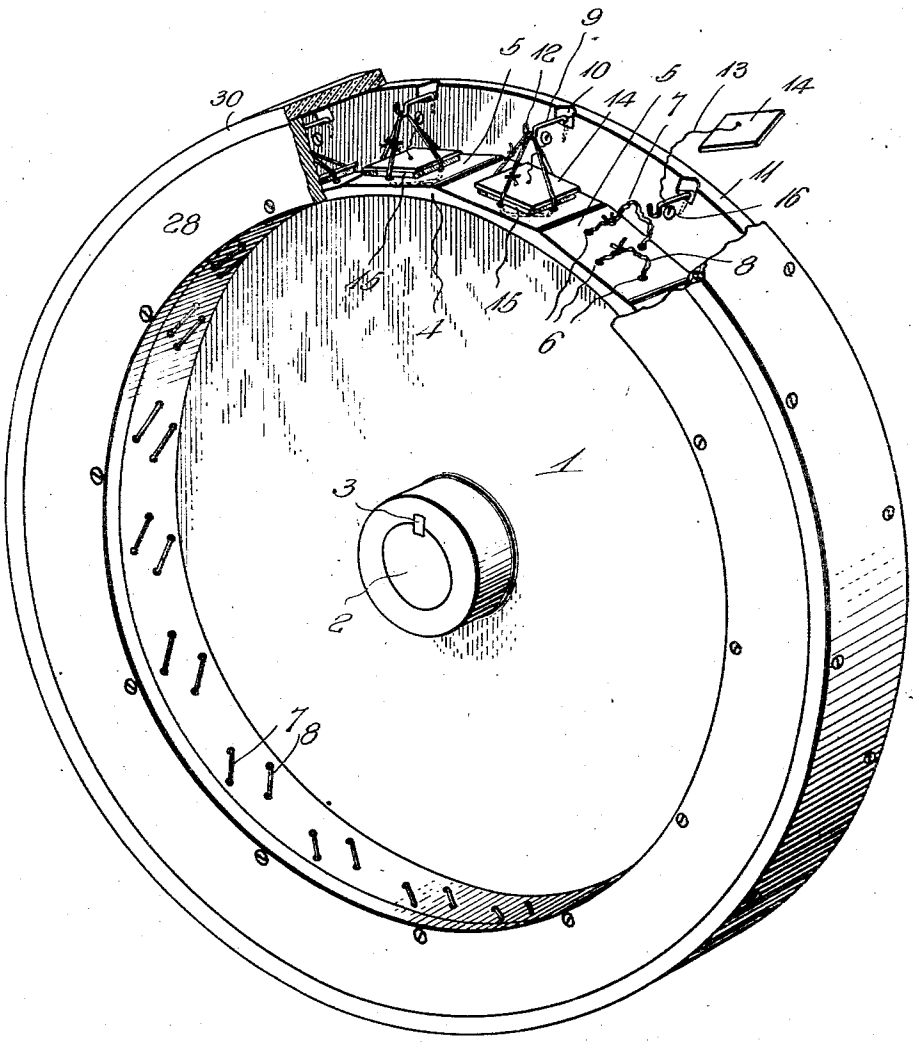
Dec. 7, 1926. 1,609,744

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MULTIPLE PIEZO ELECTRIC CRYSTAL HOLDER

Filed June 4, 1926 2 Sheets-Sheet 1



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MULTIPLE PIEZO ELECTRIC CRYSTAL HOLDER

