Aug. 9, 1949. I. STEIN 2,478,602

MUSIC BOX ELEMENT

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FIG. 1

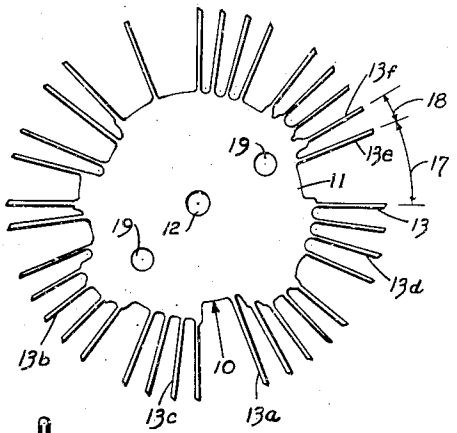


FIG. 1a

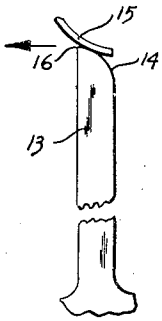


FIG. 2

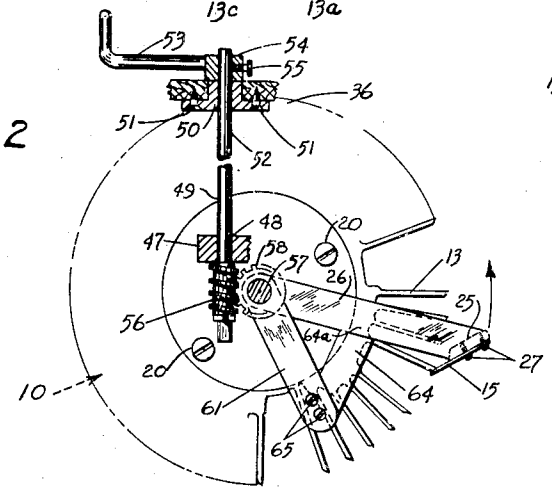
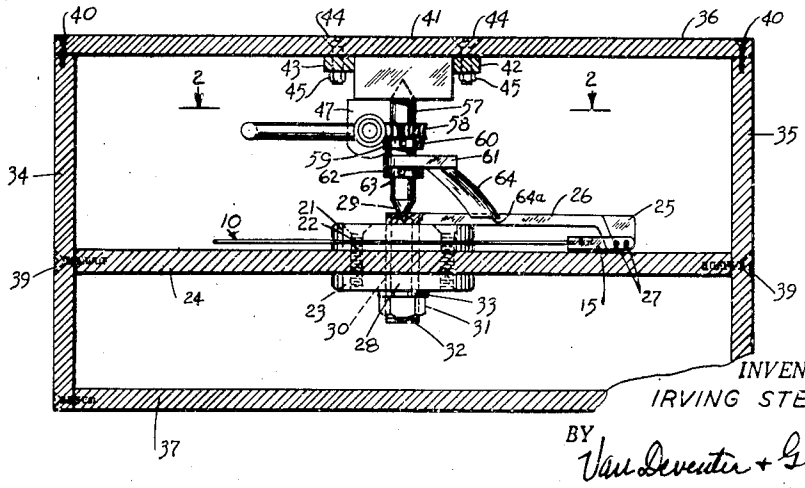


