

Jan. 23, 1962

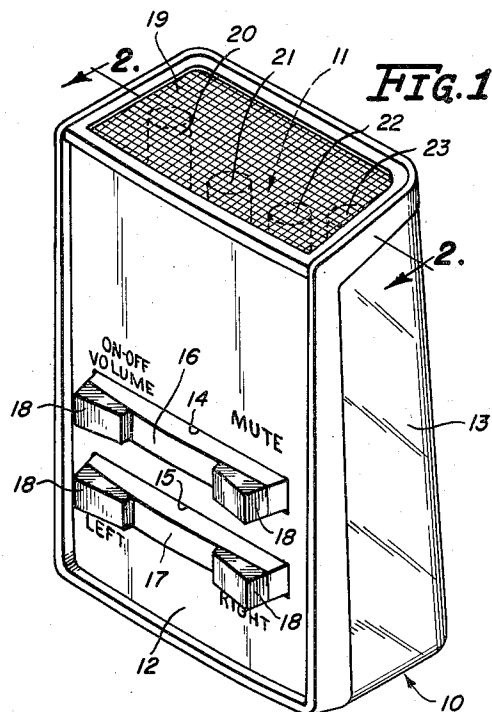
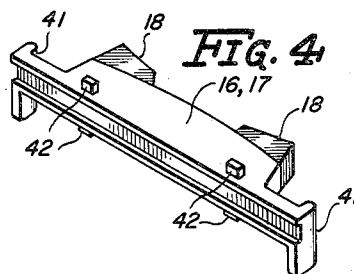
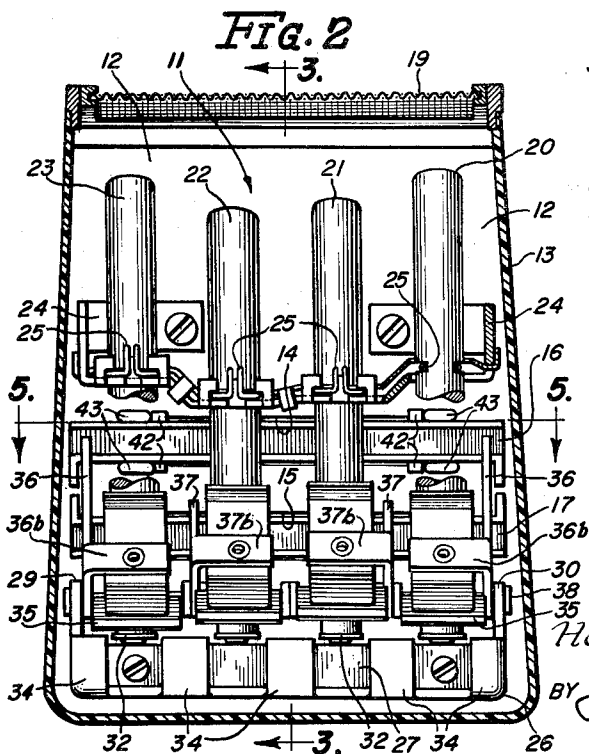
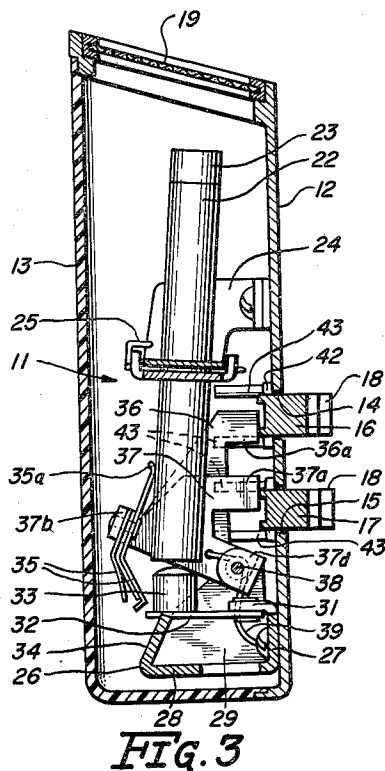
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3,017,849

