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Suda

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[54] **AUTOMATIC DICE SHAKING DEVICE**

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[73] Assignee: **Yoshi, Ito,** Tokyo, Japan

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[52] **U.S. Cl.** ..... **273/145 R**

[51] **Int. Cl.** **A63f 9/04**

[58] **Field of Search** ..... 273/145 R, 145 A, 145 B, 273/145 C, 145 CA, 145 D, 145 E, 144 R, 144 A, 144 B, 138 A, 138 R; 46/245, 247, 145; 40/106.25; 259/29, 72; 221/24, 199, 221, 222, 223, 258; 194/30, 41, 50, 76, 81, 86, 89

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Assistant Examiner—Arnold W. Kramer
Attorney, Agent, or Firm—William Anthony Drucker

[57] **ABSTRACT**

An automatic dice shaking and dispensing device comprises a dice cup fixed to a rotary shaft. A switch in the bottom of the cup is activated by the weight of dice dropped into the cup. The switch activates an electric motor which through gear mechanism drives a crank mechanism and timer at two different speeds. The fast driven crank mechanism agitates the dice cup by repeated camming the dice cup on its rotary shaft against restoring spring tension while the slow turning timer has a cam fixed thereto which eventually cams the dice cup far enough to dispense the dice. Finally, the timer and its cam releases the dice cup which is restored to its upright position by the spring tension and the timer deactivates the electric motor.

