United States Patent

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[54] **ADJUSTABLE IRIS**
5 Claims, 4 Drawing Figs.

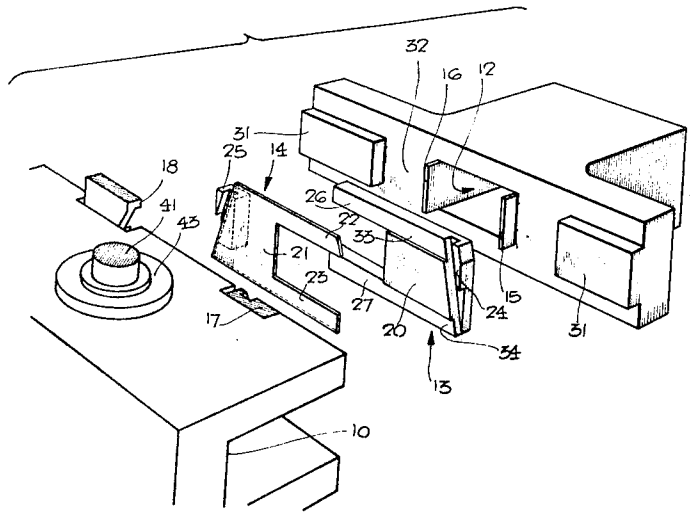
[52] **U.S. Cl.** **333/98,**
333/73, 74/110, 251/212
[51] **Int. Cl.** **H01p 1/00,**
H01p 5/04, F16k 3/03
[50] **Field of Search** 333/98,
985, 83, 73 (W), 73, 3,000; 251/205, 212, 326;
74/110

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ABSTRACT: A variable aperture iris located at a waveguide T-junction. Two sliding gates and their related positioning members are of a suitable configuration to form a smooth continuous surface along the waveguide for all sizes of aperture opening.



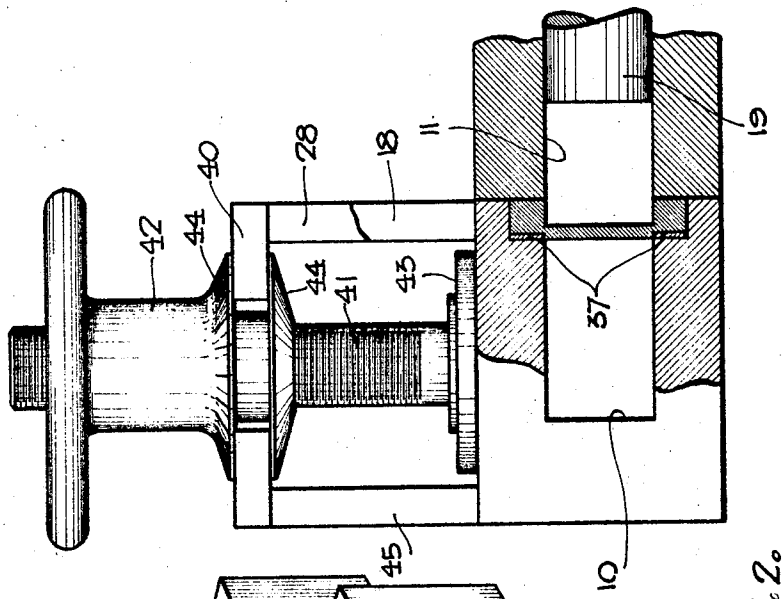


Fig. 2.