ULTRASONIC TRANSMITTER

Filed June 12, 1959

2 Sheets-Sheet 1



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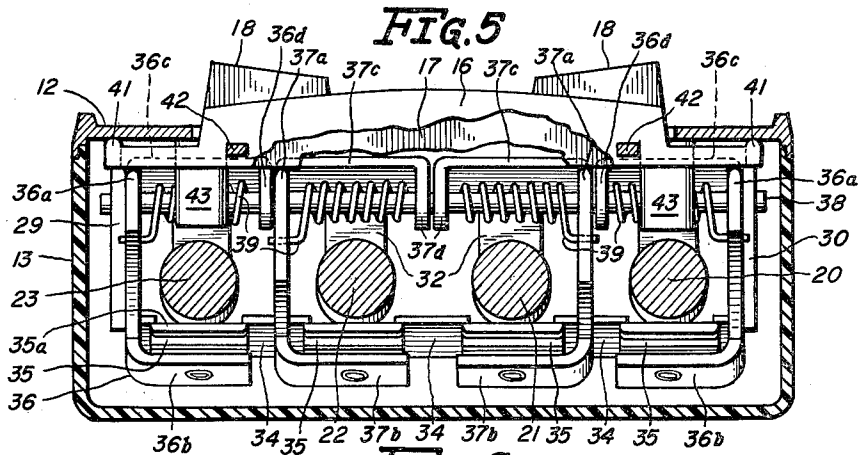
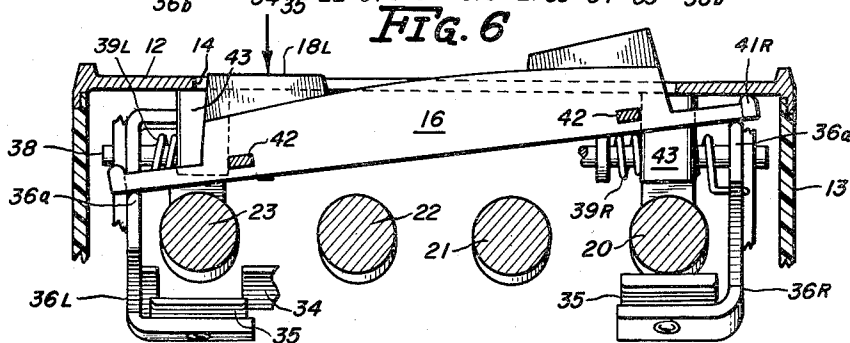
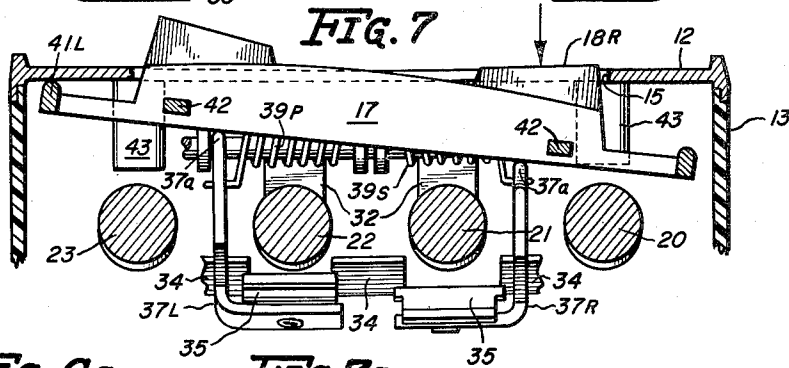
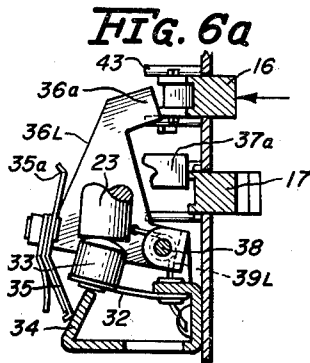
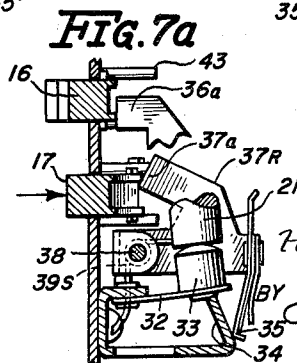
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3,017,849

