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PROXIMITY-CONTROLLED ARTICLE TUMBLING DEVICE

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Fig. 1

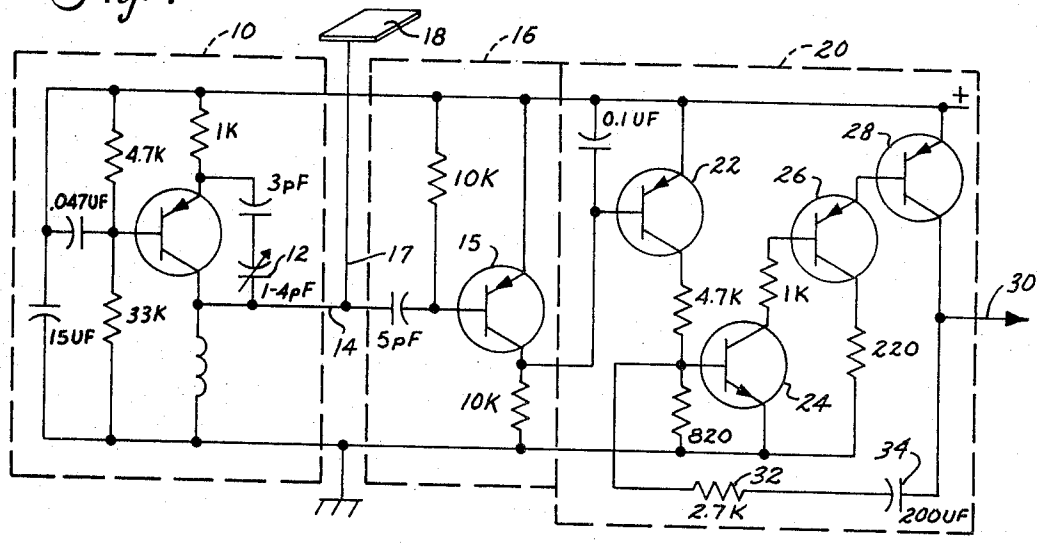
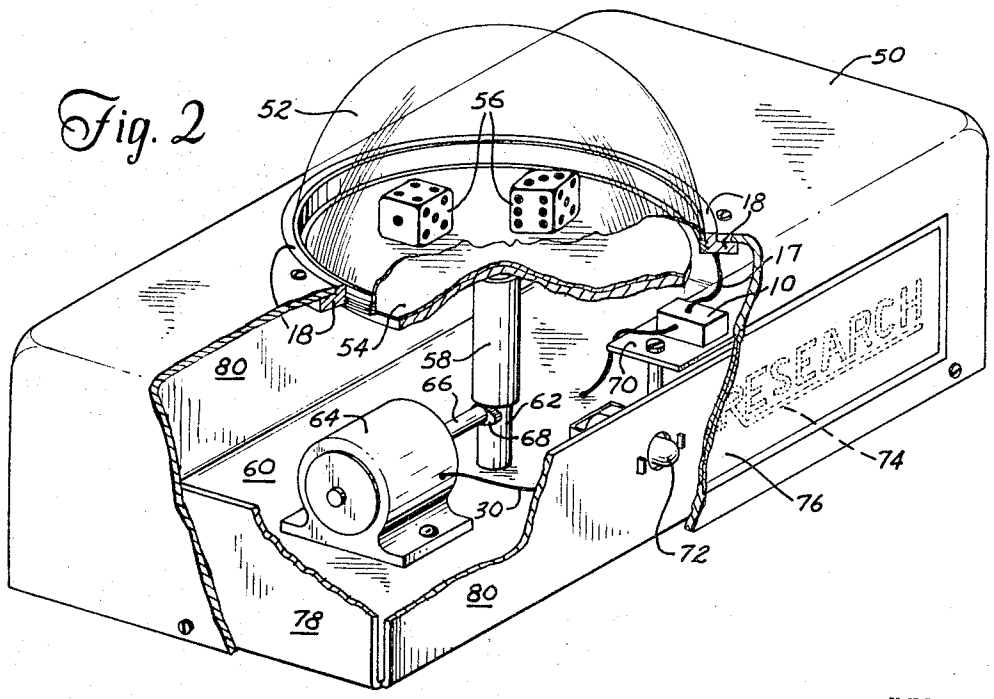


