Oct. 31, 1961 H. W. GARBE 3,006,399

FIXTURE FOR STRAIGHTENING AND ALIGNING MAGNETRON PINS

Filed June 3, 1952

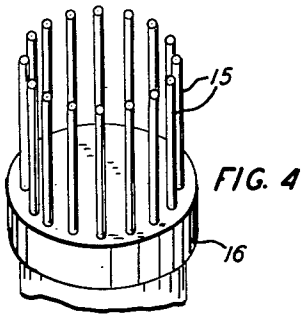


FIG. 4

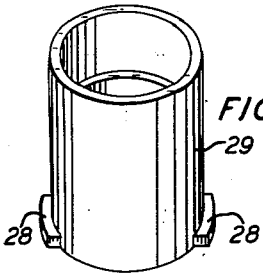


FIG. 2

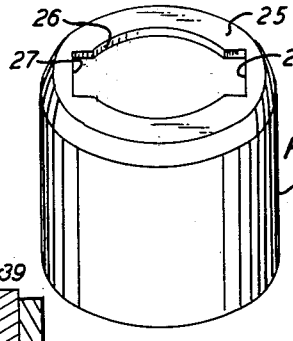


FIG. 3

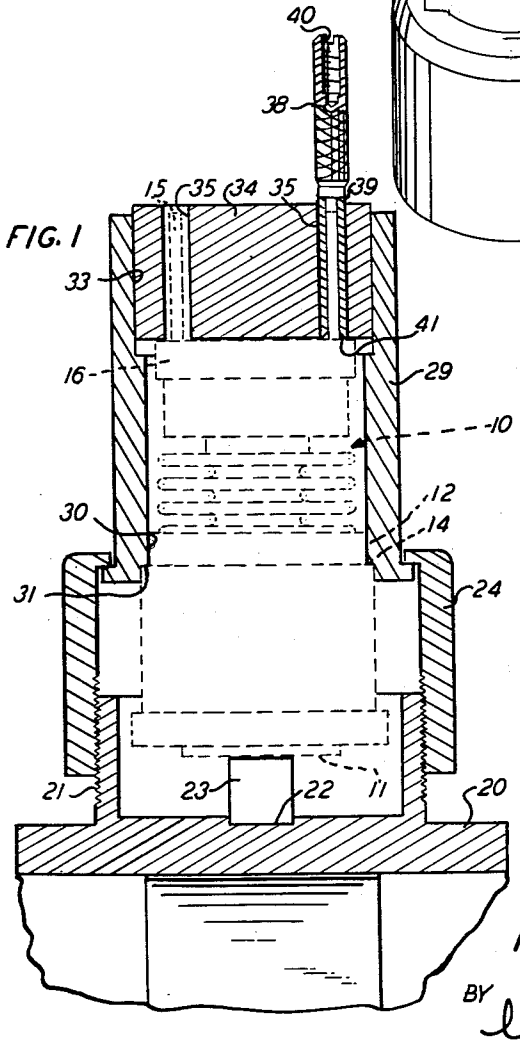


FIG. 1

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FIXTURE FOR STRAIGHTENING AND ALIGNING MAGNETRON PINS

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This invention relates to article straightening and positioning fixtures and more particularly to fixtures for straightening and positioning pins such as the tuning pins of magnetrons, relative to reference surfaces thereof.

In certain types of magnetrons the anode structure is provided with a plurality of resonant cavities and the resonant frequency is varied by means of an adjustable tuning head having a soft copper pin for each cavity. For proper operation it is essential that these pins be straight, accurately spaced and parallel with each other all within very close limits.

An object of the present invention is a fixture which is simple in structure yet highly efficient in straightening and positioning flexible pin-like parts relative to given portions of an article.

With this and other objects in view, the invention comprises a fixture having a member with an aperture therein to receive a pin-like part, means to locate the member with the aperture at a given position relative to a reference surface of the article, and an element receivable in the aperture and cooperating therewith to straighten the part.

More specifically, the fixture includes a housing formed at one end to engage reference surfaces of an article, such as the tuning head of a magnetron, and having another portion adapted to position a member with a series of apertures corresponding in number and position to the number, and positions of the resonant cavities in the anode structure (not shown) of the magnetron. The apertures in the member are accurately machined to close tolerances and are adapted to receive tubular elements cooperating with the apertures to move downwardly into the apertures over the pins to straighten the pins and position them relative to each other and the reference surface of the article or magnetron.

Other objects and advantages will be apparent from the following detailed description when considered in conjunction with the accompanying drawing wherein:

FIG. 1 is a vertical sectional view of the fixture showing the article in dotted lines;

FIG. 2 is an isometric view of the housing portion of the fixture;

FIG. 3 is an isometric view of the retaining portion of the fixture; and

FIG. 4 is a fragmentary isometric view of one end of the article showing the parts which have been straightened and positioned by the aid of the fixture.

Considering now the drawing, attention is first directed to the article for which the fixtures was designed. In the present embodiment of the invention, the article is a magnetron tuning head indicated generally at **10**, having a lower surface **11**, reference surfaces **12** and **14** and a plurality of tuning pins **15** having their inner ends embedded in a portion **16** in a circular arrangement and at equally spaced positions as shown in FIG. 4. The tuning pins **5** are mounted in the head as accurately as possible, but they require final straightening and positioning before the magnetron is assembled. The pins are usually made of soft copper so that when straightened, they remain straight, if not subjected to further stresses, and so that if necessary, they can be offset slightly just above the base portion **16** to compensate for slight inaccuracies

in mounting them. During assembly of the magnetron, the anode structure (not shown) receives the pins **15** of the head **10** in equally spaced apertures and unless the tuning pins are perfectly straight, parallel with each other and accurately positioned with respect to each other so as to be concentric with their respective apertures in the anode structure, the operation of the magnetron will not be satisfactory. Furthermore, the positions of the tuning pins **15** must be determined relative to the reference surfaces **12** and **14** which are engaged by the tuning head and through these surfaces, the location of the apertures in the tuning head relative to the tuning pins are determined.