ULTRASONIC TRANSMITTER

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2 Sheets-Sheet 2



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3,017,849

ULTRASONIC TRANSMITTER

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5 Claims. (Cl. 116—137)

This invention relates to a portable manually operable ultrasonic transmitter of the kind which utilizes a plurality of mechanical resonators to generate signals of predetermined frequency. More particularly, the invention relates to a new and improved mechanism for exciting the resonator elements of a transmitter of this kind.

Ultrasonic signals can be generated by striking or otherwise exciting a rod or other resonator element, and these signals may be employed for various control purposes as described in U.S. Patent 2,821,954, issued on February 4, 1958, in the name of Robert Adler and assigned to the assignee of the present invention. In a transmitter device constructed for operation in this manner, the hammer or other exciter should engage the resonator only during the initial delivery of mechanical energy thereto, in order to avoid undesired damping of the resonator vibration. That is, the actuating mechanism is preferably constructed to deliver a single discreet blow to a resonator for each actuating of the mechanism. A transmitter actuating mechanism of this kind is described and claimed in Patent 2,821,955, issued February 4, 1958, to Robert C. Ehlers et al. and likewise assigned to the same assignee as the present invention.

In many instances, ultrasonic transmitters of the kind to which the present invention relates are utilized as remote control units for television receivers in which application, minimum size and weight of the transmitter are important. The desirability of reduced size and weight is manifest when it is appreciated that the transmitter is to be held and operated with only one hand, so that the person using the transmitter need not divert his attention from the control apparatus or receiver during operation of the transmitter.

Accordingly, it is a principal object of the present invention to provide a new and improved portable mechanical ultrasonic transmitter of the kind using impact-excited resonator elements.

A specific object of the invention is to provide actuating mechanism for a portable ultrasonic transmitter of the mechanical type which permits a substantial and effective reduction in size of the transmitter without in any way interfering with the operation thereof.

Another object of the invention is to combine some of the operating elements for two resonators in a portable mechanical ultrasonic transmitter and at the same time to retain complete independence in operation of the two resonators.

A mechanical portable ultrasonic transmitter constructed in accordance with the present invention comprises a support structure upon which are mounted two mechanically excitable resonators, the resonators being disposed in spaced relation to each other. In a preferred arrangement, four resonators are employed, and these resonators are controlled in pairs. For each pair of resonators, the transmitter includes two exciters or hammers which are individually and preferably resiliently mounted on the support structure, each hammer being disposed adjacent an assigned one of the resonators. An operating mechanism for the exciters or hammers comprises two actuator assemblies mounted on the support structure, each of these assemblies comprising an actuating member aligned with a respective one of the exciters. Each of the actuating members is movable along a predetermined path from a rest position in which it is disengaged from its exciters, through a cocking position in which the actuating mem-

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ber engages and cocks the associated exciter, and to an actuated position in which the exciter is released to strike the associated resonator. A bar extends between the two actuator assemblies, and it is effectively pivoted at its opposite ends. Means are provided in each of the actuator assemblies to engage the bar and complete a mechanical connection from the bar to the aforementioned actuating members so that the pivotal movement of the bar about either end thereof is effective to displace a selected one of the actuating members from its rest position to its actuated position.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The organization and manner of operation of the invention, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings, in the several figures of which like reference numerals identify like elements, and in which:

FIGURE 1 is a perspective view of an ultrasonic transmitter constructed in accordance with the present invention;

FIGURE 2 is an elevation view, partially in section, as seen approximately from line 2—2 of FIGURE 1;

FIGURE 3 is a transverse sectional view taken approximately through the plane 3—3 of FIGURE 2;

FIGURE 4 is a perspective view of one of the bars appearing in FIGURE 1;

FIGURE 5 is an enlarged sectional view taken approximately through the plane 5—5 of FIGURE 2 and shows the bars and related mechanism in an initial position;