Fig. 2



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PROXIMITY-CONTROLLED ARTICLE TUMBLING DEVICE

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ABSTRACT OF THE DISCLOSURE

A specific example of a proximity-controlled article tumbling device is as an automatic die mixer which is operated by the use of a capacitance-sensitive proximity circuit. The capacitor plate, which detects the approach of a person's hand, is formed as a ring positioned about the base of the glass dome of the dice shaker, and this ring is electrically connected into the proximity circuit. The approach of the hand causes a change in the capacitance of the proximity circuit which triggers the vibration of the dice-mixing platform. The dice-mixing action continues until the hand is withdrawn. The capacitance of the proximity circuit is adjustable to vary the distance at which triggering of the dice mixer will begin in response to the approach of the hand.

The present invention relates to a proximity operated circuit and, more particularly, relates to a game device in which the proximity operated circuit is used to control operation of the game device.

Proximity operated circuits are those circuits which experience a change in their operating condition in response to the approach of a person or other object. The physical phenomenon which is experienced is a change in capacitance, and this capacitance change can, by example, be utilized to load an oscillator, start or stop an oscillator, unbalance a capacitance bridge, cause conduction in an electron tube, or detune a resonant circuit. The proximity circuit itself can be used to accomplish diverse end results such as the ringing of a bell or siren, operation of a tape recorder, detonation of a bomb, lighting of a lamp, or answering of a telephone. The patent art is filled with a large variety of proximity circuit designs which perform a variety of results.

The proximity circuit of the present invention is uniquely applied in combination with a game or amusement device. Broadly, the approach of an object, such as a person's hand, causes game articles to be mixed or tumbled, while the withdrawal of the object terminates the mixing. In order to deter slight mixing or tumbling, which could be achieved by a rapid approach and withdrawal of an object, means are incorporated to ensure mixing for at least a predetermined time period.

Accordingly, one object of the present invention is to provide a proximity-actuated article mixer or tumbler having means to continue mixing for at least a specified time period once mixing is initiated.

A further object of the present invention is to provide an improved dice mixer or tumbler containing a proximity circuit which is designed to be actuated by the approach of an object and remain actuated for at least a predetermined time period thereafter.

Another object of the present invention is to provide an improved dice mixer or tumbler containing a proximity circuit constructed to be directionally responsive to approach.

Another object of the present invention is to provide an improved device for tumbling articles including a proximity circuit having a capacitive sensing means which is responsive to the approach of an object.

Other objects and advantages will become apparent from a reading of the following specification in conjunction with the accompanying drawings in which:

FIGURE 1 is a schematic drawing of the preferred embodiment of a proximity circuit; and

FIGURE 2 is a perspective cut-away showing of a dice mixer which is operated on the proximity principle.

FIGURE 1 shows the preferred embodiment of the proximity circuit. A conventional RF oscillator **10** is shown with a variable capacitor **12** in its feedback circuit. Capacitor **12** controls the amplitude of oscillation and is, in effect, a sensitivity control which is adjusted to optimize the sensitivity of the oscillator **10** to external effects. The output oscillations are applied by line **14** to the base of transistor **15** in amplitude detector **16**.

Connected to the high side of the oscillator coil by line **17** is a sensing element **18**. Sensing element **18** is here shown shaped as a flat plate because it forms one plate of a capacitor while circuit ground forms the second plate. The capacitance of this capacitor will increase when any object approaches sensing plate **18**. If the object is an electrical conductor, the spacing between the sensing plate and ground will be effectively decreased. If the object is an insulator, the effective dielectric constant of the dielectric is increased. If the object is between these two extremes, such as a lossy dielectric or lossy conductor, a resistance is imposed in parallel with the capacitor.

The output of detector **16** is connected to a four-stage amplifier **20** which comprises transistors **22**, **24**, **26**, and **28**. Output from the circuit of FIGURE 1 is taken at line **30** connected to the collector of transistor **28**. Connected between the collector of transistor **28** and the base of transistor **24** is a feedback circuit containing a resistor **32** and capacitor **34**.

In the operation of the circuit shown in FIGURE 1 oscillator **10** is oscillating at a radio frequency. Transistor **15** in detector circuit **16** is conducting near saturation. All four transistors in amplifier **20** are nonconducting.