FIG. 3



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FIG. 4

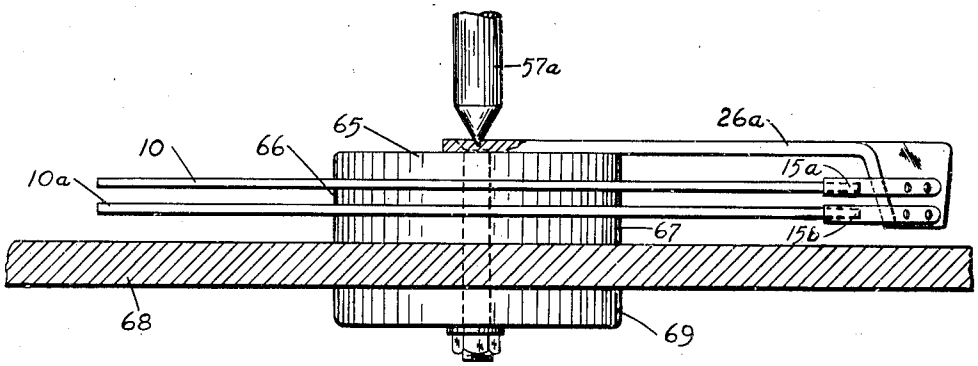


FIG. 5

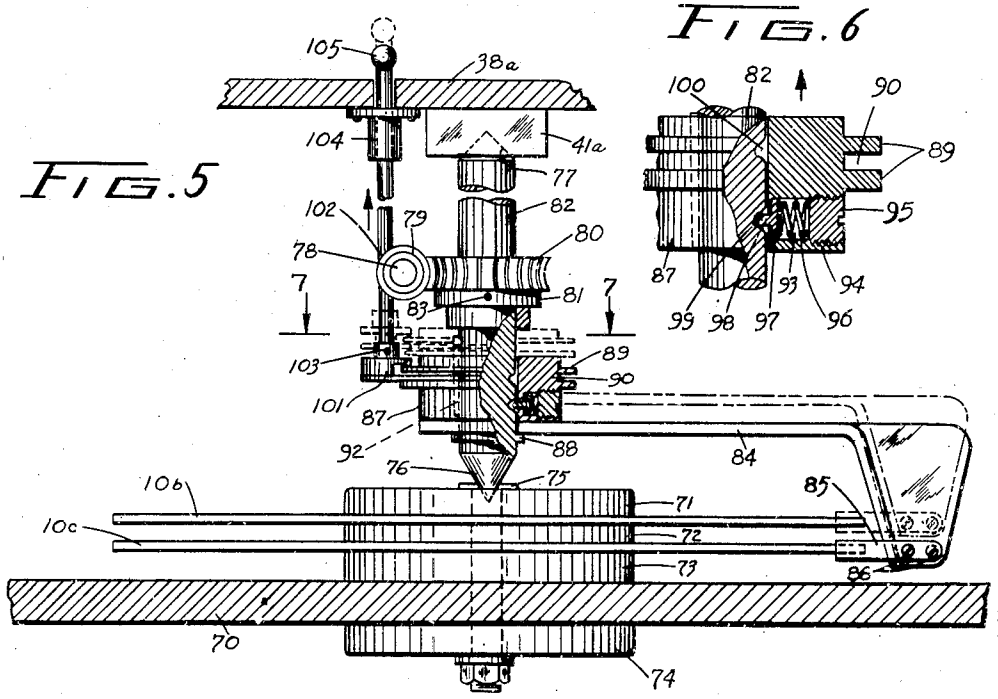
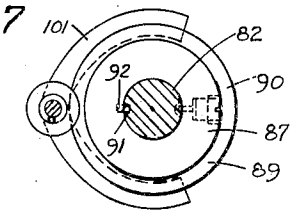


FIG. 6

FIG. 7



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MUSIC BOX ELEMENT

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13 Claims. (Cl. 84—94)

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This invention relates to improvements in music box elements and has for an object the provision of a musical element having a plurality of arms of substantially the same radius extending radially from a central portion, the angular spacings of these arms being disposed in accordance with the musical intervals of the piece represented by said movement, the tonal length of said arms being defined by the positions of the webs of the central body joining said arms.

Another object of the invention is the provision of a music box element of the character described of a central hole through said body, the center of which is equi-distant from the tips of all of the tonal arms, and the provision of means to cause a pickup to move over the ends of said arms and strum or pluck them, thereby producing musical notes in accordance with the tonal lengths of said arms and in intervals in accordance with the angular spacing of the arms.

Yet another object of the invention is the provision of a plurality of elements of the character described spaced apart on a common axis, the provision of rotatable means adapted to strum or pluck the arms in one of said elements, and means for positioning said means for strumming or plucking into association with another of said elements when it is desired to play another tune.

Another object of the invention is the provision of a plurality of elements of the character described spaced axially apart from one another, and the provision of rotatable means for strumming or plucking the arms of said elements conjointly.

Other objects and advantages of the invention will be apparent to those skilled in the art upon a study of the specification, and the accompanying drawings.