The fixture includes a base **20** having an annular threaded member **21** integral therewith and a recess **22** for a supporting block **23** of a suitable resilient material. A retaining member **24** (FIGS. 1 and 3), adjustably mounted on the threaded member **21**, is circular in cross-section with its upper end extending inwardly at **25** and provided with a circular aperture **26**. The aperture **26** has diametrically positioned enlarged portions **27** to receive projections **28** of a housing **29**. The housing **29** circular in cross-section, has an inner surface **30** and an annular recess **31** accurately machined to provide what might be termed as reference surfaces with close tolerances when considered in regard to the reference surfaces, **12** and **14** of the article **10**, to assure accurate positioning of the article in the housing while supported by the resilient member **23**.

The upper portion of the housing **29** has an annular recess **33** to receive a member **34**. The member **34** and the recess **33** are accurately machined to close tolerances, so that the apertures **35** in the member, which are also accurately machined with assurance of their positions relative to the engaging surfaces of the housing and member, to thereby assure accurate positioning of the apertures relative to the reference surfaces of the housing and article.

In the present embodiment of the invention, there are sixteen tuning pins **15** of the article and sixteen apertures **35** in the member **34**. There will be provided sixteen elements **38** identical in structure with tubular portions **39** having outer diameters substantially identical to the diameter of the apertures **35** and inner diameters substantially identical to the diameters of the pins **15**. The outer ends of the elements **38** are formed at **40** to receive a suitable tool to assist in rocking the elements in the apertures **35** while the inner ends have substantially conical or inwardly tapered surfaces **41** to guide the tubular portions of the elements over their respective pins **15**.

Considering now the function of the fixture, let it be assumed that the fixture has been dismantled, that is, the housing **29** has been removed from the retaining member **24** and the member **34** has been removed from the housing. An article **10** may be located readily in the retaining member **29** and allowed to rest on the support **23**. The housing **29** then may be lowered over the article with the projections **28** in alignment with the portions **27** of the retaining member **24** so that during downward pressure on the housing, the support **23** may be compressed sufficiently to cause interengagement between the housing and the retaining member **24** through rotation of the housing to move the projections **28** beyond the open portions **27**. The holding force embodied in the resilient member **23** and the degree of compression thereof during assembly of the housing **27** may be varied by adjustment of the retaining member **24** on the annular member **21**. Furthermore, the resilient member **23** allows the article or tuning head **10** to vary its position to assure accurate setting of the reference surfaces **12** and **14** thereof with respect to the reference surfaces **30** and

31 of the housing. The member 34 may be lowered then into the housing or the recess 33 thereof with the apertures 35 in a general alignment with the tuning pins 15. The operator then places a given number of the elements 38 in selected groups of the apertures 35 and causes rocking or rotary movement of the elements accompanied by downward force to cause them to move downwardly into the apertures 35. When the initial elements have been started in their conditioning operations, the remaining elements may be inserted in their respective apertures and rotary or rocking motions may be imparted to the elements in any desired order until all of the elements have been moved downwardly the full length of the parts or tuning pins 15. In this manner, any of the pins which may be bent or moved out of position with respect to the other pins will be straightened and accurately positioned with respect to each other and the reference surfaces to assure accurate positioning in their respective apertures of the tuning head when mounted on the magnetron.

When the straightening and positioning operation has been completed, the elements 38 may be removed in any given order after which the member 34 may be removed from the recess 33 of the housing and the housing may be removed from the retaining member 24 through downward pressure and a rocking motion sufficient to align the projections 28 of the housing with the open portions 27. When the housing has been removed, the conditioned article may be removed and another article disposed in place.

It is to be understood that the above described arrangements are simply illustrative of the application of the principles of the invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. A fixture for straightening and positioning a flexible pin like part, fixed adjacent one end thereof to a portion of an article, relative to a reference surface of the article, the fixture comprising a resilient support for the article, a hollow retaining member surrounding the support, a housing for the article adapted for interconnection with the retaining member by forcing the article against the resilient support to partially compress the support, the housing having a reference surface caused to closely engage the reference surface of the article by a force created in the partially compressed support to position the article in the housing and a locating surface spaced from said reference surface, a member having an aperture to receive the pin like part adapted to be supported by said portion of the article at a position controlled by said locating surface, and an element receivable in the aperture and guided thereby to straighten and position the pin like part relative to the reference surface of the article.

2. A fixture for straightening and positioning a flexible pin like part, fixed adjacent one end thereof to a portion of an article, relative to a reference surface of the article, the fixture comprising a resilient support for the article, a hollow retaining member surrounding the support, a housing for the article adapted for interconnection with the retaining member by forcing the article against the resilient support to partially compress the support, the housing having a locating surface within one end thereof and a reference surface adjacent the other end thereof caused to closely engage the reference surface of the article by a force created in the partially compressed support to position said portion of the article at a given position relative to the locating surface, a member, having an aperture to receive the pin like part, adapted to be supported by said portion of the article in the housing at a position controlled by said inner locating surface, and an element receivable in the aperture and guided thereby to straighten and position the pin like part relative to the reference surface of the article.

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