

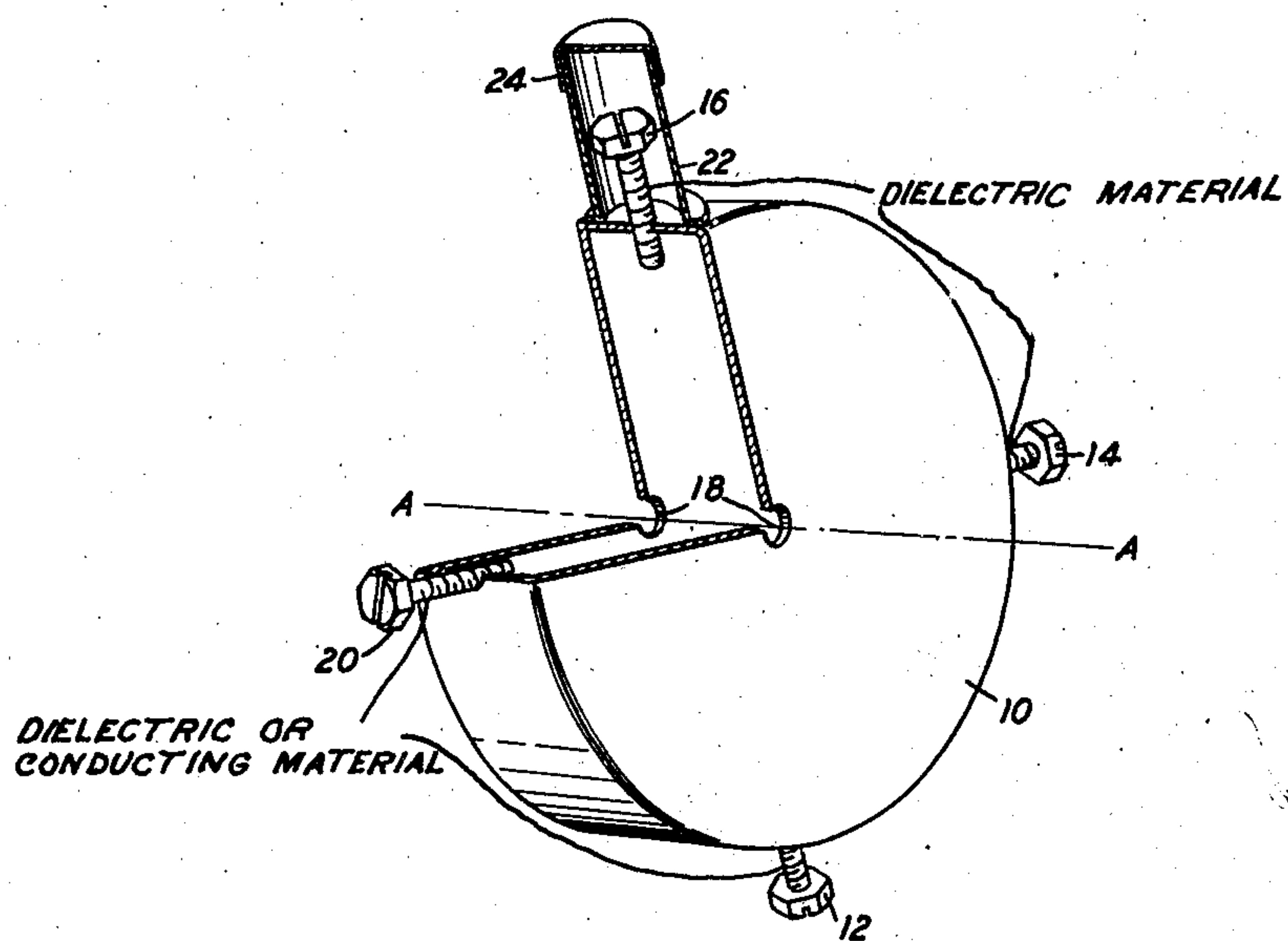
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FREQUENCY ADJUSTMENT OF RESONANT CAVITIES

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FREQUENCY ADJUSTMENT OF RESONANT CAVITIES

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3 Claims. (Cl. 178-44)

1

This invention relates to the precision adjustment of ultra-high frequency resonant cavities. More particularly it relates to the provision of relatively small dielectric members and means for introducing a precisely controllable amount of said members into a resonant cavity to slightly lower the effective resonant frequency of the cavity.

It is well known in the art that changes in the dimensions of a resonant cavity change the effective resonant frequency thereof. In accordance with this principle precise adjustment of the resonant frequency of particular cavities has been achieved by providing threaded metallic members fitted in appropriately threaded holes in the walls of the cavities so that by turning the metallic members they may be made to project into the cavity to a greater or a less extent until the precise resonant frequency desired is obtained. Adjustments as large as 3 per cent for high frequency resonant cavities are thus readily obtained.