Referring to the drawings:

Figure 1 is a plan view of my new and improved musical element;

Figure 1*a* is a fragmentary enlarged view of one of my radial tone arms;

Figure 2 is a plan view of one means of strumming or plucking the radial tone arms of my musical element;

Figure 3 is a sectional elevation of a music box showing one of my elements mounted on a soundboard, and showing mechanism for plucking or strumming the radial arms thereof;

Figure 4 is a sectional elevation showing two of my musical elements mounted on a soundboard and showing a plucking or strumming arm acting on both elements conjointly;

Figure 5 is a sectional elevation showing two

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of my musical elements mounted on a soundboard and showing mechanism for plucking or strumming the radial arms of one of the elements, said means being adapted to be shifted so that its strumming or plucking element engages the radial arms of the other element;

Figure 6 is a fragmentary view partly in section, showing means for retaining the arm carrying the plucking or strumming member in either one of two positions; and

Figure 7 is a view taken along the lines 7—7 of Figure 5, showing my shifting yoke for shifting the plucking arm.

My new and improved musical element, generally designated by the numeral 10, consists of a center or solid web 11 having a central hole 12 formed therein, and formed integral with the web 11 is a plurality of radial arms 13. The outer end of all of these arms are equi-distant from the center of the hole 12 formed in the web 11, and each radial arm has its trailing corner removed and presenting a round surface such as the surface 14 so that when a plucking or strumming member 15 engages the tone arm, moving in the direction of the arrow, Figure 1*a*, it first encounters the rounded surface 14, and as it leaves the radial tone arm it flips off of the corner 16, leaving the tone arm 13 free to vibrate in accordance with its tonal length.

It will be noted that some of the tone arms 13 are substantially longer than the others; for example, the tone arm 13*a* is substantially longer than the tone arm 13*b*, and others, for example 13*c* and 13*d*, are of lengths intermediate the lengths 13*a* and 13*b*. On the longest arm 13*a* it will be noted that the web 11 is cut back so as to give the arm 13*a* greater length, while with the arm 13*b* it will be noted that the web 11 is not cut back so far and, therefore, the tonal length of 13*b* is substantially less than the tonal lengths of 13*a*. The tone arm 13*b* will vibrate at a higher pitch than the arm 13*a*. Thus it will be seen that by cutting away the web 11 to a greater or lesser extent, I am able to form tone arms of any desired tonal value.

The intervals between the radial tone arms are formed in accordance with the intervals of the piece of music which the element is to play.

Since one object of the invention is to carry the plucking or strumming member of a radial arm rotating at a constant speed about a shaft concentric with the center of the hole 12, the intervals are taken care of by the angular displacement of the radial tone arms. For example, the angular relation 17 between the tone arms 13,

and 13e, is substantially greater than the angular interval 18 between the tone arm 13e and the tone arm 13f. Thus I am able to take care of whole notes, half notes, quarter notes, one-eighth notes, et cetera, and all values of rests. For example, the musical element shown in Figure 1 has its radial tone arms of such lengths and spaced in such intervals that it plays "Here We Go 'Round the Mulberry Bush." Obviously any piece of music may be embodied in the musical element by making the tone lengths of the arms and the intervals in accordance with the piece of music desired. The musical element 10 may have holes 19 formed therein through which mounting screws, such as the screws 20, shown in Figure 2, may pass through mounting blocks 21 and 22, and engage correspondingly threaded holes in a securing block 23 positioned beneath the soundingboard 24. When the musical element 10 is thus mounted, the vibrations of the radial tone arms are substantially amplified by the soundingboard 24.

The plucking or strumming member 15 may consist of a thin springy member formed of thin metal, fibre, or any other suitable material, and may be secured to the flat surface of an angular portion 25 of a radial arm 26 by means of screws 27.

The arm 26 is secured to a stub shaft 28, and at the upper end this shaft is provided with a conical hole 29. The stub shaft 28 is journaled in a suitable bushing 30 which extends through the blocks 21, the musical element 10, the block 22, the soundingboard 24, and the block 23. The shaft 28 is shouldered, and a nut 31, engaging the threaded end 32 thereof, clamps a washer 33 against said shoulder so that the arm 26 may be rotated about the stub shaft 28 as an axis, and the axis of the shaft 28 coincides with the axis of the hole 12 formed in the musical element 10.