Filed June 4, 1926 2 Sheets-Sheet 2

FIG. 2

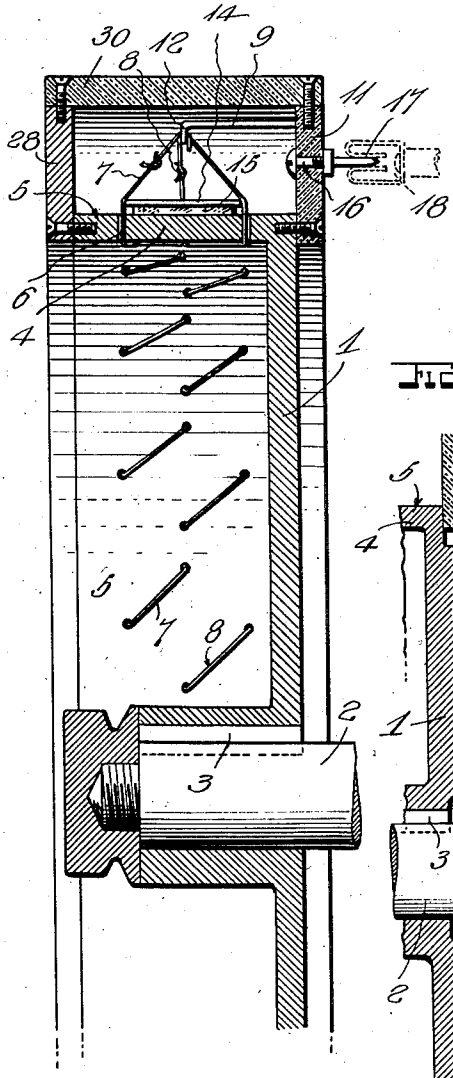


FIG. 3

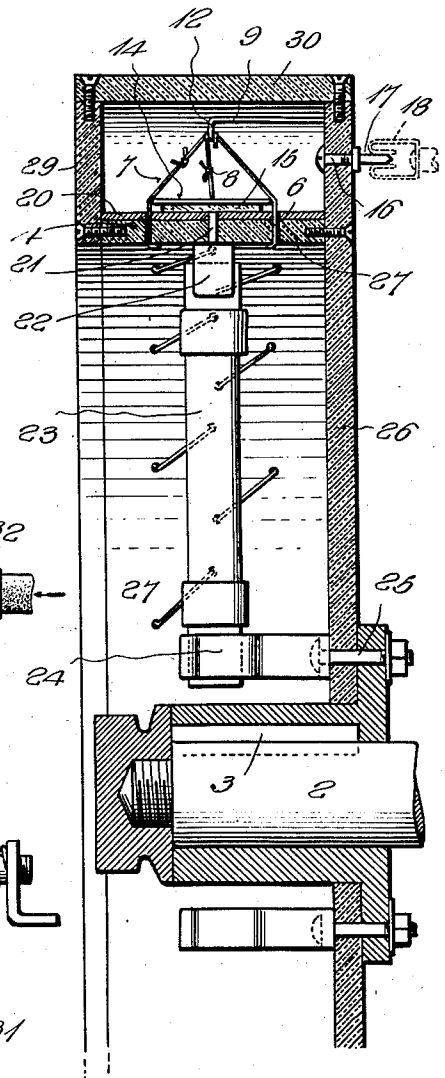
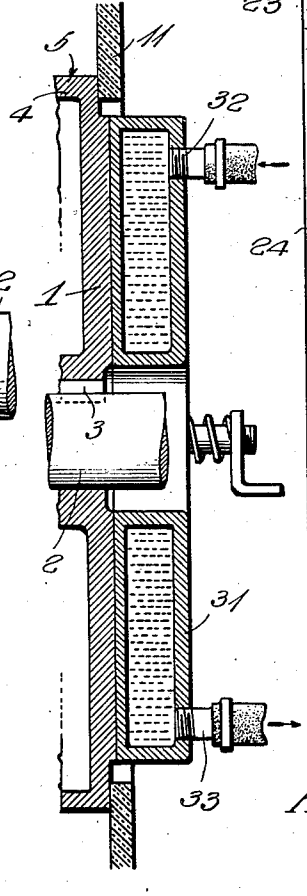


FIG. 4



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UNITED STATES PATENT OFFICE.

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MULTIPLE-PIEZO-ELECTRIC-CRYSTAL HOLDER.

Application filed June 4, 1926. Serial No. 113,791.

My invention relates broadly to frequency control apparatus and more particularly to a mounting for a plurality of piezo electric crystal devices used in the control of high frequency circuits at different frequencies.

One of the objects of my invention is to provide a practical construction of piezo electric crystal holder which may be mounted to rotate in coordination with rotary control switches for adjusting the electrical constants of a circuit simultaneously with the connection of a particular crystal in the frequency control circuit with which the apparatus is arranged to cooperate.

Another object of my invention is to provide a rotary piezo electric crystal holder having a plurality of piezo electric crystal devices of different frequency characteristics wherein the piezo electric crystal devices may be mounted upon the holder in such manner that free mechanical vibration may take place with substantially no restriction with respect to the mechanical form of mounting for the piezo electric crystal devices.

Another object of my invention is to provide a rotary construction of piezo electric crystal holder which may be maintained at a uniform temperature independent of heat which may be inherently generated from the rapid mechanical vibration of selected piezo electrical devices supported by the mounting.

Other and further objects of my invention will be understood from the specification hereinafter following by reference to the accompanying drawings wherein:

Fig. 1 is a perspective view partially broken away showing the construction of the rotary piezo electric crystal holder of my invention; Fig. 2 is a cross-sectional view taken through the rotary piezo electric crystal holder of Fig. 1; Fig. 3 is a cross-sectional view of a modified form of piezo electric crystal holder having means for mounting choke coil units in association with each of the several piezo electric crystal holders in radial position; and Fig. 4 is a fragmentary cross-sectional view showing a system for cooling the rotary piezo electric crystal holder.

