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RADIOFREQUENCY-CONTACT SPRING

Luther R. Lucas

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In the heavy-ion linear accelerator (HILAC) the accelerating chambers are made of copper-clad steel. The rf and vacuum cavities are integral and opening one cavity simultaneously opens the other. Therefore, all covers must have both a vacuum gasket and an rf contact. To facilitate entry it is desirable to use only one set of clamping bolts for making both the rf contact and the vacuum seal.

An arrangement which has proved successful for the manhole covers of the HILAC is shown in Fig. 1. The unique element of this is the rf-contact spring. This spring is designed so that the contact force rises to a maximum with a deflection of only 1/16 in., even though the spring diameter is 1 in. The contact force remains almost constant with further deflection. Because of this, the spring can accommodate large surface roughness and still give a successful rf contact that can be reused indefinitely.

The HILAC has been operating for nearly two years at rated power (70 Mc, 42 amp rms on a 3% duty cycle) and there have been no spring replacements due to burnout. One spring section had to be replaced because of mechanical damage, but the circumstances only provided the ruggedness of the design. One of the manhole covers was accidentally dropped when it was about a foot above the hole. The rf-contact spring piloted the 400-pound cover into the hole and absorbed enough shock so that nothing was damaged except one 6-in. spring section. It took only a minute to clip off the ends of the damaged spring, insert the ends of a new one, and bend them over.

Although this design has been used only in the HILAC, it is apparent that it could be applied to other situations. For instance, in a variable-volume resonator where it is necessary to have an rf contact between a sliding piston and a cylinder wall, this spring might prove ideal.

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*Work done under auspices of U. S. Atomic Energy Commission.

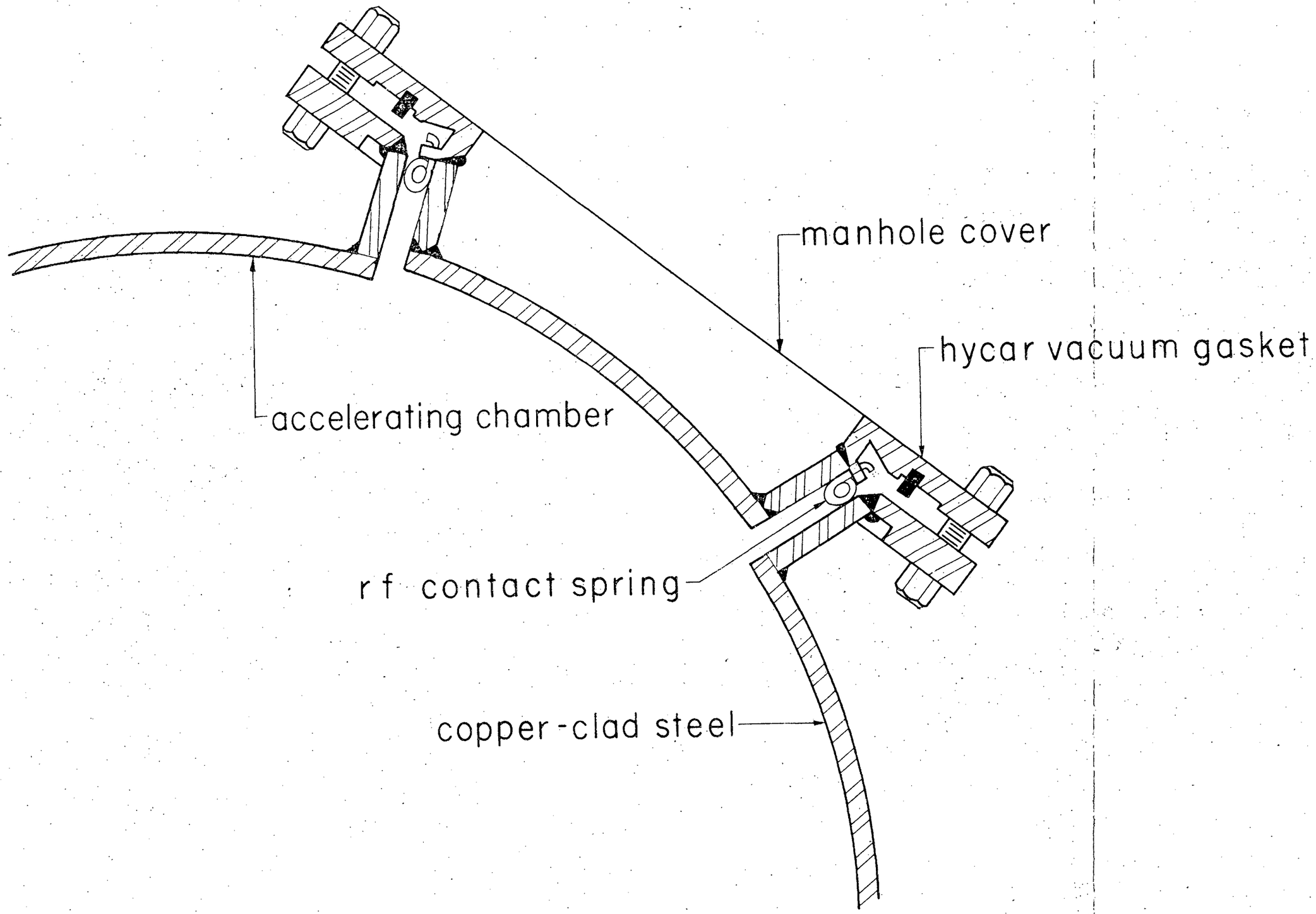
For a discussion of how to calculate the spring forces, stresses, and deflections for a given rf current, refer to UCRL-8108.*

*Luther R. Lucas, Heavy-Ion Accelerator Prestripper Tank Elastic Compression of Radially Loaded Helix, UCRL-8108, April 1957.

LEGENDS

Fig. 1. Cross section of an accelerating chamber of the HILAC, showing a manhole cover and rf-contact spring.

Fig. 2. Radiofrequency contact for a transmission-line joint of the HILAC.


manhole cover
hycar vacuum gasket
accelerating chamber
r f contact spring
copper-clad steel

50970-2 Fig. 1

Fig. 2.