Aug. 30, 1932. H. A. SNOW 1,875,170

GRID FORMING APPARATUS

Filed April 28, 1931

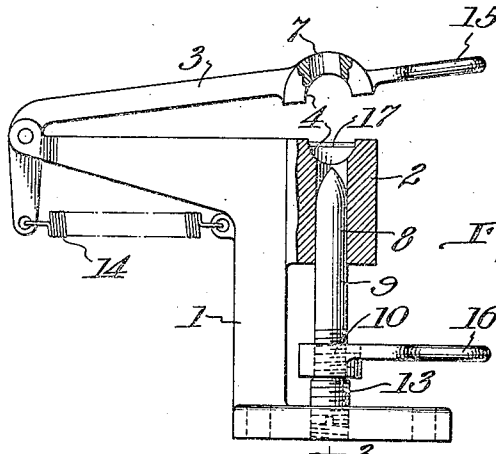


Fig. 1.

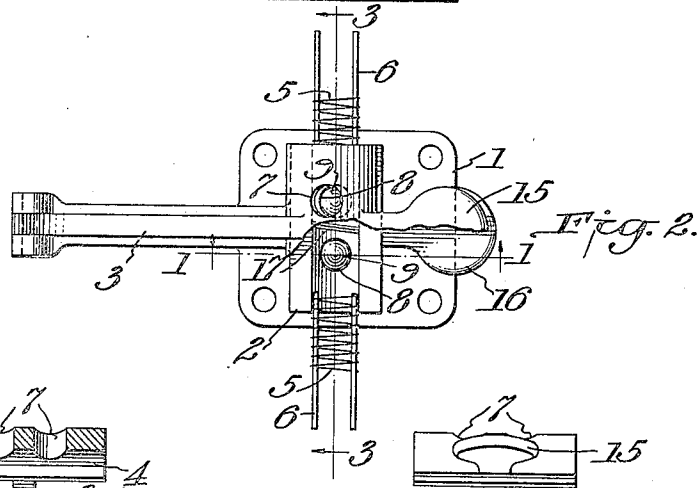


Fig. 2.

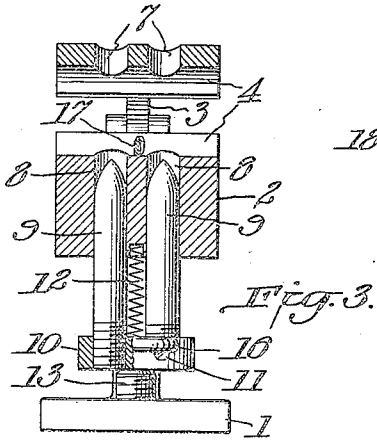


Fig. 3.

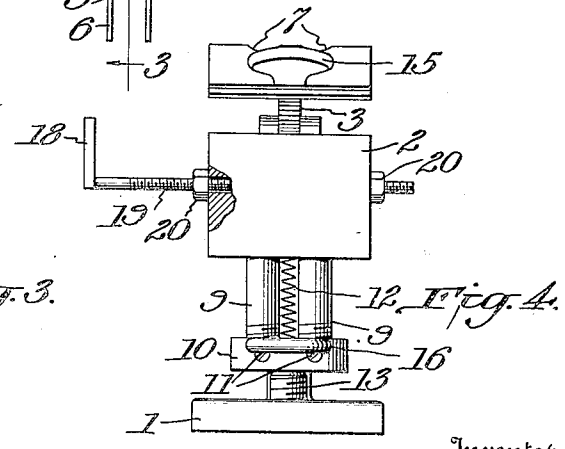


Fig. 4.

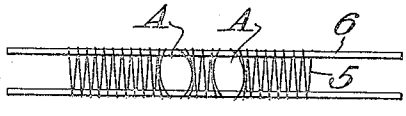


Fig. 5.

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UNITED STATES PATENT OFFICE

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GRID FORMING APPARATUS

Application filed April 28, 1931. Serial No. 533,508.

This invention relates to apparatus for forming vacuum tube grids, and particularly to apparatus for reshaping a helical winding to impart different operating characteristics to different parts of the grid structure.

As described in the copending application of Stuart Ballantine, Ser. No. 544,801, filed June 16, 1931, grid electrodes for poly-mu tubes may be formed by first preparing a helical grid winding, usually of uniform pitch throughout its length, and then axially displacing some of the turns of the winding to vary the spacing of adjacent turns.

Objects of the present invention are to provide a simple and effective apparatus for holding and bending the grid winding. A further object is to provide bending apparatus including a guide for accurately positioning the grid blank with respect to the path of movement of the bending members. More specifically, an object is to provide bending apparatus including clamping arms for holding a grid blank, one of the arms carrying a guide rib which enters between adjacent turns of the grid winding to position the same, and spreader rods supported for movement through and diametrically of the grid for effecting an axial displacement of portions of the grid winding.

These and other objects of the invention will be apparent from the following specification, when taken with the accompanying drawing, in which,

Fig. 1 is a side elevation of one embodiment of the invention, with parts in section as viewed on line 1—1 of Fig. 2,

Fig. 2 is a plan view of the same, with parts broken away,

Fig. 3 is a longitudinal section on line 3—3 of Fig. 2,

Fig. 4 is a fragmentary front elevation showing a gauging device mounted on the apparatus, and

Fig. 5 is an elevation of a reshaped grid.

