March 25, 1958 H. W. CLIFFORD ET AL 2,827,709

INTERNAL GAGING APPARATUS

Filed Nov. 1, 1955

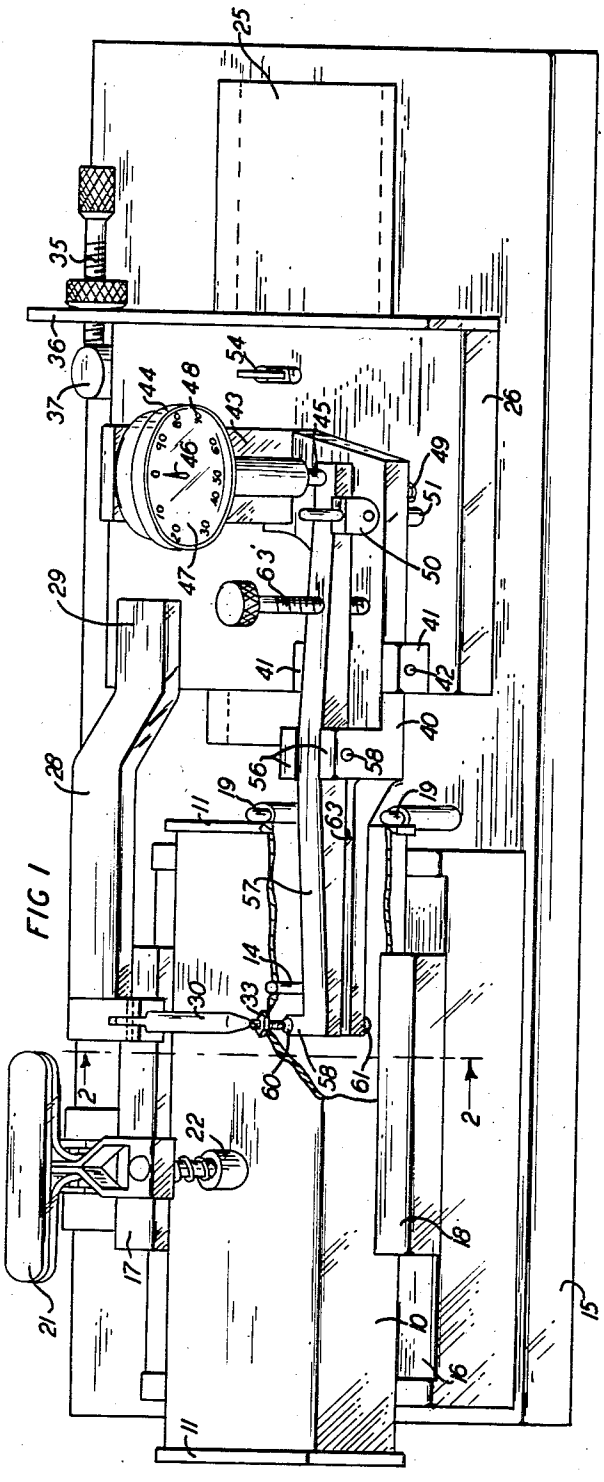


FIG 1

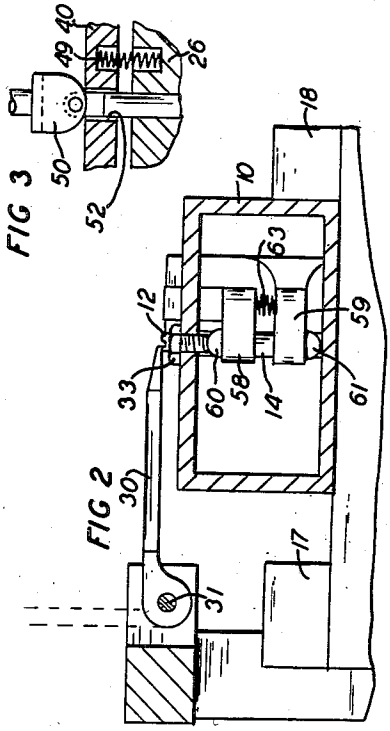


FIG 2

FIG 3

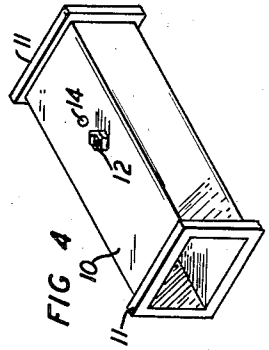


FIG 4

INVENTORS
H. W. CLIFFORD
A. W. KAYLE

BY W. A. Johnson

ATTORNEY

United States Patent Office 2,827,709
Patented Mar. 25, 1958

2,827,709

INTERNAL GAGING APPARATUS

Harry W. Clifford, East Orange, and Albert W. Kayle, Bloomfield, N. J., assignors to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York

Application November 1, 1955, Serial No. 544,176

2 Claims. (Cl. 33—174)

This invention relates to internal gaging apparatus particularly apparatus for gaging the internal positions of adjustable elements extending through walls of hollow articles.