In the operation of radio transmitters where facilities must be provided for the instantaneous change in the apparatus for transmission on different wave lengths, I have found that a particular construction of piezo electric crystal holder must be provided in order to coordinate the frequency control system with the switching apparatus which is arranged to control the wave length range of the transmitter. In certain transmitters which must handle traffic with various stations while communication is being simultaneously conducted by and between adjacent stations, it is necessary for the operators at the stations desiring to establish a communication channel to select a frequency band which is not busy. The shifting of the circuits at the transmitter to the selected frequency band must be effected without loss of time. The change in the adjustment of wave changer switches which control the inductance or capacity elements of the transmitter circuits must be coordinated with a similar shift in the frequency control circuit where a selected piezo electric crystal device must be connected in the frequency control circuit.

I have developed a piezo electric crystal holder as described herein for the purpose of permitting a rapid selection of a piezo electric crystal of a predetermined frequency for connecting such crystal in the frequency control circuit. The construction of the rotary piezo electric crystal holder is relatively simple and inexpensive and special provision is made for maintaining the piezo electric crystal holder at a uniform temperature. Each piezo electric crystal is mounted on the periphery of the rotary holder in such manner that free mechanical vibration of the crystal may take place without restriction and the maximum current for sustaining oscillations in an associated electron tube oscillator circuit thereby obtained.

Referring to the drawings in more detail, reference character 1 represents the rotary piezo electric crystal holder which is keyed as represented at 3 to a shaft 2 which may be rotated in coordination with the selector switches of a wave changer system. The rotary piezo electric crystal holder is provided with a flange 4 extending at right angles to the radially extending portion 1. The portion 4 is in the nature of a cylindrical drum the outer surface of which is provided with a multiplicity of flat areas 5 each of which supports a piezo electric crystal of a particular frequency characteristic.

As many of the flat areas as there are frequency channels to be covered may be provided. The flat areas are apertured as represented at 6 for the passage of loops of cord or thread 7 and 8 therethrough for the purpose of locating the piezo electric crystal device and an upper contact plate with respect to the flat area portions. The cords 7 and 8 are stretched taut by means of a cantilever spring device 9 secured in the pocket portions 10 formed in the rear wall 11 of the piezo electric crystal holder. A hook portion 12 is provided on the resilient spring device 9 in order to secure the loops of cord 7 and 8 in a position centrally over the upper contact plate 14 of the complete assembly. A flexible lead 13 extends from the upper contact plate 14 connecting to binding posts 16 on the rear of the insulated panel 11 establishing connection through the upper contact plate 14 with the upper surface of the piezo electric crystal 15 which is mounted in position on the flat surface 5. Each of the binding posts 16 terminates in a blade portion 17 which will readily slide between the jaws of a contact clip 18 during the rotation of the piezo electric crystal holder in order to establish connection with any selected piezo electric crystal devices.

A housing is provided around the piezo electric crystal devices as represented at 28 and 30 forming a base like annular enclosure for the multiplicity of piezo electric crystal devices which are supported around the periphery of the metallic drum. In order to maintain the temperature of the piezo electric crystal holder and the piezo electric crystal thereon at a uniform value, I may provide a water jacket 31 adjacent the surface 1. The water jacket is provided with a fluid inlet 32 and a fluid outlet 33 so that cooling water may be applied in good thermal contact with the flange portion of the rotary piezo electric crystal holder for removing the heat generated during the operation of the piezo electric crystal by a process of conduction. It will also be understood that by the circulation of cooling water through the water jacket the piezo electric crystal may be maintained at a temperature above the surrounding temperature which is often desirable for securing maximum efficiency in operation.

In Fig. 3 I have shown a modified construction of a rotary piezo electric crystal holder which is constructed of insulated material 26 and 27 with metallic contact plates 20 mounted around the surface of the insulated drum 27 for the support of the piezo electric crystal device 15, as hereinbefore described. Each of the plates 20 is provided with a depending post 21 terminating in a clip 22. The inner portion of the rotary holder may be provided with clip members 24 secured as represented at 25 by a post which grounds to the metallic shaft 2. Between the clip members 22 I insert a choke coil 23 individual to each of the frequency control circuits. It will be observed that the choke coils 23 are readily positioned within the rotary piezo electric crystal holder in the manner of the spokes of a wheel thereby greatly conserving space and at the same time providing individual piezo electric crystal devices with choke coils in series therewith for instantaneous connection in the frequency control circuit of a transmitting system in coordination with the change of electrical constants of the circuits with which the piezo electric crystal apparatus is associated.