When an object approaches plate **18**, the capacitance in the output circuit of oscillator **10** begins to increase and, if the object is lossy, energy is also dissipated. An additional load is added to the oscillator, reducing the output. Current flow through transistor **15** decreases and its collector voltage begins to rise. As the object draws nearer to plate **18**, the critical range is reached where the amplitude of oscillations decreases sufficiently to reduce the current through transistor **15** to such an extent that transistor **22** in amplifier **20** conducts.

When transistor **22** conducts, transistors **24**, **26**, and **28** also conduct. Current now flows in the output line **30**. As transistor **28** began conducting, current was applied through feedback capacitor **34** and resistor **32** to the base of transistor **24**. This feedback caused transistor **24** to conduct more which, in turn, caused transistors **26** and **28** to conduct more. As transistor **28** conducted more, more current flowed in the feedback path to the base of transistor **24**. The net result was a regenerative action which caused all transistors **24**, **26**, and **28** to become fully conducting immediately, and full current to flow in output line **30**.

As long as the object remains within the critical range of sensing plate **18**, current will flow in output line **30**. Once the object is withdrawn sufficiently from sensing plate **18** to permit the amplitude of oscillation to rise sufficiently to turn on detector **16**, transistor **22** will begin to turn off followed by transistors **24**, **26**, and **28**. The regenerative action of the feedback path through resistor **32** and capacitor **34** will cause this turn-off to occur immediately. Current will cease to flow in output line **30**.

It should be noted that were the feedback circuit not present an object could be quickly brought within the effective or critical range of the sensing plate **18** and then withdrawn immediately so that output current would flow in line **30** for a very brief interval of time. With the feedback circuit present it takes a definite period of time for capacitor **34** to become charged even though the regenerative action of this feedback circuit causes the three transistors to become fully conducting immediately. The result is that enabling current flows to the base of transistor **24** during this charging time, thereby holding transistor **24** conducting regardless of the conducting state of transistor **22**. For the values of resistor **32** and capacitor **34** shown, this charge time is approximately one-half second. Thus, if an object is brought into the effective range of sensing plate **18** and withdrawn before one-half second elapses, this feedback circuit delays turn-off and ensures that current continues to flow in output line **30** for the remainder of the one-half second period.

FIGURE 2 shows a cut-away perspective view of a dice mixer controlled by the proximity circuit shown in FIGURE 1. The dice mixer is enclosed in a cover or casing **50** having centrally located on its top portion a transparent glass bowl or dome **52**. Dome **52** is threaded to mate with a retaining ring **18** which functions as the sensing plate or element described in FIGURE 1. Visible within the dome **52** is a felt-covered platform **54** upon which are loosely positioned the dice **56**. Attached to the underside of this platform **54** is a sleeve **58**. Mounted on the base **60** of the dice mixer and extending upwardly is a post **62**. Sleeve **58** is positioned to ride on post **62**.

Also mounted on the base **60** is a motor **64** whose shaft **66** has formed thereon a cam **68**. The motor shaft and cam are so positioned in relation to the platform **54** and sleeve **58** that the surface of cam **68** contacts the bottom edge of the sleeve **58**. Rotation of motor shaft **66** and cam **68** causes sleeve **58** to rise and fall rapidly on post **62** and, accordingly, platform **54** is rapidly raised and lowered to effect a vibrational motion of the platform. Oscillator **10** is here shown as being mounted on an elevated insulated board **70** as are the other electrical circuit components (not shown).

The device shown in FIGURE 2 is designed to function primarily as a game or amusement device in which the mixing or tumbling of the dice **56** occurs in response to the approach of the hand of a person in the game. Sensing plate **18**, here formed as a ring, senses when the person's hand is brought within critical proximity and the proximity circuit of FIGURE 1 then functions as described previously. Current flows through line **30** to motor **64** causing rotation of cam **68** by shaft **66**. Platform **54** vibrates and the dice **56** are mixed or tumbled in response to this rapid movement of the platform. As long as the participant's hand stays within the operational range of the proximity circuit, the dice will continue to mix. Once the hand is withdrawn from this range the dice come to rest and the value of the dice can be read through the glass dome **52**. It desired, during operation of the mixer, current in line **30** can also be used to light lamps **72** which illuminate a legend or message **74** formed on transparent or transluscent glass **76**.