Various hollow articles have elements or units mounted therein which must be located at predetermined positions with respect to openings or walls of the articles. As an example, tuning screws of resonant cavity wave guide sections of filters must be located at predetermined positions relative to opposing walls of the sections in which they are disposed.

The object of the present invention is an apparatus which is simple in structure and highly efficient in operation for gaging the internal positions of adjustable elements extending through walls of hollow articles.

In the present embodiment of the invention the gaging apparatus includes relatively movable gaging elements having portions adapted to extend into a hollow article relative to an element to be gaged and an indicating unit actuable by the relative movement of the elements to indicate the position of the element.

More specifically the hollow article is a resonant cavity wave guide section for filters having a tuning screw adjustable in a threaded aperture in one wall of the section for positioning relative to the opposing wall thereof. In the present instance, a bar or stud extending through the section or article is in general alignment with the tuning screw, making it necessary to provide offset contacts on the gaging elements and particular guide means for the article when moving it toward and in engagement with locating stops to align the contacts with the screw and the portion of the surface they are to engage. Furthermore, the gaging elements and associated indicating unit are supported on a slide, movable relative to the article into gaging position and adapted to be releasably locked in this position until the gaging operation is performed.

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

Fig. 1 is an isometric view of the gaging apparatus, a portion of the article being gaged shown in section;

Fig. 2 is a lateral sectional view taken along the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary sectional view of a portion of the apparatus, and

Fig. 4 is an isometric view of the article and the element therein to be gaged.

Before considering the structure of the apparatus, attention is directed to the article which is to be gaged. The article 10 is a hollow structure formed of thin walls producing a rectangular cross-sectional contour with enlarged open ends 11. A tuning screw 12 disposed in a threaded aperture in the top wall of the article is the element to be gaged, particularly the position of its inner end in the hollow article. One disturbing factor is the presence of an obstruction such as a rod 14 extending through the hollow article and having its ends embedded in apertures of the opposing walls thereof.

The apparatus includes a base 15 with an article or work supporting portion 16 having parallel guides 17 and 18 extending vertically therefrom and disposed at positions to be engaged alternately by opposing sides of the article 10. Locating pins or stops 19 mounted on the base 15 are positioned to be gaged by the leading end of the article to locate it on the work supporting portion. Suitable clamping means indicated generally at 21 including a spring pressed plunger 22 is mounted upon the base 15 adjacent the central portion of the article when disposed in gaging position to firmly hold the article against displacement. The clamping unit may be a commercial known toggle clamp adapted for temporarily locking the article in gaging position.

A dove-tailed guide 25 mounted on the base 15 and terminating short of the guide pins 19 receives and supports a carriage 26 having a dove-tailed groove (not shown) in its undersurface to permit sliding movement of the carriage in a given path relative to the gaging position for articles. An arm 28 fixed at 29 to the carriage 26 supports a locating finger 30 pivotally mounted at 31 (Fig. 2) and having its free end 33 reduced in shape and size to serve as a pointer to register with the element or screw 12 to locate the carriage in its gaging position. If like articles are to be disposed successively in the gaging position, a screw 35 mounted in a threaded aperture of a member 36 mounted on the carriage 26 may be adjusted relative to the fixed stop 37 mounted on the base 15 to successively locate the carriage in gaging position.

A lower gaging element 40 extends between vertical members 41, which are mounted on the carriage 26 and support the ends of a pivot rod 42 extending through the lower gage 40. The portion of the lower gage 40 at the right of its pivotal support 42 has a vertical member 43 acting as a support for a unit 44 for indicating the position of the element or tuning screw 12 in the article 10. The unit 44 has the conventional internal mechanism under the control of its spring actuated plunger 45 to actuate the pointer 46 relative to a dial 47 having indications thereon as illustrated at 48.

A spring 49 (Fig. 3), having its ends embedded in recesses of the carriage 26 and the lower gage 40, normally urges the lower gage counter-clockwise about its pivot 42. A cam lever 50, pivotally connected to the upper end of a rod 51 fixedly mounted in an aperture in the carriage 26 and extending freely through an aperture 52 in the lower gage, may act against the force of the spring 49 to move the lower gage 40 clockwise and hold it in this position. A thumbscrew 54 disposed in a threaded aperture of the carriage 26 is actuable to engage the top surface of the dove-tailed guide 25 to lock the carriage 26 in the gaging position.