FIGURE 6 is a sectional view, similar to FIGURE 5, except for the omission of certain parts for clarity, which illustrates the upper bar being manually depressed to produce an ultrasonic control signal of a desired frequency;

FIGURE 6a is a fragmentary sectional view similar to FIGURE 3, but illustrating the mechanical action occurring subsequent to the actuation of the upper bar as in FIGURE 6;

FIGURE 7 is a sectional view similar to FIGURE 6 but illustrating the lower bar being manually depressed to produce an ultrasonic control signal of another desired frequency; and

FIGURE 7a is a fragmentary sectional view similar to FIGURE 6a but viewed from an opposite direction to better illustrate the mechanical action occurring subsequent to depressing of the lower bar as in FIGURE 7.

The device of FIGURE 1 is an ultrasonic transmitter constructed in accordance with the present invention and comprises a housing 10 of generally rectilinear configuration wherein a transmitter mechanism 11 is contained. Housing 10 is of convenient size and shape to afford easy holding and manipulation of the device and consists principally of a front panel 12 and a rear cover 13. Front panel 12 is formed of relatively heavy material and constitutes the main frame of the device whereon the transmitter mechanism 11 is mounted. Elongated openings 14 and 15 are provided in front panel 12 through which upper and lower bars 16 and 17 protrude. Each of these bars have a pair of finger pads 18 affixed to their respective outer levels. The application of a slight amount of pressure to any one of the finger pads 18 causes one of the bars to rock and thereby initiates a mechanical cycle (described later) which causes one of four resonators 20, 21, 22, or 23 to vibrate and generate a signal of ultrasonic frequency that is radiated through a screened opening 19 in the housing 10.

As shown in FIGURES 2 and 3, a bracket 24 is suitably fastened to front panel 12 and is provided with four openings through which resonators 20, 21, 22 and 23 are extended. The resonators are mounted on the support

structure comprising the panel 12 and the bracket 24 by resilient clamping wires 25 in a manner similar to that shown in Patent 2,821,956 of Ole E. Wold, issued February 4, 1958, and assigned to the same assignee as the present application. The resonators 20, 21, 22 and 23 are of different lengths and produce signals of different frequencies when set into vibratory motion. The resonators are supported at their respective vibrational nodes located at the longitudinal centers of each rod. Consequently, bracket 24 is preferably constructed with the point of support for each resonator at a different height from the other support points to locate the lower ends of the rods at equal levels with respect to each other. This facilitates the design of the striker mechanisms (next to be described), for it allows all of them to operate from a common level.

Another frame member, generally designated 26, is suitably affixed to the lower portion of front panel 12 and forms a part of the support structure of the transmitter. Frame member 26 serves as a supporting means for a series of striker elements or hammers 33 and actuating levers 36 and 37. Frame member 26 comprises a rear wall 27, a bottom wall 28, and side walls 29 and 30.

Rear wall 27 of frame member 26 has four horizontal tabs 31 (only one is seen in FIGURE 3) projecting therefrom which afford base or support members for four resilient spring members 32. Members 32 carry at their unsupported ends, the hammers 33 which, upon actuation of treadle bars 16 or 17, impinge sharply and percussively against the underside of an assigned one of the resonators 20, 21, 22 or 23 to vibrate the rod. Bottom wall 28 of frame member 26 has a plurality of inclined camming surfaces 34 projecting upwardly therefrom and positioned in spaced relation to each other so as to allow the resilient spring members 32 to be deflected downwardly between the camming members.