The delay feature of the feedback circuit formed by resistor **32** and capacitor **34** in FIGURE 1 finds particular utility with the dice mixer of FIGURE 2. Once a person's hand or other object is brought within the critical zone or range of actuation of the proximity circuit, the mixing of the dice **56** occurs for at least the predetermined period, which is here one-half second. This ensures that a thorough mixing of the dice occurs if the person's hand or other object is withdrawn before this predetermined period elapses.

The base **60** is electrically conductive and forms the chassis ground for the electrical components contained within the dice mixer. Suitable connections are made from the electrical components to ensure good contact with this ground. Base **60** also serves as the second plate of the proximity capacitor. Each end **78** and side **80** of base **60** is upturned. The effect of this is to shield the upper sensing plate **18** from the effect of objects at and below the level of these upturned ends **78** and sides **80**. In this manner, the sensing plate **18** is influenced less by objects resting alongside the dice mixer and is, therefore, directional in that it is more responsive to objects approaching from a level above that of the upturned ends and sides.

The critical range of the sensing plate varies depending on the size and type of the approaching object. A person's hand is generally considered a lossy dielectric and ideally the proximity circuit is adjusted to be actuated when a person's hand is brought within several inches of the dome **52** taking into account both the change in capacitance and the energy loss. In FIGURE 2, reference has been made to dice when describing the operation of the mixer. Obviously, other articles such as game pieces, tokens, or the like are capable of being mixed or tumbled.

When the present invention has been discussed with respect to the preferred embodiment, it is appearent that various modifications may be made therein within the scope of the invention and it is desired, therefore, that only such limitations be placed on the invention as are imposed by the prior art and set forth in the appended claims.

We claim:

1. A game device for tumbling articles of a game of chance, said device being adapted to be actuated in response to the approach of an object, comprising a tumbling platform, game of chance articles to be tumbled thereon, means for vibrating said platform, means including a proximity circuit and sensing means for causing the actuation of said vibrating means in response to the approach of said object toward said sensing means and for maintaining the continued actuation of said vibrating means during the presence of said object.

2. A device as claimed in claim **1** wherein said sensing means is capacitive and includes first means mounted on said device for functioning as a first capacitor plate, and said proximity circuit is actuated in response to the change in capacitance occasioned by the approach of said object toward said first capacitor plate to cause thereby the actuation of said vibrating means.

3. A device as claimed in claim **2** wherein said sensing means includes second means mounted on said device for functioning as a second capacitor plate.

4. A device as claimed in claim **3** wherein said second means is formed as a substantially flat conductive metal plate having upturned sides and ends, and said first means is positioned above said metal plate to be responsive primarily to the approach of an object above the level of said upturned sides and ends of said metal plate.

5. A device as claimed in claim **2** further comprising control means including a resistance-capacitance timing circuit for ensuring actuation of said vibrating means for at least a predetermined time period, said control means being activated simultaneously with the actuation of said proximity circuit.

6. A game device for tumbling articles of a game of chance, said device being adapted to be actuated in response to the approach of an object, comprising a tumbling platform, game of chance articles to be tumbled thereon, means for vibrating said platform, means including a proximity circuit and sensing means for causing the actuation of said vibrating means in response to the approach of said object toward said sensing means and for maintaing the continued actuation of said vibrating means during the presence of said object, and control means for ensuring actuation of said vibrating means for at least a predetermined time period.

7. A device as claimed in claim **6** wherein said sensing means is capacitive and includes a capacitor plate mounted on said device, said capacitor plate in response to the approach of an object serving to effect a change

of capacitance in said proximity circuit, and said proximity circuit further including means for detecting when a predetermined capacitance level is attained to cause thereby actuation of said vibrating means.

8. A device as claimed in claim 7 wherein said articles which are tumbled are two or more dice, said device further comprising transparent means mounted thereon and covering said tumbling platform to permit a view of the tumbling platform and the dice as well as their tumbling, when the dice are placed on said platform and said device is actuated.

9. A device as claimed in claim 8 wherein said capacitor plate is ring-shaped in construction and is mounted on said device adjacent to and encircling said transparent means.

10. A device as claimed in claim 7 wherein said proximity circuit includes means for predetermining the required capacitance level necessary to cause actuation of said vibrating means, and thus serving to establish the effective range of said capacitor plate.

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