In the drawing, the reference numeral 1 identifies a supporting stand which carries a clamping arm 2 and to which is pivoted the movable clamping arm 3. The opposed faces of the clamping arms are provided with semi-cylindrical recesses 4 that cooperate to provide a cylindrical chamber for recessing a grid blank in the form of a helical winding 5 secured to and supported by one or more longitudinal wires 6.

The clamping arms 2, 3 are provided with alined apertures 7, 8, respectively, whose axes extend substantially diametrically of the axis of the cylindrical chamber provided by the recesses 4. The lower ends of spreader rods 9 are adjustably mounted in a cross head 10, being locked therein by set screws 11, and the upper pointed ends of the spreader rods are normally retained below the bottom of the recess 4 in clamping arm 2 by the spring 12 which urges the crosshead 10 downwardly into contact with the stop 13.

The upper clamping arm 3 is normally held in raised position by a spring 14, and lugs 15, 16 project forwardly from clamping arm 2 and crosshead 10, respectively. To insure that the helical grid blank will be so positioned that the pointed ends of spreader rods 9 will pass between turns of the grid winding, a narrow rib or guide 17 projects into the recess 4 of the lower clamping arm 2.

In reshaping a helical grid blank, the operator places the blank in the recess 4 of the lower clamping arm, and with the guide 17 entering between adjacent turns at the central portion of the winding 5. The upper clamping arm 3 is depressed to hold the grid blank in place, and the crosshead 10 is raised to force the spreader rods diametrically through the grid winding. In practice, these operations are performed in proper sequence by pressing lugs 15, 16 towards each other with the thumb and a finger of one hand. Upon releasing the pressure, the spreader rods are withdrawn by spring 12 and the arm 3 is lifted by spring 14. The reshaped grid may then be lifted from the arm 2.

As shown in Fig. 5, the finished grid has portions of the winding 5 displaced axially to form apertures, indicated at A, A, which are, in comparison to the average spacing between turns, of relatively large size. Due to the positioning of the grid blanks by the guide 17 which is close to the path of movement of the spreader rods, the finished grids are very uniform as to their electrical prop-

erties. The apertures A formed in the helical winding are substantially identical as to size and shape, and these factors determine the operating characteristics of the finished grid even though there may be some slight variation in the relative axial location of the apertures in different grids.

Ordinary care in fitting the approximate center of the grid winding over the guide 17 will insure a substantially uniform output, but a gauge may be provided to assist the operator in placing the grid blanks in proper position in the forming apparatus. As shown in Fig. 4, such a gauge may comprise a stop plate 18 arranged transversely to the grid-receiving chamber and at such distance from the guide 17 that the ends of the grid support wires 6 will touch the plate 18 when the grid is approximately in its desired position with respect to the spreader rods 9. The gauge is preferably adjustable, for example by mounting the plate 18 on a threaded rod 19 that is slidable in an aperture in the clamping arm 2 and carries nuts 20 for securing it thereto with the plate 18 spaced a desired distance from the guide 17.

By mounting removable spreader rods 9 on the cross head, the apparatus may be used to form grids of other physical form and/or different electrical properties. One of the spreader rods may be replaced by a shorter rod which will enter only one side of the grid blank, or by a rod having a smaller diameter at the portion which passes through one or both sides of the blank.

While the illustrated apparatus shows two spreader rods, it will be apparent that the invention is not restricted thereto as one or several spreader rods may be employed. It is therefore to be understood that various changes which may be made in the several parts, their relative size, shape and location, fall within the spirit of my invention as set forth in the following claims.

I claim:

1. In apparatus for shaping grid electrodes, cooperating members providing a cylindrical chamber for receiving and supporting a grid electrode blank, spreader means slidable diametrically of and through said chamber, and guide means on one of said members for maintaining a predetermined relation between a grid blank to be operated upon and the path of movement of said spreader means.

2. In apparatus for forming grid electrodes from helically wound blanks, the combination with supporting means for encircling a helically wound grid electrode blank, and a movable spreader rod mounted to pass through a portion of a blank held in said supporting means, of a guide rib positioned on said supporting means to lie between adjacent turns of the helical winding of the grid electrode blank to position said blank with respect to the path of movement of said spreader rod.

3. In apparatus for shaping grid electrodes from blanks comprising helical windings, clamping means for encircling the blank and provided with an aperture extending diametrically of a grid blank positioned in said clamping means, a spreader rod mounted to move in said aperture and through at least a portion of a blank positioned in said clamping means, and a guide rib mounted on said clamping means to lie between adjacent turns of the helical winding of a grid blank held in said clamping means.

4. In apparatus of the type stated, a frame carrying a pair of relatively movable clamping arms, recesses on the opposed faces of said arms cooperating to provide a cylindrical chamber for receiving a grid blank apertures through said arms and alined diametrically of said chamber, a spreader rod mounted to move axially of said apertures and across said chamber, and a guide rib on one of said arms for positioning a grid blank with respect to the path of movement of said rod.

In testimony whereof, I affix my signature.

HAROLD A. SNOW.