8 Claims, 11 Drawing Figures

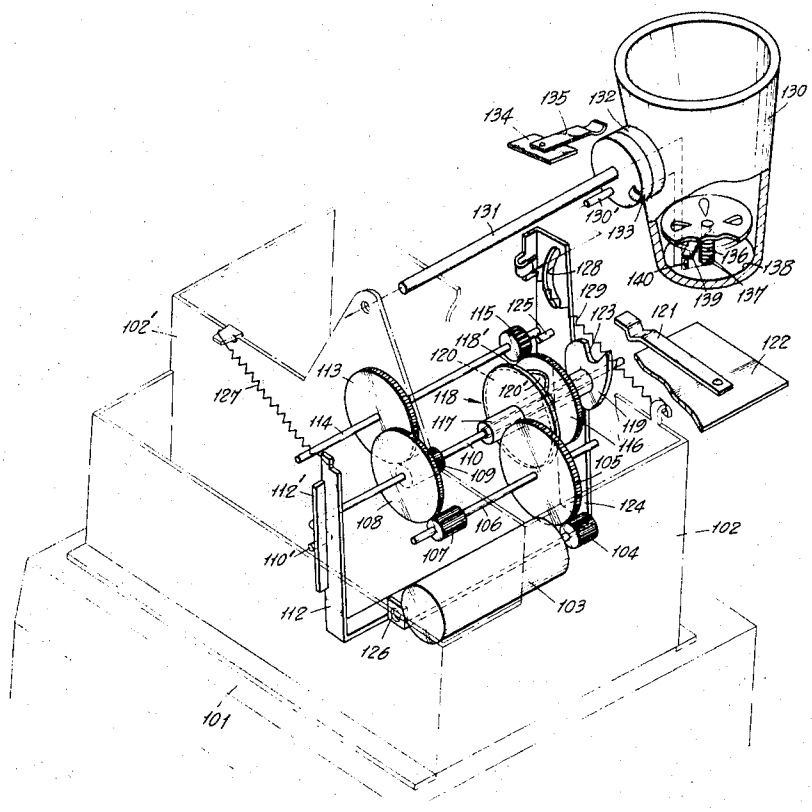
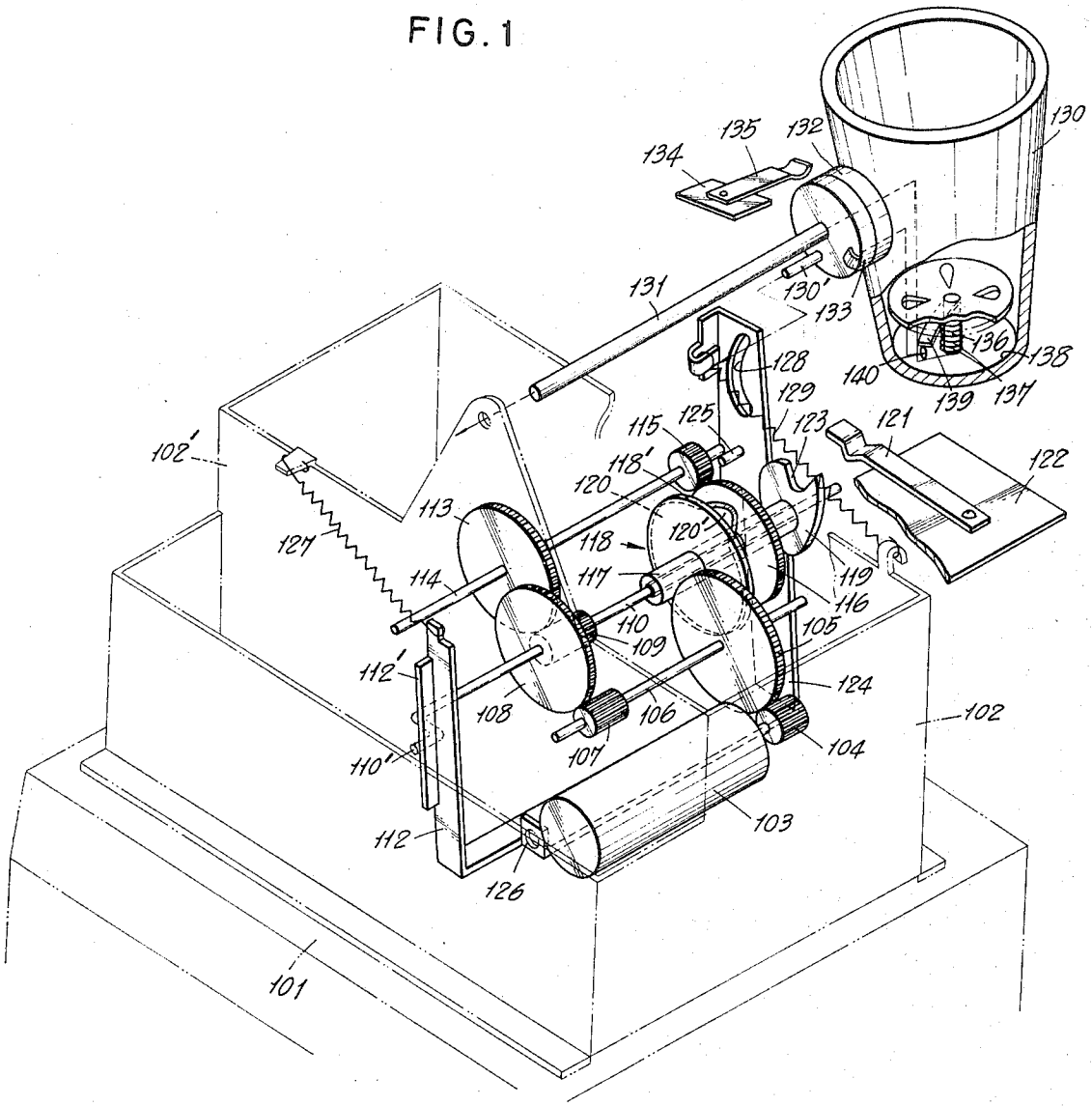


FIG. 1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104
110'
103
112
126
101