The portion of the lower gage 40 extending from the left of its pivotal support 42 includes parallel vertical members 56 spaced from each other to receive an upper gage 57 and support the ends of a pin 58 which serves as a pivot for the upper gage. The left ends of the upper and lower gages 57—40 have offset portions 58 and 59 respectively with semi-spherical contacts 60 and 61 respectively to engage the inner end of the element or tuning screw 12 and the opposing surface of the article 10. A spring 63 having its ends housed in recesses of the upper and lower gages normally urges the upper gage 57 clockwise to move its contact 60 in engagement with the element 12 while the spring 49 normally urges the bottom gage counter-clockwise to move its contact 61 into engagement with the bottom or opposing surface of the article. An adjustable set screw 63 extending through a threaded aperture in the upper gage 57 and

engaging the upper surface of the lower gage **40** is adapted to set the upper gage in a given position which may be the preferred position for locating the element in the article.

Considering now the function of the apparatus, let it be assumed that the article **10** with its pivot **12** to be gaged is to be moved on to the work support **10**. If the gaging elements **40** and **57** are located in the gaging position, the article may be located on the work supported portion **16** in engagement with the inner surface of the guide **17**. By utilizing the guide **17** until the leading end of the article has engaged the stops **19** the rod **14** is moved beyond the contact ends of the gages **40** and **57**. The final movement of the article is toward the operator until the adjacent surface engages the inner surface of the guide **18**.

In initially setting up the apparatus, the screw **54** is loosened to free the carriage for movement on its guide **25** and through the assistance of the locating finger **30**, the contacts **60** and **61** of the gages may be located in alignment with the element. When this has been accomplished the carriage **26** is locked in position by the screw **54** and the adjustable screw **35** is adjusted and locked in position to engage the stop **37**.

The unit **44** may be set so that the pointer **46** will register "zero" when the element or screw **12** is in the preferred position in the article. When the gages **40** and **57** are in their gaging positions and the article is moved through the aforementioned path into its gaging position the contact **60** will engage the element **12** and the contact **61** will engage the opposing surface of the article. Variation in the position of the element **12** from the preferred position and the direction of the variation will be indicated by the unit **44** as a result of the gages **40—57** affecting movement of the pointer **46** to either side of the "zero" position. If the indicating figure is registering with the element **12**, it may be moved about its pivot to the dotted line positions at which time suitable tools, such as a screwdriver and wrench, may be employed to make the necessary adjustments in the element or screw until the pointer **46** of the unit **44** returns to its "zero" position.

With this structure it is possible to gage accurately the location of an element or unit internally of a hollow article even with the presence of disturbing members such as the rod **14** in the article.

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. An apparatus for gaging the internal position of an element, adjustably disposed in an aperture in one side of a hollow article having an obstruction disposed therein between the element and an open end of the article, relative to an opposing side of the article, the apparatus comprising companion elongate gages pivotally connected intermediate contact and measuring ends of the gages to allow relative movement thereof, the contact ends of the gages being offset to enter the open end

of the article, to extend partially around the obstruction, to respectively engage the element and the opposing side and thereby cause relative positioning of the measuring ends, a gage unit mounted on a measuring end of one of the gages, engaging the measuring end of the other gage and operable by the relative movement of the measuring ends to indicate variations of the element from a predetermined position relative to the opposing side, a support for the article adapted for longitudinal and lateral movement thereon, a stop on the support to limit longitudinal movement of the article toward its gaging position, a guide on the support against which the article may be moved longitudinally to guide its obstruction past the contact ends of the gages, the stop serving to guide the article during its lateral movement away from the guide, and a member on the support to locate the article in its gaging position when moved laterally from the guide relative to the stop.

2. An apparatus for gaging the internal position of an element relative to an opposing side of an elongate hollow article, the element being adjustably disposed in an aperture in one side of the article and the article having an open end and an obstruction disposed between the element and the open end, the apparatus comprising elongate gages pivotally connected intermediate contact and measuring ends of the gages to allow relative movement thereof, the contact ends of the gages being offset in a direction to extend partially around the obstruction to engage the element and the opposing side of the article when moved into gaging position, a stop to limit longitudinal movement of the article toward the gaging position, a support for the article during longitudinal and lateral movements of the article, a member positioned adjacent the support to guide the article in a longitudinal path on the support to the stop to assure movement of the obstruction beyond the contact ends of the gages, another member disposed adjacent the support to terminate lateral movement of the article on the support and cooperate with the stop to locate the article in the gaging position where the contact ends of the gages will engage the element and the opposing surface of the article, and means actuated by the relative movement of the measuring ends of the gages to indicate the relative position of the element and opposing surface.

References Cited in the file of this patent

UNITED STATES PATENTS

893,753	Rode	July 21, 1908
914,855	Mastrangel	Mar. 9, 1909
1,981,153	Schoof	Nov. 20, 1934
2,083,373	Hardesty	June 8, 1937
2,268,579	Eisele	Jan. 6, 1942
2,436,537	Wilkinson	Feb. 24, 1948
2,504,961	Braaten	Apr. 25, 1950
2,553,574	Gray	May 22, 1951
2,657,468	Lyons	Nov. 3, 1953
2,659,158	Cobb	Nov. 17, 1953

FOREIGN PATENTS

1,797	Great Britain	1909
549,737	Great Britain	Dec. 4, 1942