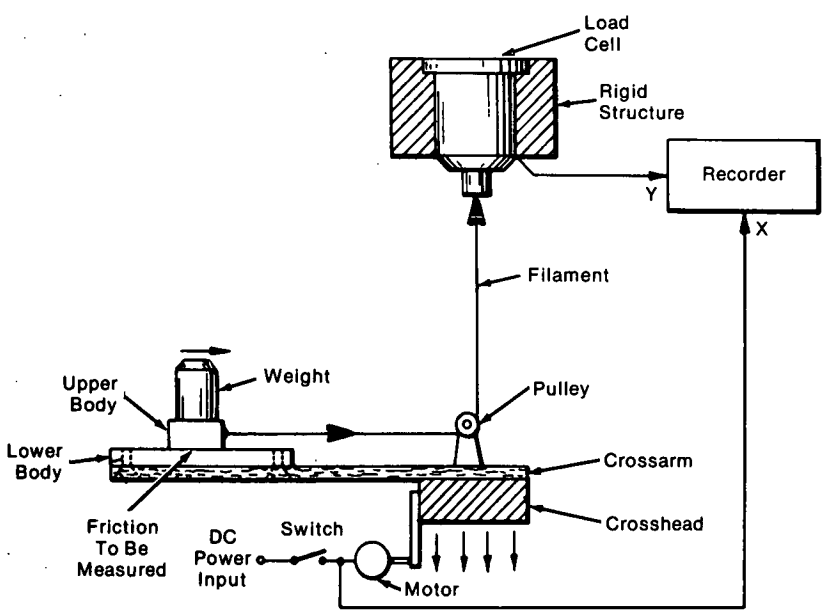

Figure 1. Apparatus for Measuring Static Coefficient of Friction

(continued overleaf)

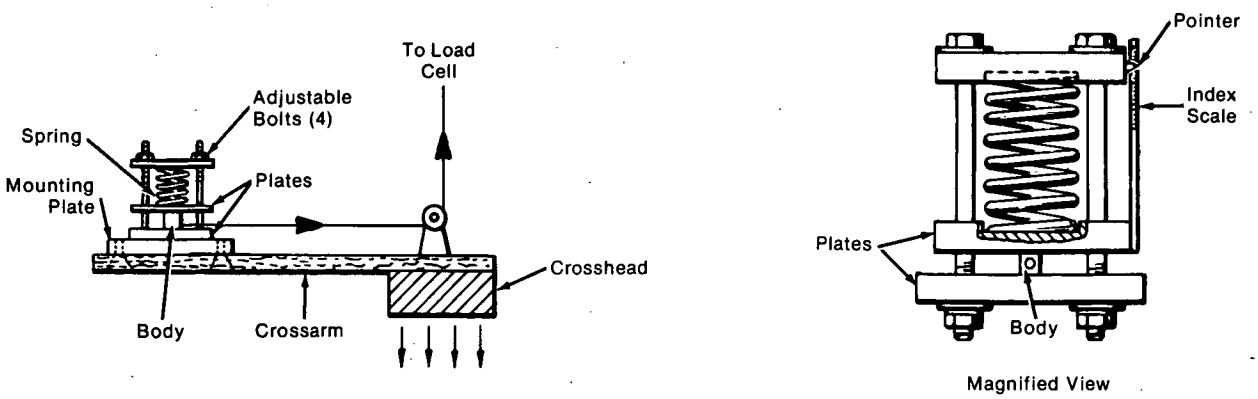

Figure 2. Use of Spring To Provide Compressive Force

The force F necessary to overcome the friction is recorded continuously on the X-Y recorder. The coefficient of friction μ is obtained from the following equation:

$$\mu = F/N$$

where F is obtained from the recorder and N is the normal force supplied by the compressive load.

Note:

Requests for further information may be directed to:

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Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

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