

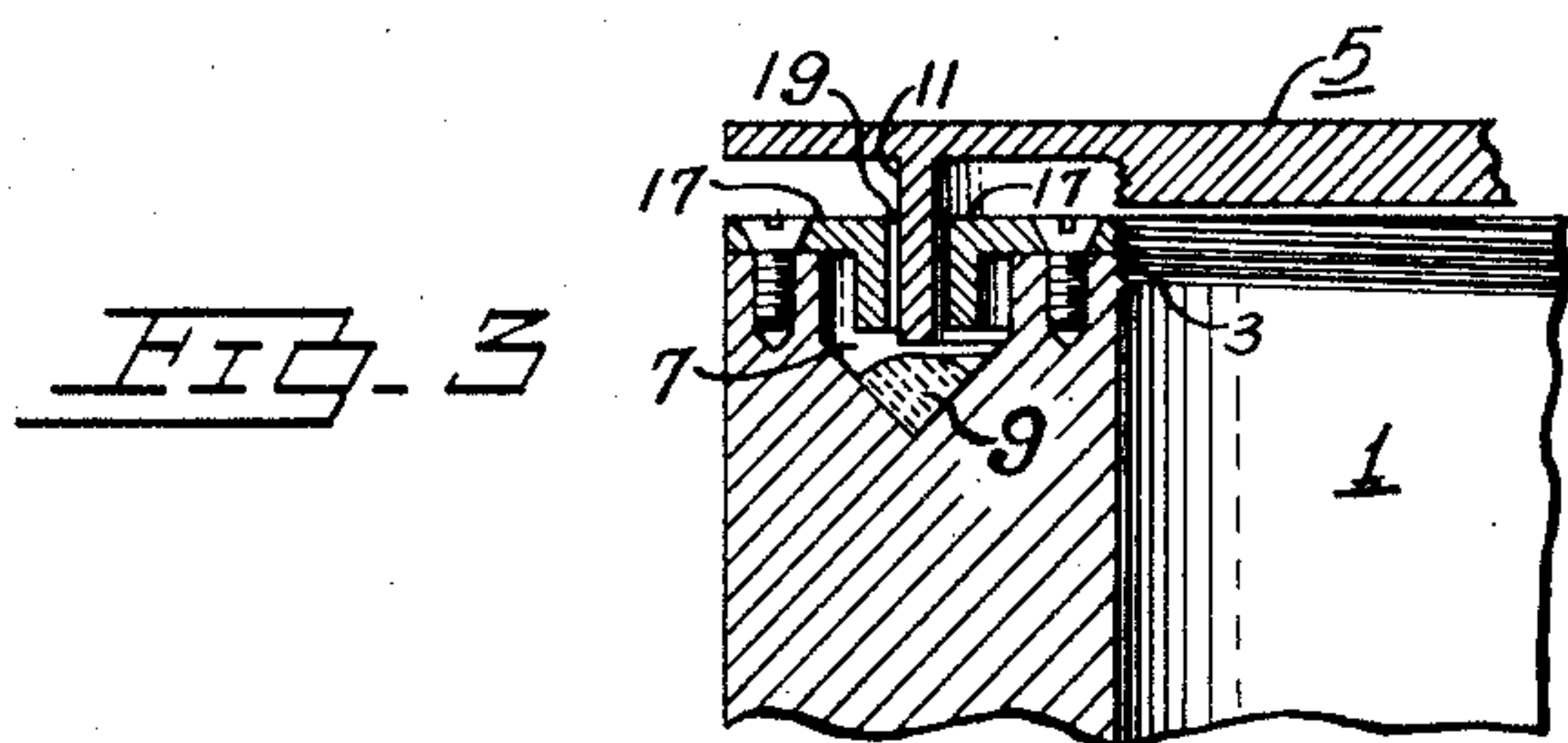
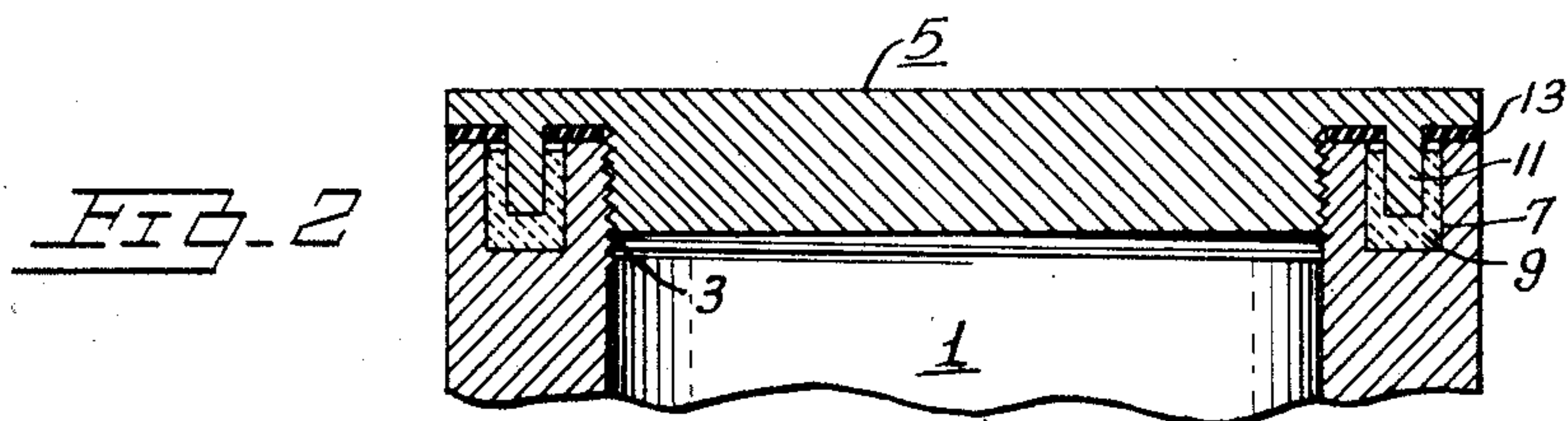
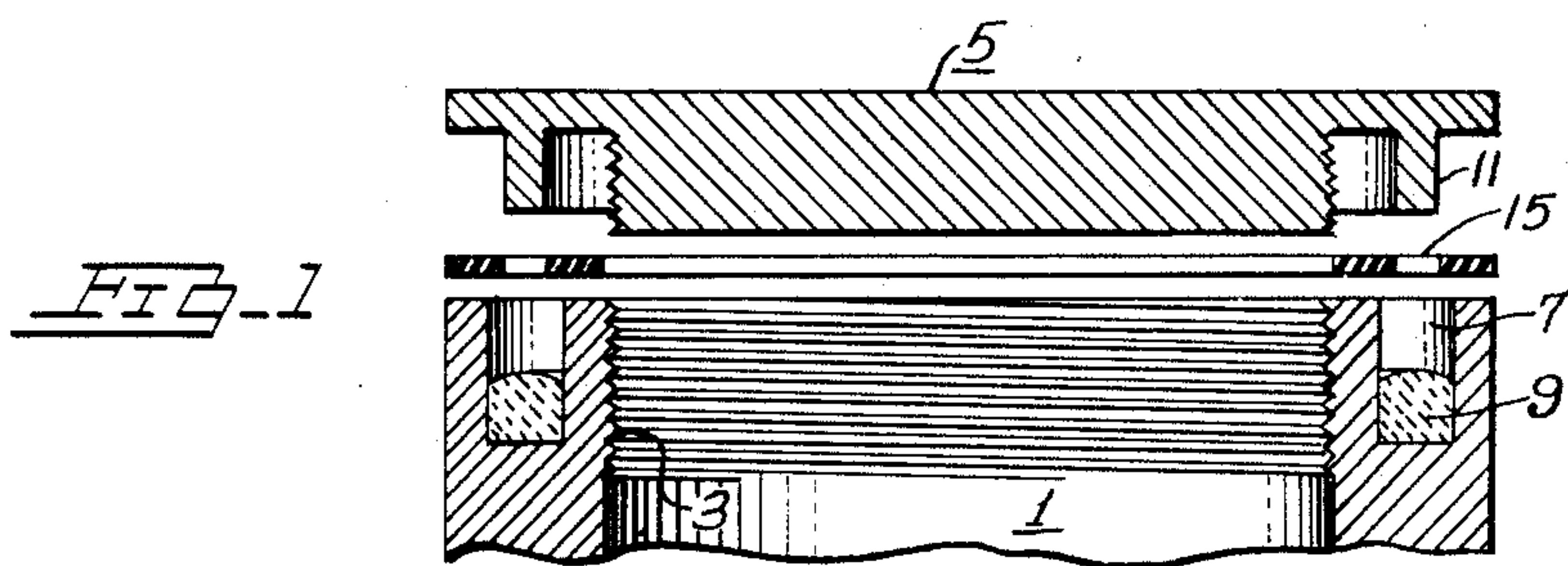
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MICROWAVE CLOSURE MEMBER AND SEAL THEREFOR