Since the plucking or strumming member 15 must first encounter the curved surface 14 on the radial tone arms, it is necessary that it be rotated in one direction only, and this is in a counter-clockwise direction as shown by the arrow in Figure 2.

The soundingboard is mounted in a box or casing which has side walls 34 and 35, an end wall 36, an opposite end wall not shown, a bottom wall 37, and a top wall 38. The soundingboard is fixed in the casing by means of screws such as the screws 39. The top wall 38 is secured to the rest of the casing by means of screws 40. Secured to the top wall 38 is a boss 41 having lugs 42 and 43 formed integral therewith which are secured to the top plate 38 by means of screws 44, and nuts 45. The boss 41 has a conical hole 46 formed therein which is in alignment with the conical hole 29. The boss 41 has a depending lug 47 with a bearing 48 therein in which a shaft 49 is journaled. A lug 50 secured to the wall 36, by means of screws 51, has a bearing 52 formed therein in which the shaft 49 is also journaled, the bearings 48 and 52 being in alignment.

A crank 53 has a hub 54 which fits on the outer end of the shaft 49 and is secured thereto by means of a set screw 55. Secured to the shaft 49 adjacent to the depending lug 47 is a worm 56 which may either be secured to or formed integral with the shaft 49. A vertical shaft 57 has both ends conical, and its lower end engages the conical hole 29, and its upper end engages the conical hole 46.

A worm gear 58 is mounted on the shaft 57,

and a pin 59 passes through its hub 60 and the shaft 57. A radial arm 61 has a hub 62 which is pinned to the shaft 57 by means of a pin 63. The worm 56 meshes with the worm gear 58 so that as a crank 53 is turned the shaft 49 is rotated, and the shaft 57 and the arm 61 carried thereby is rotated slowly about the axis of the shaft 57.

An inclined leaf spring 64 is secured to the arm 61 by means of screws 65, and is so positioned that its lower end 64a bears against the side of the arm 26 so that if the crank 53 is rotated in the proper direction the arm 61 will move in a counter-clockwise direction as viewed in Figure 2, and the lower end 64a of the leaf spring 64 bears against the side of the arm 26 and propels it in a counter-clockwise direction, and as the arm 26 moves in a counter-clockwise direction its plucking or strumming member 15 will sequentially engage and release, and thereby set into vibration, the radial tone arms 13 on the musical element 10.

In case the crank 53 is turned backwards the leaf 64 will leave the arm 26 and not drive the same; when the shaft 57 makes almost a complete revolution the end 64a of the leaf spring will ratchet over the arm 26 without driving it, therefore, the musical element 10 cannot be damaged by rotating the crank in the wrong direction.

In the modification shown in Figure 4, musical element 10, and musical element 10a are mounted concentrically between blocks 65, 66, and 67, and these blocks are secured to a soundingboard 68 with a fourth block 69 therebelow. The radial tone arms of the element 10 may constitute the soprano or melody of a piece of music, and the radial tone arms of the musical element 10a may represent the alto of the same piece of music.

The plucking or strumming member 15a may traverse the radial tone arms of the musical element 10 and a second plucking or strumming member 15b may traverse the radial tone arms of the musical element 10a. The plucking or strumming members 15a and 15b may be secured to an arm 26a, and this arm may be driven in one direction by a leaf spring member similar to that shown in Figures 2 and 3, and carried on a shaft 57a, similar to the shaft 57. Since the mechanism for moving the arm in one direction only is fully described in connection with Figures 2 and 3, it is believed that this description need not be repeated.

Obviously any number of musical elements may be grouped in the manner described. For example, a quartet would be reproduced by four such musical elements.

In the arrangement shown in Figures 5, 6, and 7, I employ a plurality of musical elements and provide means for selectively playing any one of them.

Referring to said figures musical elements 10b and 10c are mounted on a soundingboard 70 with blocks 71, 72, 73, and 74. The upper block 71 carries a metal insert 75 having a conical hole 76 formed therein.

Secured to the top 38a of the casing is a boss 41a similar to the boss 41, which has a conical hole 77 formed therein. A shaft 78 is assumed to be driven by a motor, not shown, and consequently rotates in the proper direction. Secured to the shaft 78 is a worm 79 and this worm meshes with a worm gear 80 having a hub 81 secured to a shaft 82 by means of a pin 83. The shaft 82

has conical ends bearing in the conical holes 76 and 77.

