XXIII. SHOP NOTES

A. A SEAL THAT PERMITS MOVEMENT WITHIN A VACUUM SYSTEM

There has long been a need for a vacuum seal that allows mechanical motion to be transmitted into the vacuum space. In electronics research it is especially advantageous if probes can be moved inside the tubes or low-pressure chambers.

Several (1, 2, 3) methods have been proposed for achieving this transmission of motion, but most of the seals have a number of disadvantages. Bellows can be used to provide linear one-directional motion of limited distance. Rubber diaphragms of different shapes have also been used to transmit mechanical motion. The most frequently

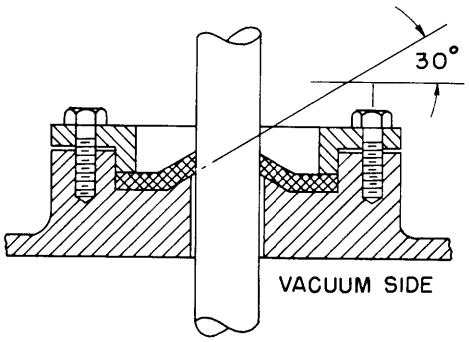

Fig. XXIII-1. Wilson seal.

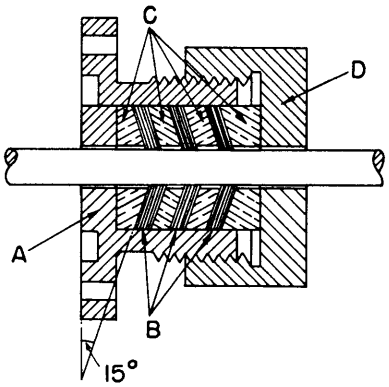

Fig. XXIII-2. Kinetic vacuum seal.

used seal is the Wilson seal (4), that is shown in Fig. XXIII-1. Its disadvantage is that it cannot be used at very low pressures without considerable leaking.

A new kind of seal which makes both translational and rotational movement possible has been developed, built, and tested with a helium leak detector. The shaft was moved in and out and turned around in a vacuum of 10^{-7} mm Hg. During the one-hour test there was no observable change of the vacuum pressure in the system.

This kinetic vacuum seal is shown in Fig. XXIII-2. It consists of a housing (A), three neoprene rings (B), four conical metal rings (C), and the housing cap (D). With the screw thread provided on the cap the metal rings are squeezed against the rubber rings. The rubber rings adhere to the walls of the housing and to the shaft, and thus make a vacuum-tight sealing. Stopcock grease on the shaft enables it to slide in and out and to turn around with ease. All of the metal parts are made of brass.

Figure XXIII-3 shows a few suggested modifications on the seal. Instead of brass, low-vapor-pressure R-Monel could be used for the metal parts. Teflon also has lower vapor pressure than neoprene, and its mechanical properties are better. With Kovar, a direct mounting on the glass tube is possible. For precise and very accurate

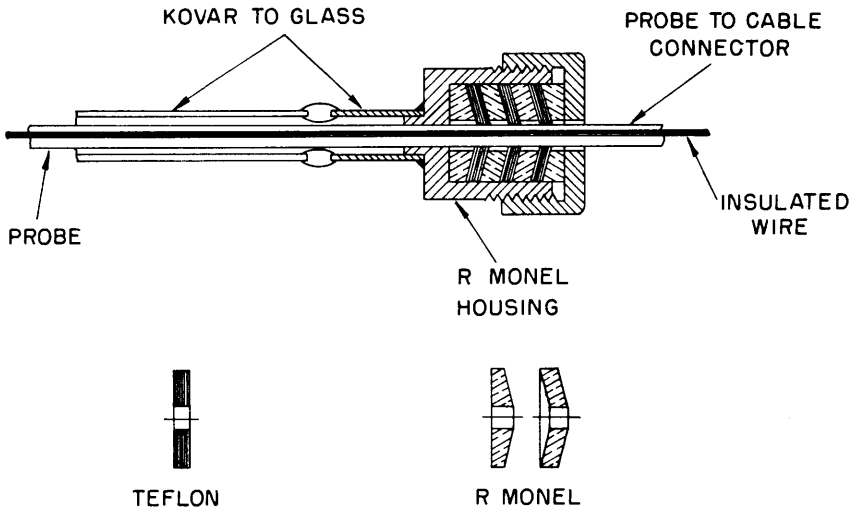

Fig. XXIII-3. Proposed kinetic seal.

measurements in the axial direction of the shaft, a micrometer can be mounted on the seal. This proposed new model is also much lighter than the one already built.

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References

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