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MICROWAVE CLOSURE MEMBER AND SEAL THEREFOR

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This invention relates generally to microwave apparatus and more particularly to improved closure members and seals for openings in microwave enclosures such as shielding members, cavity resonators and the like.

Waveguides, cavity resonators and shielding enclosures in microwave systems require numerous mechanical joints for ease in assembly and for access to microwave apparatus enclosed therein. Such joints normally are not closely fitted and frequently the abutting elements are merely screwed or clamped together, thereby permitting appreciable microwave leakage through the joint. Various methods have been employed heretofore to reduce such leakage, but in most instances the only effective procedure for substantially eliminating all such leakage is to solder or otherwise conductively coat the joints.

The instant invention comprises an improved closure member which may be fitted or threaded to an aperture in a microwave enclosure wherein the joint includes a continuous pool of a conductive fluid or other easily distortable material, and a shoulder upon the closure member includes a complementary annular or edge portion which projects into and makes good electrical contact with the conductive liquid or material. Since good electrical contact is provided at all points around the joint, substantially no microwave leakage can occur through the joint. However, the closure member may be readily removed merely by unscrewing or unclamping it from the microwave enclosure, and by lifting its projecting shoulder out of the conductive fluid pool.

Among the objects of the invention are to provide an improved method of and means for sealing an opening in a microwave enclosure. Another object is to provide improved methods of and means for effectively eliminating microwave leakage through a joint in a microwave enclosure. An additional object is to provide an improved microwave seal for an opening in a microwave enclosure comprising an improved closure member which contacts a continuous pool of conductive fluid or other deformable material surrounding the opening in said enclosure. A further object is to provide an improved microwave seal including a closure member having a projection extending into a conductive fluid or other material in a pool entirely surrounding an opening in said microwave enclosure and including means for preventing spilling of said fluid when said closure member is removed. An additional object is to provide an improved method of and means for employing conductive

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fluid media or other readily deformable materials for effectively preventing microwave leakage through a joint in a microwave enclosure.

The invention will be described in greater detail by reference to the accompanying drawing of which Figure 1 is an exploded, cross-sectional, elevational view and Figure 2 is an assembled cross-sectional, elevational view of a first embodiment of the invention; and Figure 3 is a fragmentary, exploded, cross-sectional, elevational view of a second embodiment of the invention. Similar reference characters are applied to similar elements throughout the drawing.

Reference to Figures 1 and 2, a microwave enclosure 1 such, for example, as a cavity resonator, waveguide or a shielding enclosure for microwave apparatus, includes a threaded or otherwise fitted aperture 3 for a complementary conductive closure member 5. While the elements 1 and 5 are illustrated as of circular cross-section, it should be understood that they may be of any other desired shape, providing that a reasonably close mechanical fit may be made therebetween. Adjacent to the edge of the microwave enclosure 1, and entirely surrounding the opening 3 therein, is a slot 7 into which is introduced a quantity of conductive fluid 9. The conductive fluid may comprise, for example, mercury, or grease or other fluid including sufficient conductive material in solution or suspension to provide good electrical conductivity. The closure member 5 includes an inwardly projecting shoulder 11 which is complementary to the slot 7 in the microwave enclosure 1, and which extends into the conductive fluid 9 when the closure member 5 is inserted into the opening 3 in the microwave enclosure, as shown in Figure 2, thereby effecting a complete seal against microwaves.

In order to prevent leakage of the conductive fluid 9 when the closure member 5 is introduced therein or when the microwave enclosure 1 is tilted thereafter, a compressible gasket 13, of conductive or natural rubber, or other readily distortable material and including an aperture 15 for the projecting shoulder 11 of the closure member 5, is interposed between the members 1 and 5. The closure member 5 thence is screwed into the aperture 3 of the microwave enclosure 1 to compress the gasket 13 to provide an effective fluid seal for the fluid pool 9.

Figure 3 shows a second embodiment of the invention wherein the fluid pool 9 includes a pair of concentric reentrant caps 17 providing an aperture 19 therebetween and permitting

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passage of the projecting shoulder 11 of the closure member 5 into the fluid pool 9 when the closure member is fitted into the microwave enclosure 1. The caps 17 may be screwed or otherwise fastened to the microwave enclosure wall in registry with the projecting shoulder 11 of the closure member 5.

The shape of the slot 7 combined with the caps 17 prevents the spilling of the conductive fluid should the member 1 be inverted while the closure member 5 is removed. The caps 17 could be made of rubber so that the edges thereof spring together to form a seal against spilling when the closure member is removed but are forced apart when the closure member is in place.

Thus the invention described comprises two embodiments of an improved microwave seal between two conductive elements of a microwave enclosure wherein a projecting metal shoulder of one of the elements extends into and makes good electrical contact with a pool of conductive fluid in the other of said elements, said pool substantially surrounding the opening in said other element. Additional means are disclosed for minimizing the possibility of fluid leakage.

I claim as my invention:

1. A microwave seal for a threaded opening in a cylindrical electromagnetic microwave enclosure comprising a closure member complementarily threaded for said threaded opening, means defining an annular slot in said enclosure surrounding said opening, a projecting annular element on said member complementary to and coincidental with said slot in said enclosure, and a conductive fluid in said slot for providing a

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microwave seal and electrical contact between said enclosure and said closure member when said projecting element is introduced into said slot.

2. A seal according to claim 1 including a pair of deformable gaskets interposed between said enclosure and said closure member on opposite sides of said slot to provide seals for said liquid.

3. A seal according to claim 1 including a deformable apertured cap for said slot to prevent spilling of said fluid when said closure member is removed and said enclosure is tilted.

4. A microwave seal for a threaded opening in a cylindrical electromagnetic microwave enclosure comprising a closure member complementarily threaded for said threaded opening, means defining a reentrant annular slot in said enclosure surrounding said opening, a projecting annular element on said member coincidental with said slot in said enclosure, and a conductive fluid in said slot for providing a microwave seal and electrical contact between said enclosure and said closure member when said projecting element is introduced into said slot.

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