I have found the construction of the rotary piezo electric crystal holder as described herein to be very satisfactory as it permits a rapid connection of the piezo electric crystal device in the frequency control circuit and yet eliminates the possibility which is always present when a large number of separate piezo electric crystal holders are provided for plug in connection, of misplacing one or more crystals in a set and keeps the crystals positively arranged in a predetermined sequence. The fact that the several piezo electric crystal devices are compactly arranged enables the rotary holder to serve as its own crystal selector thus avoiding the complication of associated switch mechanism.

While I have described my invention in one of its preferred embodiments, I desire that it be understood that modifications may be made without departing from the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. Piezo electric crystal apparatus comprising a rotary drum, a shaft member mounted to rotate with said drum, said drum being provided with a plurality of flattened surfaces upon its periphery, piezo electric crystals of different frequency characteristics carried by said flattened surfaces, a contact plate for establishing connection with the upper surface of each of the said piezo electric crystals, spring devices arranged around said drum for maintaining said piezo electric crystals and said contact plate in position with respect to each other, and means for establishing connection with a selected one of said piezo electric crystals by rotating said drum.

2. A holder for a multiplicity of piezo electric crystals of differing frequency characteristics comprising a metallic drum flattened at a plurality of points around its periphery, piezo electric crystal devices positioned on each of the flattened portions of said drum, means for establishing connection with the upper surface of each of said piezo electric crystals, and a shaft member for ro-

tating said drum for establishing electrical connection with a selected one of said piezo electric crystal devices to the exclusion of others of said devices.

3. Piezo electric crystal apparatus comprising in combination a rotary drum, a plurality of flattened metallic surfaces on the periphery of said drum, each of said flattened surfaces providing means for supporting a piezo electric crystal of selected frequency characteristic, an individual contact plate for establishing connection with the upper surface of each of said piezo electric crystal and terminal connections for each of said piezo electric crystals whereby said drum may be rotated to bring a selected one of said terminal connections into association with a frequency control circuit.

4. Piezo electric crystal apparatus comprising a rotatable drum, a plurality of flattened surfaces on the periphery of said drum for supporting individual piezo electric crystal elements of differing frequency characteristic, an upper contact plate for each of said piezo electric crystal elements, an insulated annular wall adjacent the periphery of said drum, a plurality of cantilever spring devices extending from said wall and terminating centrally of each of said flattened surfaces, flexible cord members looped through said surfaces and stretched taut by said spring devices, said cords serving to locate said piezo electric crystal elements and said upper contact plates with respect to each of said flattened surfaces, and means for effectively utilizing selected piezo electric crystal elements in a frequency control circuit.

5. Piezo electric crystal apparatus comprising a rotary shaft, a drum carried by said shaft, an annular housing supported upon the periphery of said drum, said drum having a plurality of flattened surfaces for supporting a corresponding number of piezo electric crystal elements within said annular housing and terminals carried by said annular housing for each of said piezo electric crystal elements whereby rotation of said drum effects the connection of a selected piezo electric crystal element in a frequency control circuit.

6. Piezo electric crystal apparatus comprising in combination a wheel-like support having a radially extending web portion and a cylindrical peripheral portion, a plurality of flattened surfaces on said cylindrical peripheral portion for supporting a plurality of piezo electric crystal slements each having a predetermined frequency characteristic, an upper contact plate individual to each of said piezo electric crystal elements, means for locating said upper contact plates in position upon each of said piezo electric crystal elements and a fluid circulating system in thermal contact with said radially extending web portion for maintaining said flattened surfaces at a substantially uniform temperature by a process of heat conduction.

7. Piezo electric crystal apparatus comprising in combination a wheel-like structure carried by a rotatable shaft member, a plurality of piezo electric crystal devices carried by the periphery of said wheel-like structure and a plurality of choke coils radially positioned within said wheel-like structure and individual to each of said piezo electric crystal devices, said wheel-like structure being rotatable to select a particular one of said piezo electric crystal devices and associated choke coils for controlling an electrical circuit.

8. Piezo electric crystal apparatus comprising in combination a rotatable drum, an annular housing carried adjacent the periphery of said drum, a multiplicity of piezo electric crystal elements of differing frequency characteristics positioned within said housing and choke coil devices connected with each of said piezo electric crystal elements and radially positioned within said drum, terminals individual to each of said piezo electric crystal elements carried by said annular housing for effectively including a selected piezo electric crystal device and associated choke coil in an electrical circuit upon rotation of said drum.

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