An arm 84 carrying a plucking or strumming member 85, which is secured thereto by screws 86, has a hub 87 which is journaled on the shaft 82 and is positioned between the hub 81 of the worm gear 80, and a shoulder 88 formed on the shaft 82. The distance between the shoulder 88 and the hub 81 is equal to the center spacing of the musical elements 10b and 10c, so that when the arm 84 is in its lower position the plucking or strumming member 85 engages the radial tone arms of the lower musical element 10c and when the hub 87 is moved upwardly in contact with the hub 81 of the gear 80, the plucking or strumming member 85 is in engagement with the radial tone arms of the musical element 10b.

The hub 87 has formed integral therewith a portion 89 of larger diameter, and the portion 89 has a groove 90 formed therein. The hub 87 also has a keyway 91 formed therein and a key 92 in the shaft 82 drives the hub 87 leaving it free to be positioned in either one of the positions described above. The hub 87, as may be best seen in Figure 6, has a radial hole 93 formed therein and this hole is counterbored and threaded at 94. A plug 95 engages the threaded hole 94 and bears against one end of a helical spring 96; the other end of the spring 96 bears against a plug 97 slidably mounted in the hole 93. The plug 97 has a tip 98 of smaller diameter which extends through a smaller hole formed at the bottom of the hole 93 and engages a depression 99 formed in the shaft 82. When the plug tip 98 engages the depression 99 the arm 84 is in the position shown in solid lines in Figure 5, and is against the shoulder 88 formed on the shaft 82 so that the plucking or strumming member 85 traverses the radial arms of the musical element 10c.

A second depression 100, spaced apart from the depression 99, is formed in the shaft 82. This depression is so spaced from the depression 99 that when the tip 98 of the plug member engages it the plucking or strumming member 85 is in position to engage the radial tone arms of the musical element 10b.

For selectively positioning the plucking or strumming element 85 in engagement with one or the other of the musical elements, I employ a yoke 101 which engages the groove 90 formed in the hub 87, and this yoke is secured to a vertical shaft 102 by means of a pin 103. The vertical shaft extends upwardly through a bearing hole in a bushing 104 secured to the top member 38a of the casing and may carry on its upper end a ball or knob 105 outside of the top member 38a.

The device of Figures 5, 6, and 7, when in the position shown in solid lines, will play the lower musical element 10c. Now when the knob 105 is grasped and pulled upwardly, the arm 84 is shifted to the dot-dash position, and the plucking or strumming element carried thereby is in position to play the musical element 10b.

Due to the fact that my new and improved musical elements employ angular spacing of the tone arms in accordance with the musical intervals, and due to the fact that I can obtain different tone arm lengths by varying the solid central web, I am enabled to produce duplicates in quantity of any desired pieces of music by making dies (one die for each given piece of music) and stamping out these musical elements in mass production and find that the corresponding tone arms on each member so produced is substantially the same tonal length, and consequently

produces the same note. Therefore, tuning the tone arms after the punching operation is unnecessary. Therefore, I believe I am the first to produce musical elements of the character described herein adapted to be produced in mass production, and although the musical element is herein described in connection with music boxes, I intend to use it not only in making boxes, but in connection with any device in which a series of musical notes is actuated.

While the invention has been described in detail with specific examples, such examples are illustrative and are not given as limitations, since other modifications within the spirit and scope of the invention will be apparent to those skilled in the art. Hence, the invention is to be understood as limited only as indicated, in the appended claims, in which the intent is to set forth all the novelty over the prior art.

What is claimed is:

1. A musical element formed of a disc of vibratable material, said disc having a center, a plurality of radial arms or reeds the outer extremities of which are equi-distant from said center, said arms being angularly disposed about said center in accordance with the musical intervals, and of varying lengths from said extremities inwardly, in accordance with the tones which the arms are to produce.

2. A musical element formed of a disc of vibratable material, said disc having a center, a plurality of radial arms or reeds formed integral therewith, the outer extremities of said reeds being equidistant from said center, said reeds being angularly disposed about said center in accordance with the musical intervals desired and of varying lengths from the extremities inwardly in accordance with the tones the reeds are to produce.