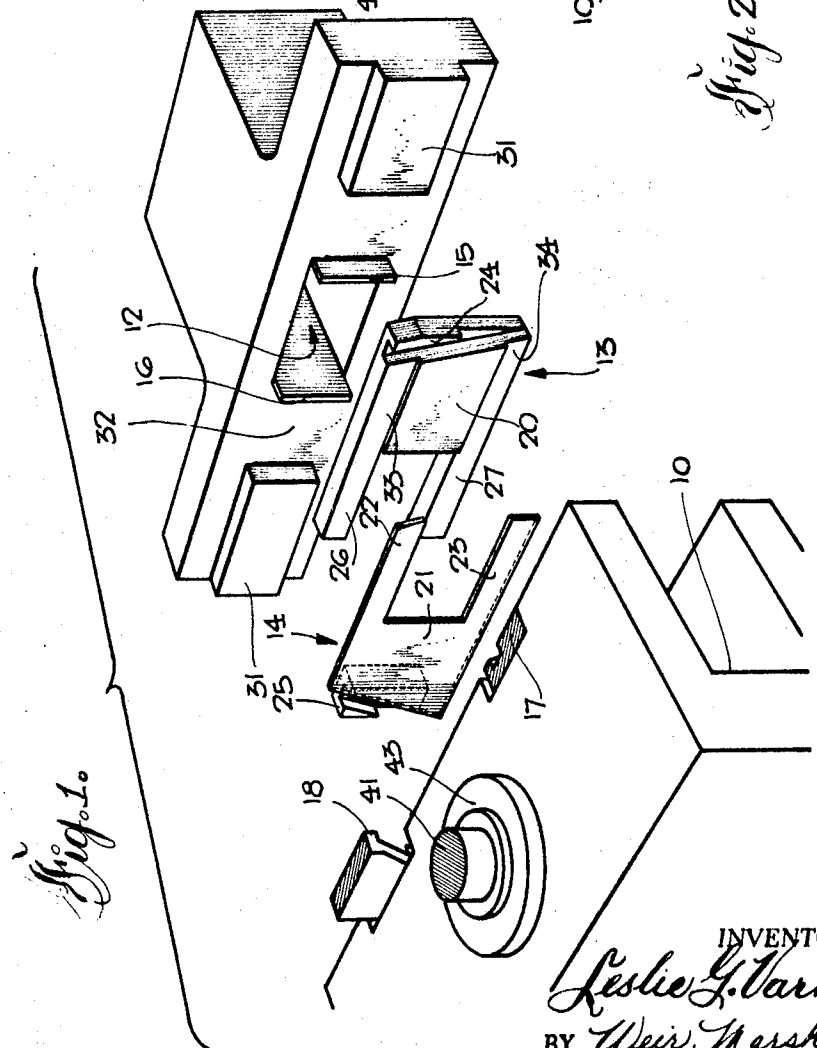


Fig. 1.

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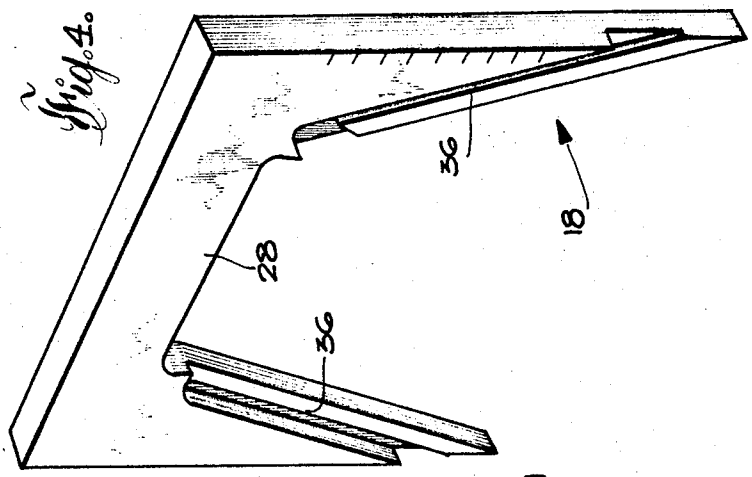


Fig. 4.