The transmitter further includes a cross shaft 38 which is journaled in the side walls 29 and 30 of frame member 26. Actuating levers 36 and 37 are pivotally mounted on shaft 38 and are each provided with resilient fingers 35 (see FIGURES 2 and 3). Fingers 35 are preferably of multi-leaved construction for greater resilience and are individually aligned with respective ones of the camming surfaces 34 on bottom wall 28 of frame member 26. Actuating levers or members 36 and 37 are generally similar to each other; thus, the two levers 36 are each provided with a bar engaging lug 36a and the levers 37 are each provided with a similar lug 37a as shown in FIGURE 5. The only substantial difference between levers 36 and 37 is that lugs 36a are disposed at a greater radial distance from shaft 38 than are the corresponding lugs 37a. The bar-engaging lugs 36a are contiguous to upper bar 16, whereas lugs 37a are disposed adjacent to and in contact with lower bar 17. Thus, and as described more fully hereinafter, rocking or pivotal movement of upper bar 16 is effective to operate one of the actuating members 36, whereas a similar movement of lower bar 17 operates one of the actuating levers 37.

The bars 16 and 17 are captivated within openings 14 and 15 of panel 12 by the action of the engaging lugs 36a and 37a. Four torsion springs 39 are mounted on cross shaft 38 and urge the actuator levers or members 36 and 37 in a clockwise direction as seen in FIGURE 3. Thus, the springs afford a biasing means tending to maintain bars 16 and 17 in their outermost position with fulcrums 41 (see FIGURE 4) abutting the inner wall of front panel 12, which comprises a principal part of the transmitter support structure. The bars 16 and 17, when rocked, are directed in a path perpendicular to front panel 12, by a plurality of horizontally extending guide posts 43 mounted on panel 12 and positioned directly above and below the ends of the bars. Further guidance is provided by lugs 42 on the bars, which cooperate with these same guide posts 43 to maintain the bars in align-

ment with the elongated openings 14 or 15 (see FIGURES 5, 6 and 7) as the bars are depressed.

FIGURE 5 illustrates the preferred configuration of the actuating levers 36 and 37; there are two of each. These levers may be generally C-shaped with one leg 36b or 37b of the C having the resilient fingers 35 attached thereto and the other leg 36c or 37c terminating in an ear 36d or 37d. Ears 36d and 37d are parallel to the main body of actuator levers 36 and 37 and are provided with apertures therein through which shaft 38 passes. The actuating levers 36 and 37 are therefore supported on shaft 38 at two spaced-apart points, affording a stable mounting arrangement for each of the actuator members. The legs 36c and 37c are preferably of a chosen length which enables the four actuating levers to be journaled on shaft 38 between side walls 29 in a maintained space relationship without the need of any additional spacers. Also, the area between the main body of the actuating levers and their respective remotely positioned ears provides a convenient means for entrapping torsion springs 39 to prevent them from becoming entangled with one another.

FIGURES 5, 6, 6a, 7 and 7a best illustrate the device in various operated conditions. FIGURE 5 is illustrative of the device at rest wherein the four actuating levers 36 and 37 are firmly holding bars 16 and 17 in protruded positions through openings 14 and 15, respectively, in the front panel 12. The biasing or holding force is provided by torsion springs 39 acting on the actuating levers 36 and 37. It should be noted that both the left and right fulcrum elements 41 of each of bars 16 and 17 are in engagement with the inner wall of front panel 12 because of the forces exerted by springs 39.

FIGURE 6 illustrates the effect of a force applied, as by an operator's thumb or finger, to the left finger pad 18L of the upper bar 16. The bar rocks about its right fulcrum 41R and consequently causes the left-hand one of the two actuating levers, 36L as seen in this figure, to pivot about shaft 38 against the bias of the torsion spring 39L. The right fulcrum 41R is maintained in contact with wall 12 as this pivoting occurs by the right-hand one of the actuating levers, 36R, and its associated torsion spring 39R. The left torsion spring yields, whereas the right spring does not because of the mechanical advantage afforded by the right actuating lever over that of the left lever. It can readily be seen, upon examination of FIGURE 6, that the point of contact of the right actuating lever 36R with bar 16, is almost coincident with the right fulcrum 41R whereas the point of contact of the left actuating lever 36L with bar 16 is at a great relative distance from fulcrum 41R.