3. In a musical element, a thin body or web having a plurality of integral radial tone arms extending therefrom and having their outer extremities terminating on a line, the lengths of said arms from said line to said body being varied in accordance with the pitch at which each arm is to vibrate, said arms being spaced apart from each other in accordance with the musical intervals desired, and a member for plucking said arms arranged to move along said line.

4. In a musical element, a body having a plurality of radial tone arms extending therefrom, said arms having their extremities terminating on a circular line the center of which falls within said body, the lengths of said arms from said line to said body, being varied in accordance with the pitch at which each arm is to vibrate.

5. In a musical element of the character described, a body having a plurality of radial tone arms extending therefrom, the outer extremities of said arms terminating on a circular line the center of which lies within said body, the radial spacing of said arms being in accordance with the musical intervals of the music to be reproduced, and the tonal lengths of said arms from said line to said body, being varied in accordance with the sequential pitches at which said arms are to vibrate.

6. The invention according to claim 5, in which said element is secured to a sounding board, and in which an actuating arm is mounted for rotation about said center as an axis and carries a flexible pick positioned thereon for sequentially engaging and releasing the extremities of said arms to cause them to vibrate in the plane of said body.

7. The invention according to claim 6, in which corresponding outer corners of said radial tone arms are rounded and in which said pick is angularly disposed on said actuating arm whereby it first engages the rounded edge on each tone arm as said actuating arm is rotated in a predetermined direction.

8. In a musical device, a soundingboard, a plurality of musical elements mounted on said soundingboard with spacers therebetween, each of said musical elements being comprised of a thin body having radial arms or reeds formed integral therewith and having their outer extremities terminating on a circle, the center of which is substantially the center of said body, a radial actuator arm having its end offset and adapted to be rotated about an axis coinciding with the centers of said musical elements, and a plucking or strumming member of a width to span all of said elements secured to the offset portion of said actuator arm and adapted to pluck or strum the radial arms on all said elements.

9. In a musical device, a musical element comprised of a thin body having radial arms or reeds formed integral therewith and having their outer extremities terminating on a circle, the center of which is substantially the center of said body, corresponding corners of the extremities of said reeds being rounded, an operation arm adapted to rotate about a center coinciding with the center of said element, said operation arm having its outer end offset angular with respect to its radius, a plucking or strumming member secured to said offset portion, whereby said operation arm may be rotated in a direction in which said rounded portions of said extremities are first encountered by said plucking or strumming member.

10. In a musical device, a soundingboard, a plurality of musical elements, said elements being comprised of thin bodies each having radial arms or reeds formed integral therewith and having the outer extremities of said reeds terminating on a circle, the center of which is substantially the center of said body, said elements being stacked with spacers therebetween on and rigidly secured to said soundingboard, said elements having their axes coinciding, an actuator arm rotatable about a center coinciding with said axes and having its outer end offset, a plucking or strumming member adapted to engage the radial arms on one of said elements, means to rotate said actuator arm, and means for selectively

positioning said actuator arm with said plucking or strumming member in alignment with any one of said elements.

11. The invention according to claim 10, in which said arm is slidably keyed to a rotatable shaft and in which registry means partly on said shaft and partly on said arm engage and effect positive alignment of said plucking or strumming member with any one of said elements selected for playing.

12. The invention according to claim 10, in which said actuator arm is provided with a hub which is slidably keyed to a rotatable shaft and in which a series of depressions is formed in said shaft corresponding in number to the number of said elements, said hub carrying a spring-loaded plunger adapted to engage any one of said depressions with which it is brought into alignment, and manually operable means engaging said hub whereby an operator may shift it in accordance with the musical element to be played.

13. In a musical element of the character described, a web having a plurality of radial tone arms formed integral therewith and extending therefrom, the outer extremities of said arms terminating on a circular line the center of which lies within the body of said web, the radial spacing of said arms being in accordance with the musical intervals of a tune to be reproduced and the tonal lengths of said arms from said outer extremities to the bases thereof being varied in accordance with the sequential pitches of the notes in said tune, the ends of said radial tone arms being adapted to be sequentially plucked or strummed by a member moving in a plane parallel to a plane cutting the major axis of said element.

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