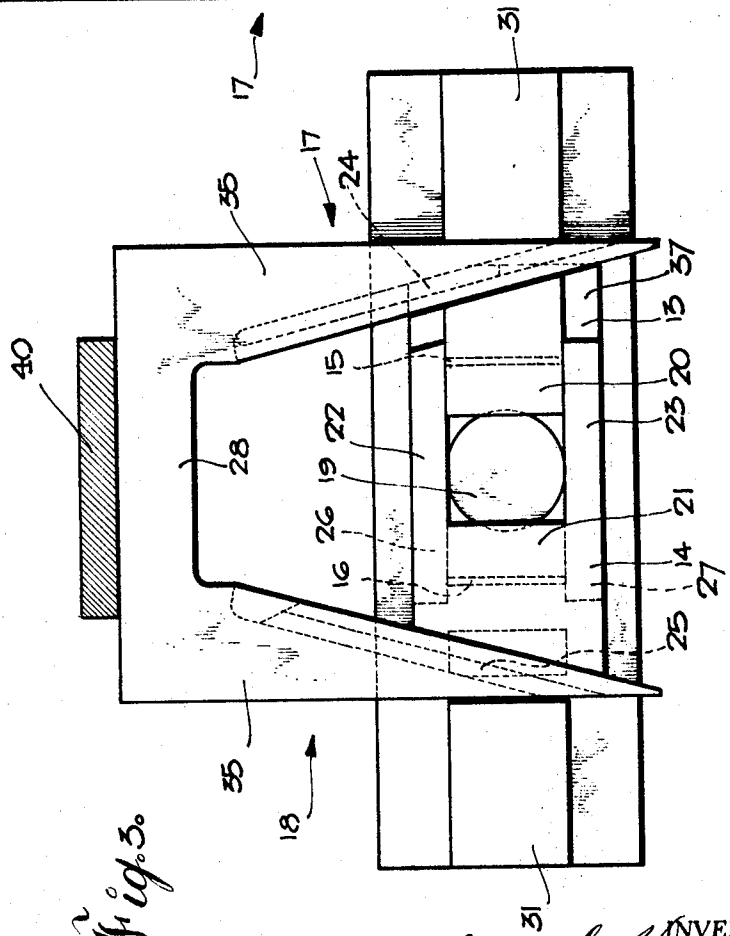


Fig. 3.

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ADJUSTABLE IRIS

BACKGROUND OF THE INVENTION

This invention relates to a variable aperture iris providing coupling between two waveguides.

It is known that the susceptance of a waveguide can be varied by inserting conductive diaphragms or irises in the waveguide. The added susceptance is inductive or capacitive depending on whether the added material is parallel or orthogonal to the electric field vector. The magnitude of the added susceptance depends on the dimensions of the added material, i.e., the size of the aperture defined by the iris.

One type of waveguide filter uses several cavities connected in shunt with the main waveguide, the coupling between the main waveguide and each cavity being controlled by an positioned at the junction. In setting up such filters, and in particular in performing susceptance measurements, difficulties arise due to the large number of readings required at differing sizes of iris aperture. Such measurements have generally been performed by disassembling the filter structure to insert fixed irises of different sizes.

SUMMARY OF THE INVENTION

Briefly, the structure of the variable iris of the present invention consists of two slidable gates each having a smooth wall forming a portion of the sidewall of the main waveguide. A positioning member of wedge-shaped configuration is provided for each gate. Each positioning member has a smooth surface and a notched surface. The notched surface engages with a corresponding notched portion in the respective gate to effect movement thereof while the smooth surface abuts on the smooth surface of the gate forming a further portion of the waveguide wall.

Such structure is particularly useful in setting up microwave filters of the type described in the preceding section in that there is no requirement to disassemble the filter in order to change the aperture size of the iris. Calibration markings may be provided on the positioning members which indicate accurately the corresponding aperture opening.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded view of the variable iris of the present invention,

FIG. 2 is a side view, partially in section,

FIG. 3 is a front view of the iris in assembled condition, and

FIG. 4 is a perspective view of the positioning members.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A particular embodiment of the invention used in conjunction with a waveguide T-junction will be described in conjunction with FIGS. 1 through 4. With particular reference to FIGS. 1 and 2, a T-junction is formed between a main waveguide **10** and a secondary waveguide **11**. Secondary waveguide **11** is intended for use as a resonant cavity and a conventional tuning plunger **19** is provided.

The coupling between main waveguide **10** and secondary waveguide **11** is adjustable by means of a variable iris structure positioned at the entrance **12** of the secondary waveguide. To provide this variable iris structure, a section of the sidewall of the main waveguide is recessed between surfaces **31** to form a support surface **32**. Supporting members **15** and **16**, which are extensions of the sidewalls of the secondary waveguide **11**, extend beyond support surface **32** toward the plane of the sidewall of the main waveguide. Slidable gates **13** and **14** provide the variable aperture in the iris structure. Gate **13** has a smooth wall portion **20** bridging parallel legs **26** and **27**. These legs are substantially square in cross section and are slightly displaced from the plane of smooth wall **20** to form therewith a pair of shallow grooves **33** and **34**. In the assembled condition gate **13** is positioned for slidable movement abutting on support surface **32** with legs **26** and **27** engaged on either side of supporting members **15** and **16**. In this position, wall surface **20** lies in the plane of the sidewall of the main waveguide, that is, it is coplanar with surfaces **31**.