FIGURE 6a illustrates the left actuating lever 36L in its pivoted position as in FIGURE 6. The initial pivoting of this lever first causes the resilient hammer support member 32 to be deflected downwardly from its rest position because of its being contacted by the resilient finger 35 as lever 36L is pivoted about shaft 38. At a point on camming surface 34, slightly above the illustrated position, the resilient finger 35 engages cam surface 34, causing the finger to break contact with member 32 and thereby allow it to spring upwardly. As support member 32 moves upwardly, hammer element 33 hits the underside of resonator 23. As illustrated in FIGURE 6a, at this instant, resonator 23 is caused to vibrate at a predetermined ultrasonic frequency, the vibration decaying at an exponential rate and continuing until finger pressure is released at bar 16. Actuating lever 36L then is allowed to return to its unoperated or rest position through the action of spring 39L. As actuating member 36L reaches its rest position, the damping surface 35a of resilient finger 35 engages the side of resonator 23 and effectively damps out the vibrations. Of course, a similar sequence of mechanical actions occurs at resonator 20 if the bar 16 is rocked by an application of finger pressure to its right side.

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FIGURE 7 illustrates the effect of pressure applied to the right finger pad 18R of lower bar 17. In this instance, the right actuating lever 37R is pivoted and thereby causes the striker or hammer element 33 to deliver a blow to the underside of resonator 21 as evidenced in FIGURE 7a. The mechanical actions taking place in FIGURES 7 and 7a are the same as those occurring in FIGURES 6 and 6a except, of course, the lower bar 17 of FIGURE 7 initiates the striker actions on the inner resonators 21 and 22, whereas the upper bar 16 initiates the striking actions on the outer resonators 20 and 23.

It will be noted from an observance of FIGURE 7, that the right actuating lever 37R is not caused to pivot as much as the left actuating lever 36L of FIGURE 6 under similar rocking of the bars 16 and 17. Also, the left actuating lever 37L of FIGURE 7 is pivoted slightly because of its contacting the bar 17 at a substantial distance from the left fulcrum 41L. However, this slight pivoting of the left actuating lever 37L is not enough to initiate a striking action at resonator 22. The right actuating lever 37R of FIGURE 7 maintains a substantial mechanical advantage over the left arm 37L (although not as great as those existing between the actuating arms 36 of FIGURE 6) so that the right torsion spring 39S is caused to yield upon pressure being applied to the right finger pad of bar 17 whereas the left torsion spring 39P does not yield and therefore maintains the left-hand fulcrum 41 of bar 17 in engagement with wall 12 through left lever 37L. As before, an application of pressure to the right side of bar 17 causes mechanical action to occur at resonator 22 that is substantially the same as that occurring at resonator 21 as illustrated in FIGURES 7 and 7a.

Accordingly, the above-described device presents a new and novel means for actuation of the exciter or hammer elements of an ultrasonic transmitter, which means allows for a more compact assemblage of necessary components, and a consequent formation of a transmitter housing of small dimensions. The transmitter of reduced size greatly facilitates one-handed operation of the device.

While a particular embodiment of the invention has been shown and described it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention in its broader aspects, and therefore, the aim in the appending claims is to cover all such changes and modifications as fall within the true spirit and scope of the invention.

I claim:

1. In a mechanical portable ultrasonic transmitter of the type having a support structure, two mechanically excitable resonators mounted on said support structure in spaced relation to each other and two exciters individually resiliently mounted on said support structure adjacent an assigned one of said resonators, an operating mechanism for said exciters comprising: two actuator assemblies mounted on said support structure, said actuator assemblies each including an actuating member aligned with a respective one of said exciters, each of said actuating members being movable along a predetermined path from a rest position effectively disengaged from the associated exciter through a cocking position in which said actuating member engages and cocks the associated exciter, to an actuated position in which said actuating member releases the associated exciter to strike its resonator; a bar extending between said actuator assemblies and being effectively pivoted at its opposed ends; and means included in each of said actuator assemblies for engaging said bar and completing a mechanical connection between said bar and said actuating members to displace one of said actuating members from its rest position to its actuated position in response to pivotal movement of said bar about a given end thereof.

