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ADJUSTABLE WAVEGUIDE JOINT

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FIG. 1

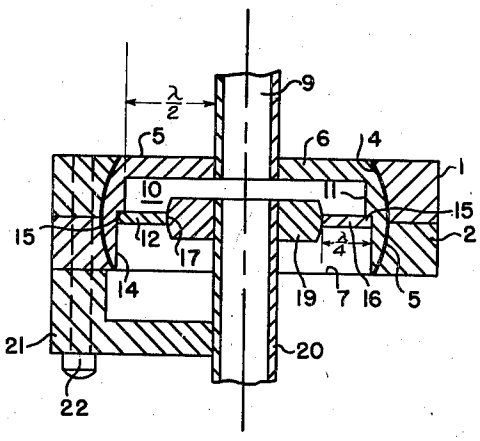


FIG. 2

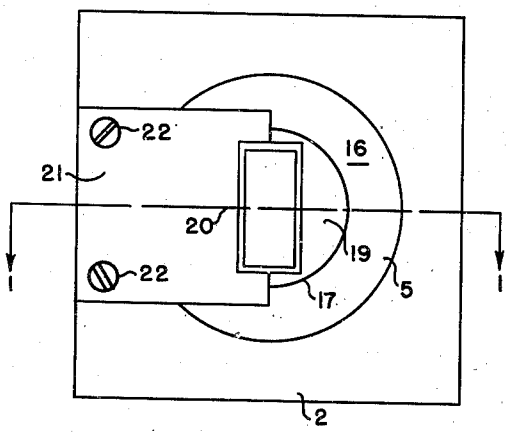
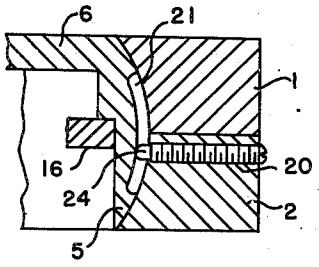


FIG. 3



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ADJUSTABLE WAVE GUIDE JOINT

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3 Claims. (Cl. 178—44)

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This invention relates to waveguides, and particularly to an improved form of movable or "wobble" to allow angular movement between two guide sections.

Couplings which permitted angular movement between waveguide sections have previously been open to the objection of having substantial radiation loss. Commonly, choke couplings have been used cut back to permit the desired movement. This cutback arrangement introduced relatively large spaces between the moving parts, and the radiation loss became increasingly large as the spacing increased. The present invention uses a universal joint which has only a very small gap, and keeps the gap a constant size at any angle through which the joint may be turned.

The invention is illustrated in the drawing, in which:

Fig. 1 is a sectional view of a wobble joint incorporating the invention, taken as indicated by line 1—1 in Fig. 2;

Fig. 2 is a bottom view of the embodiment shown sectionally in Fig. 1; and

Fig. 3 is a fragmentary view similar to that of Fig. 1, but showing a modification of the invention.

The wobble joint shown in Fig. 1 includes two joined rectangular outer housing blocks 1 and 2 in which a seat 4 is centrally formed in the shape of a spherical segment. Within the spherically curved seat 4 is movably disposed a snugly fitting spherical segment 5 having a closed end 6 and an open end 7. A waveguide section 9, which is illustrated as being of conventional rectangular cross-section, is fixed to the closed end 6 and opens into the space within the spherical segment 5. Outer housing blocks 1 and 2 may be assembled about segment 5 after the spherically curved portions which combine to form seat 4 have been machined, and secured by means described hereafter.

Segment 5 is internally bored to form a radial choke 10, or cylindrical cavity, the axis of revolution of which is coincident with the center of symmetry of the waveguide section 9. The radius of the cavity is so selected that the walls 11, defining the boundary of the choke 10, are effectively one-half wavelength from the waveguide wall 9. By "effectively one-half wavelength" is meant that the radius selected is the one which causes the standing wave ratio in the waveguide sections to be a minimum.

It is desirable to construct the joint with a step in the flat surface a quarter wavelength from the outside of the cavity. This is the region at which the choke currents are a minimum, and hence is most desirable for the break in the conducting surface necessary in broad banding the joint.

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This step includes a disc member 12 inserted into a bore 14 formed in segment 5. Bore 14 is coaxial with but of larger diameter than choke 10, and the juncture therebetween forms a shoulder 15, against which disc 16 is seated. Disc 16 has a bore 17 formed therethrough of such diameter that the spacing between the bore and choke wall 11 will be one-quarter wavelength. The bore then constitutes the beginnning of the step or break in the cavity. Within bore 17 is movably disposed an inner spherical segment 19 which is about three times the thickness of disc member 12, and is spaced symmetrically about the same center of revolution as the disc 12 and spherical segment 5.

Through the center of inner spherical member 19 is fixed a waveguide member 20. When the inner spherical segment 19 and the spherical segment 5 are properly alined, the center lines of waveguide sections 9 and 20 will coincide.

A bracket 21 is used to hold waveguide 20 fixed relative to the outer housing block 2. The bracket may be secured to the housing block 2 by bolts 22 which also serve to hold blocks 1 and 2 together. When the waveguide section 9 is tilted, either with or without rotation, the outer spherical segment 5 is free to turn in any desired direction within the seat 4. Disc 12 will maintain close contact with the inner spherical segment 19 throughout such movement, since the centers of the spherical surfaces of members 5 and 19 are the same.

In the event that it is desired to permit motion of the waveguide member 9 relative to guide member 20 in one plane only, a pin 20, shown in Fig. 3, may be adjustably inserted in the housing 2, and a keyway 21 cut into the surface of segment 5 to receive the end 24 of the pin.

It will be apparent that with the construction shown, openings at the joints through which undesired radiation can occur have been substantially eliminated. Regardless of the angle between the waveguides 9 and 20, there is the same effective separation between them, and the presence of the choke 10 minimizes radiation loss. Other connecting means, such as gimbal rings, might be substituted for those elements now joining segment 5 and guide 19.

What is claimed is:

1. Means for connecting a first waveguide section to a second waveguide section while permitting angular movement between the axes thereof, comprising a hollow spherical segment having

a closed end through which said first guide section is fixed, the wall of said hollow segment being spaced effectively one-half wavelength about said first guide section, a spherically curved seat rotatably surrounding said hollow segment, means for rigidly connecting said seat to said second waveguide section, an inner spherical segment terminally disposed about said second waveguide section within said hollow spherical segment, a substantially thinner disc having an annular width of one-quarter wavelength movably disposed symmetrically about said inner spherical segment and fixed within said hollow spherical segment, and means for restricting said annular movement to movement within one plane.

2. A coupling for waveguide sections arranged to permit relative angular movement therebetween, comprising a hollow spherical segment having a closed end through which a waveguide may be secured, a spherically curved seat in which said segment may be held rotatably, a second waveguide section, means for joining said second section to said seat, an inner spherical segment fixed about said second waveguide section, and a disc substantially thinner than said segment disposed movably about said inner spherical segment and fixed within said hollow segment; said hollow segment portion having its wall spaced effectively one-half wavelength

about said waveguide section one-quarter wavelength from said inner spherical segment.

3. A microwave wobble joint, comprising a spherical segment having a waveguide fixed thereto, a seat curved congruently about said segment and arranged for movement relative thereto, a cylindrical cavity formed within said segment extending effectively half a wavelength outwardly from said waveguide, a disc closing off said cylindrical cavity, said disc having a bore therethrough one-quarter wavelength inwardly from the walls of said choke, an inner spherical segment substantially thicker than said disc disposed within said bore for relative movement between said segment and said disc, and a waveguide disposed through said inner spherical segment.

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