Gate **14** has a smooth wall surface **21** coplanar with legs **22** and **23**. Gate **14** is positioned for slidable movement abutting on gate **13** with legs **22** and **23** engaged in shallow grooves **33** and **34**, respectively. When so positioned, wall surface **21** also forms a portion of the sidewall of the main waveguide being coplanar with fixed wall surfaces **31** and wall surface **20** of gate **13**.

Thus, it will be seen that in the structure so far described, gates **13** and **14** are movable to form the variable iris which controls the degree of coupling between the main waveguide **10** and the secondary waveguide **11**. When the iris aperture is partially open, as in normal operation, portions of grooves **33** and **34**, designated **37** in FIGS. **2** and **3**, form hollow spaces in the assembled structure. It will be noted, however, that spaces **37** are outside waveguides **10** and **11** and do not provide any discontinuity to affect wave propagation.

The movement of gates **13** and **14** is controlled by positioning members **17** and **18**, shown in greater detail in FIGS. **3** and **4**. Each positioning member is of a tapered or wedge-shaped configuration and has a smooth surface **35** and an opposed notched surface **36**. Corresponding notched portions **24** and **25** are provided at the end of gates **13** and **14** respectively. In the assembled position of the variable iris, each positioning member is located with the notched surface **36** engaging with one gate notched portion and the smooth surface positioned in the plane of the sidewall of the main waveguide. Movement of the positioning members in the plane of the sidewall of the waveguide produces corresponding movement of the gates and hence variation in aperture size.

It will be noted that the sidewall of the main waveguide is completely free from discontinuities and obstructions. That is, in the region of the variable iris, the wall is formed by surfaces **31**, smooth surfaces **35** of the positioning members, and surfaces **20** and **21** of the movable gates. Similarly, the walls of the secondary waveguide **11** are unobstructed, being defined in the region of the variable iris by supporting members **15** and **16** and legs **26** and **27** of gate **13**.

Positioning members **17** and **18** are connected for simultaneous movement by a crossbar **28** which is, in turn, attached to an apertured plate **40**. Plate **40** engages with flanges **44** on an internally threaded hand wheel **42** mounted for movement along a lead screw **41**. Lead screw **41** is supported by base **43** on the upper surface of the waveguide assembly. Further guiding members **45**, which may be generally similar to **17** and **18**, are provided at the other side of the main waveguide from positioning members **17** and **18** in order to eliminate twisting and side pressure. In one form of the present invention a pair of resonant cavities are provided on either side of the main waveguide. For this situation guiding members **45** become the positioning members of a further variable iris located (with reference to FIG. **2**) in the left-hand sidewall of waveguide **10**.

It will be realized that the extent of the aperture opening in the iris cannot be observed when the apparatus is in its assembled condition. The opening is, however, directly related to the vertical displacement of the positioning members and suitable visible calibration indicia may be placed on them and on flange **44** of handwheel **42**, as shown in FIGS. **2** and **4**.

I claim:

1. A variable iris positioned in a wall of a main waveguide comprising:

a support surface spaced from the plane of said waveguide wall defining a fixed aperture.

supporting members extending from said support surface toward the plane of said waveguide wall,

a first gate having a projecting smooth wall at one side thereof and spaced guiding members positioned abutting on said support surface for slidable movement with the guiding members engaging the supporting members and said smooth wall forming a portion of the waveguide wall partially covering said fixed aperture,

a second gate having a smooth wall at one side thereof and spaced guiding members positioned abutting on and engaged with said first gate section for slidable movement, the smooth wall of said second gate forming a further portion of the waveguide wall partially covering said fixed aperture,

a pair of positioning members, one for each gate section, each having opposed smooth and notched surfaces positioned with said notched surfaces engaging with notched portions on said gates and the smooth surfaces forming further portions of said waveguide wall, whereby movement of said positioning members moves said gates to alter the opening of the variable iris,

the smooth walls of said gates and the smooth surfaces of said positioning members forming a substantially unbroken coplanar surface.

2. A variable iris as defined in claim 1 wherein said support surface defines a further waveguide forming a tee junction with the main waveguide and the variable iris alters the coupling between said main waveguide and said further waveguide.

3. A variable iris as defined in claim 2 wherein said supporting members are extensions of the sidewalls of the further waveguide and the guiding members of said first gate consist of a pair of spaced apart parallel legs.

4. A variable iris as defined in claim 3 wherein the guiding members of said second gate are a pair of spaced apart parallel legs received in channels in said first gate.

5. A variable iris as defined in claim 1 wherein said positioning members are of tapered configuration.