The introduction of additional metal in effect reduces the size of the cavity and raises the frequency of resonance thereof. Such metallic members provide adjustment in one direction only and if the cavity has an initial or minimum resonant frequency which is too high they cannot reduce it.

It has been discovered, however, that dielectric members can be substituted for the metallic members and as they are introduced into the cavity they in effect increase the dielectric capacity of the cavity and therefore lower the resonant frequency thereof. The greater the dielectric constant of such members the greater their affect in lowering the resonant frequency of the cavity. By using some dielectric and some metallic adjusting members a greater range of adjustment can be realized.

A principal object of the invention is therefore to facilitate the final precise adjustment of the resonant frequency of high frequency resonant cavities.

Another object is to provide means for precisely lowering the resonant frequency of a high frequency resonant cavity.

Other and further objects will become apparent during the course of the following description and in the appended claims.

The principles of the invention will be more readily understood in connection with the accompanying drawing in which the sole figure represents an illustrative embodiment comprising a resonant cavity provided with a plurality

2

of dielectric members which may be precisely adjusted to project into the cavity as required to provide a desired resonant frequency thereof.

In more detail in the sole figure of the drawing member 10 is a metallic vessel having a cavity within it of such dimensions as to be resonant at a frequency slightly above a particular desired frequency when excited by way of example in accordance with the velocity variation method by a stream of electrons passing along its horizontal axis A—A through the centrally positioned small orifices 18.

A plurality of plugs 12, 14, 16 and 20 of a suitable dielectric material, for example, polystyrene, phenol formaldehyde or the like, are provided around the periphery of the vessel 10. These plugs are threaded and extend through holes in the periphery of the vessel 10 which are threaded to receive them. To avoid variation, after an adjustment is made, the plugs should fit tightly. Alternatively lock nuts can be provided to lock the plugs in position when adjusted suitably.

For a particular cavity, plugs of several different dielectric materials can be employed, the plugs of material having higher dielectric constants being used to effect larger adjustments and those of material having smaller dielectric constants being used for precise final adjustments. As previously suggested, too, some metallic plugs can be employed to provide a greater range of adjustment where desired.

Where leakage of energy from the cavity of member 10 through the dielectric plug is likely to prove troublesome a metallic shield 22 provided with a cap 24 enclosing the portion of the plug which extends outside the member 10 can of course readily be provided.

A number of additional applications of the principles of the invention will readily occur to those skilled in the art. For example, any of the numerous forms of high frequency tank circuits well known to the art may be substituted for the vessel 10 of the drawing. No attempt has here been made to exhaustively cover such applications. The scope of the invention is defined in the appended claims.

What is claimed is:

1. A resonant device for high frequency systems comprising a substantially closed metallic vessel enclosing a cavity adapted for excitation by the projection of an electron stream across a centrally positioned path through said cavity, said cavity having a resonant frequency slightly differing from a particular desired resonant frequency and means for precisely adjusting the

3

resonant frequency of the cavity to the desired value comprising a plurality of plugs some of said plugs being of dielectric material, the others being of conductive material, said plugs extending through the wall of said vessel at points substantially removed from the said centrally positioned path, said plugs being precisely adjustable with respect to their respective amounts of projection into the cavity of said vessel whereby the resonant frequency of the cavity may be precisely adjusted to values either slightly above or slightly below its frequency of natural resonance.

2. In a high frequency system, a substantially closed metallic vessel enclosing a cavity adapted for excitation by the projection of an electron stream across a centrally positioned path through said cavity, and means for precisely adjusting the resonant frequency of said cavity to a slightly lower value, said means comprising a member of dielectric material and a member of conductive material, both members extending into the cavity of said vessel through the wall thereof precisely adjustable amounts, said dielectric member being provided with a conductive shield

4

over its externally projecting portion, whereby accurate adjustment of the resonant frequency of said cavity in either direction from its frequency of natural resonance may be effected and will be unaffected by external factors and radiation from the externally projecting portion of said dielectric member is eliminated.

3. In a high frequency system, a substantially closed metallic vessel enclosing a cavity adapted for excitation by the projection of an electron stream across a centrally positioned path through said cavity, said vessel having a plurality of threaded holes therein, a like plurality of threaded plugs assembled in the said plurality of threaded holes in the walls of said vessel, said plurality of plugs including dielectric plugs of several substantially different dielectric constants and conductive plugs, whereby the resonant frequency of said cavity within said vessel can be precisely adjusted by turning appropriate ones of said plurality of plugs to project to a greater or lesser extent into the cavity.

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