2. In a mechanical portable ultrasonic transmitter of the type having a support structure, two elongated longitudinal-mode resonators mounted on said support structure in spaced relation to each other and two hammers

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individually resiliently mounted on said support structure adjacent one end of an assigned one of said resonators, an operating mechanism for said hammer comprising two actuator assemblies mounted on said support structure, said actuator assemblies each including an actuating member aligned with a respective one of said hammers, each of said actuating members being movable along a predetermined path from a rest position effectively disengaged from the associated hammer through a cocking position in which said actuating member engages and cocks the associated hammer, to an actuated position; means for releasing each of said actuating members from the associated hammer to strike its resonator when the actuator member reaches its actuated position; a bar extending between said actuator assemblies and being effectively pivoted at its opposed ends; and means included in each of said actuator assemblies for engaging said bar and completing a mechanical connection between said bar and said actuating members to displace one of said actuating members from its rest position to its actuated position in response to pivotal movement of said bar about a given end thereof.

3. In a mechanical portable ultrasonic transmitter of the type having a support structure, two mechanically excitable resonators mounted on said support structure in spaced relation to each other and two exciters mounted on said support structure adjacent an assigned one of said resonators, an operating mechanism for said exciters comprising two actuator assemblies mounted on said support structure, said actuator assemblies each including an actuating member aligned with a respective one of said exciters, each of said actuating members being pivotally movable along a predetermined arcuate path from a rest position effectively disengaged from the associated exciter through a cocking position in which said actuating member engages and cocks the associated exciter, to an actuated position in which said actuating member releases the associated exciter to engage its resonator, said actuator assemblies each including biasing means normally maintaining said actuator members in their respective rest positions; a bar extending between said actuator assemblies and being effectively pivoted at its opposed ends; and means included in each of said actuator assemblies for engaging said bar and completing a mechanical connection between said bar and said actuating members to displace one of said actuating members from its rest position to its actuated position, against said biasing means, in response to pivotal movement of said bar about a given end thereof.

4. In a mechanical portable ultrasonic transmitter of the type having a support structure, two elongated longitudinal-mode resonators mounted on said support structure in spaced parallel relation to each other and two hammers mounted on said support structure adjacent corresponding ends of assigned respective ones of said resonators, an operating mechanism for said hammers comprising two actuator assemblies mounted on said support structure, said actuator assemblies each including an actuating member aligned with a respective one of said hammers, each of said actuating members being movable along a predetermined path from a rest position effectively disengaged from the associated hammer through a cocking position in which said actuating member engages and cocks the associated hammer, to an actuated position in which said actuating member releases the associated hammer to strike its resonator; a bar extending between said actuator assemblies and engaging said support structure at its opposite ends; and means, comprising a lug on each of said actuating members, for engaging said bar to maintain said bar in contact with said support structure at both ends of said bar when said actuating members are in their rest positions, said bar being effective to displace each of said actuating members from its rest position to its actuated position in response to pivotal movement of said bar about a given end thereof.

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5. In a mechanical portable ultrasonic transmitter of the type having a support structure provided with an access opening, two mechanically excitable resonators mounted on said support structure in spaced relation to one another and two exciters mounted on said support structure adjacent an assigned one of said resonators, an operating mechanism for said exciters comprising: two actuator assemblies mounted on said support structure, said actuator assemblies each including an actuating member aligned with a respective one of said exciters, each of said actuating members being pivotally movable along a predetermined arcuate path from a rest position effectively disengaged from the associated actuators, through a cocking position in which said actuating member engages and cocks the associated exciters, to an actuated position in which said actuating member releases the associated exciter to engage its resonator, said actuating assemblies each including biasing means normally maintaining said actuator members in their respective rest

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positions; a bar extending between said actuator assemblies, having opposite end portions engaging said support structure to permit pivotal movement of said bar and having an intermediate portion projecting through said access opening; and means included in each of said actuator assemblies for engaging said bar and completing a mechanical connection between said bar and said actuating members to displace one of said actuating members from its rest position to its actuating position, against the force of said biasing means, in response to pivotal movement of said bar resulting from manipulation of said intermediate portion thereof.

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