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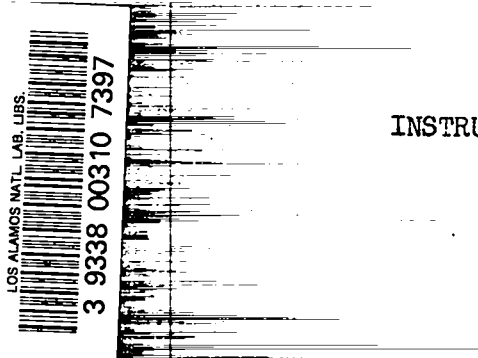
LOS ALAMOS SCIENTIFIC LABORATORY
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THE UNIVERSITY OF CALIFORNIA

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July 21, 1950

K-FACTOR FISSION CHAMBER

John H. Larkins



INSTRUMENTATION

INSTRUMENTATION

Los Alamos

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K-FACTOR FISSION CHAMBER

Due to excessive exposure of persons operating the equipment, a great need was felt for a fission chamber designed to reduce the complexity of operation and minimize repairs and adjustments during operation.

I

DESIGN CONSIDERATIONS

The primary design consideration was the reduction of exposure of personnel to artificial radioactivity induced in metallic parts of fission chambers. This reduction could be achieved by the following means:

1. Minimize the amount of metal used so as to reduce total amount of induced radioactivity.
2. Make the process of changing foil plates and vials simpler and faster in order to reduce duration of exposure.
3. Design the chamber electrically and mechanically so that fewer repairs are necessary during operation.

II

MECHANICAL DESIGN FEATURES

The body of the chamber consists of two blocks of cloth base bakelite hinged together on a $\frac{1}{4}$ " pin at one end and held closed by

a rotary cam lock at the other end. The cavities which comprise the chamber proper are machined out of these solid blocks. A gas-tight seal between the two halves is provided by a flat circular neoprene gasket of $1/16''$ x $1/8''$ cross section.

The collecting plates and guard rings are fastened in the bottoms of the cavities by screws through the back. The foil plates fit into recesses slightly larger in diameter than the inside of the chamber. The shoulders of these recesses determine the spacing between the foil plates and collecting plates. The plates are held apart and in contact with the shoulders by the springs around the lower spacer ring.

The upper spacer ring is a snap ring with small projecting lugs which engage undercut notches near the edge of the cavity. The lower spacer ring is solid but with three flat springs arranged around the bottom surface.

III

ELECTRICAL DESIGN FEATURES

Standard $2\frac{1}{2}''$ diameter foil plates are used. The collecting plates are $1\frac{3}{4}''$ diameter and the guard rings are $2\frac{1}{4}''$ O.D. x $1\frac{13}{16}''$ I.D. The spacing between foil plates and collecting plates is 1 cm. A space of $7/32''$ between the two foil plates allows room for a $3/16''$ thick vial.

Electrical connections to the collecting plates and guard rings are made through one of the screws in each. Grooves were milled in

the back to accommodate the wires which are soldered to the screw heads. All the screws were sealed with Duco cement; and after the connections were made the grooves were filled with cement around the wires, a thin coat of cement was applied to the whole surface and a 1/8" thick bakelite plate was fastened on with screws to provide mechanical protection.

The connection to the foil plates is made through a screw which projects very slightly above the surface of the shoulder upon which the lower plate rests. Electrical connection between the foil plates is made through the spacer rings.

IV

OPERATION AND TEST RESULTS

Operation of the chamber in actual use has proved it to be vastly superior to previously used chambers both from the standpoint of exposure of personnel and from that of trouble-free operation. Most of the reduction in exposure is due to the ease with which the chamber can be opened and the foil plates removed. The head of the locking rod is slotted for a large screwdriver, and can be locked or released by turning it through 270°. A hinge-type snap ring tool was made to remove the top spacer ring. This same tool also serves to remove the lower spacer ring and foil plates, all of which have similarly spaced holes drilled for that purpose.

With the old type chamber one change after the chamber had been

in the pile twenty minutes would give an exposure of approximately 100 mr. as determined by a film badge worn on the wrist. With the new chamber, after it had been in the pile six hours, one change gave an exposure of only 8.5 mr. as registered by a pencil chamber clipped to a finger ring. The latter method of determining exposure should give a more accurate value of actual exposure than the former, so it is possible that the difference is actually much greater than would be indicated by the preceding figures.

FIG. 1
CROSS SECTION LONGITUDINAL

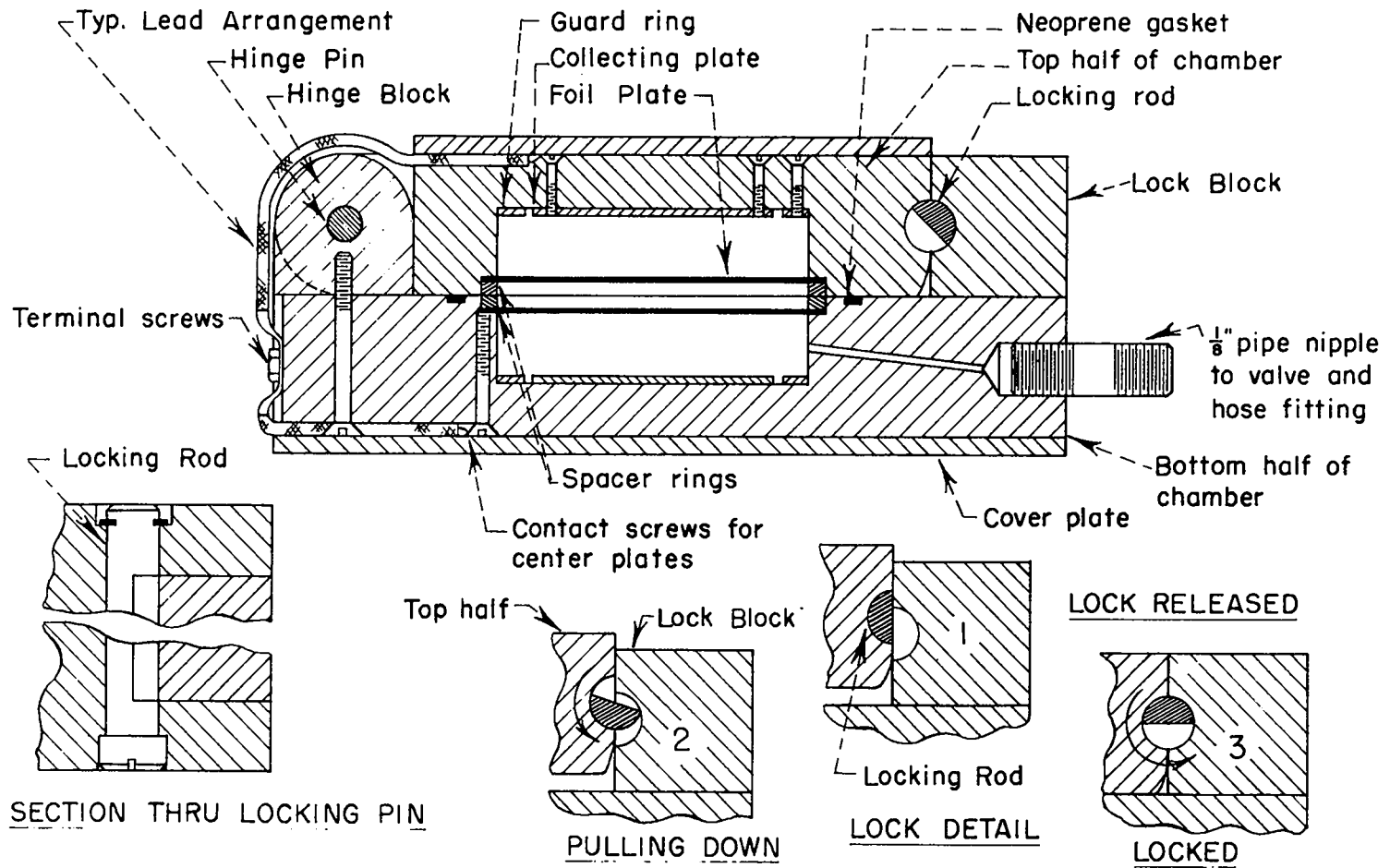
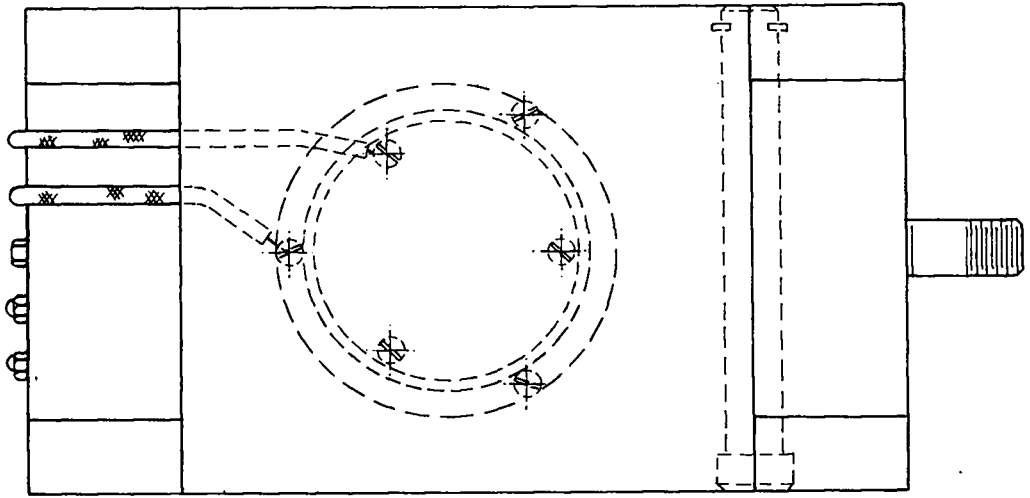
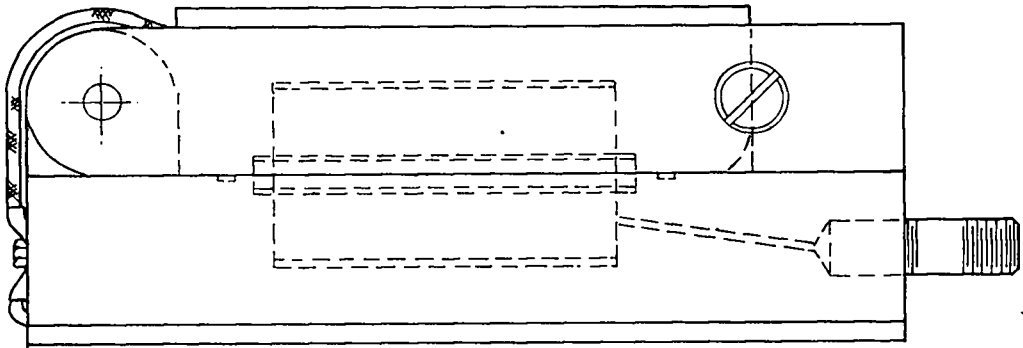


FIG. 2

TOP AND SIDE VIEWS



TOP VIEW



SIDE VIEW

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