FIG. 2

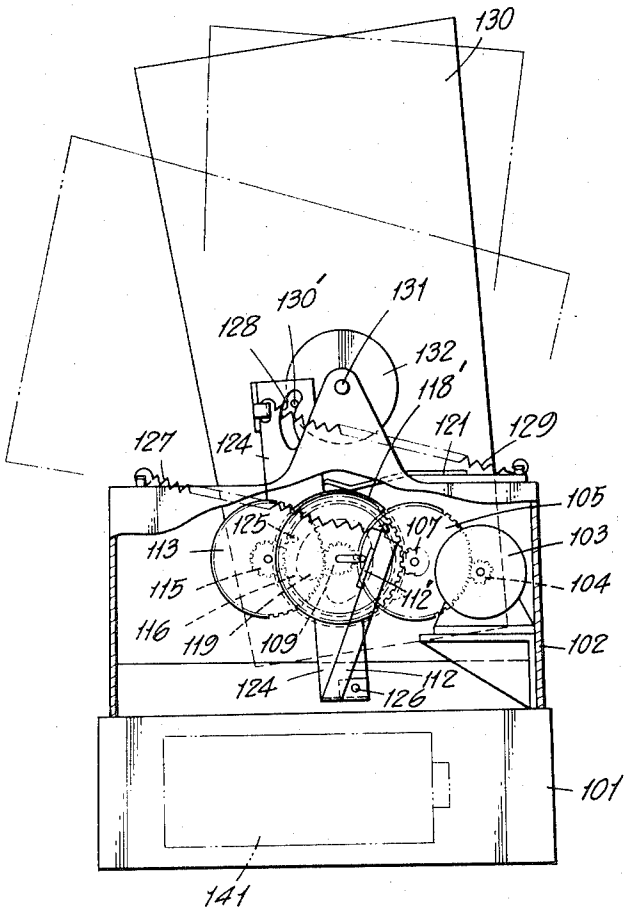


FIG. 4

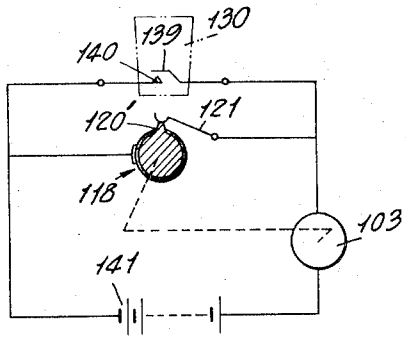


FIG. 3

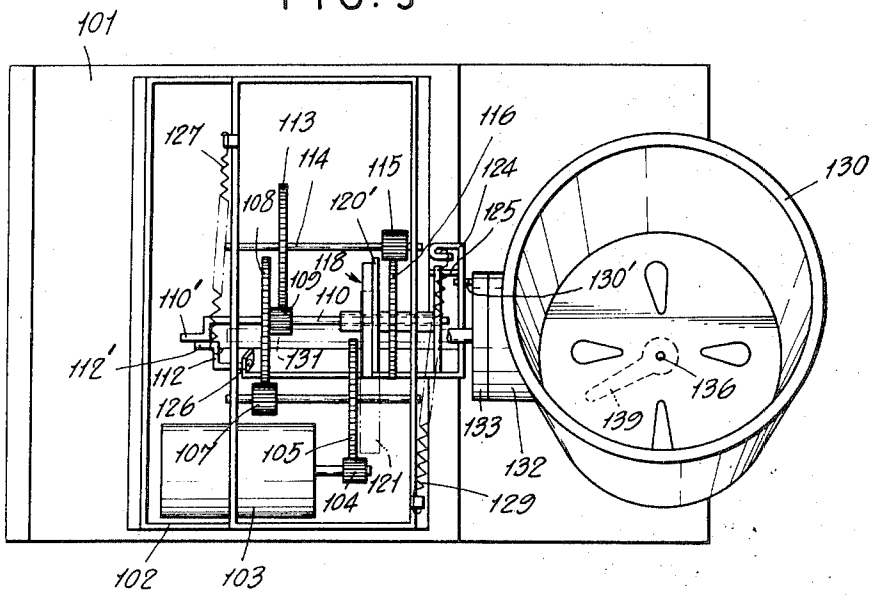


FIG. 5a

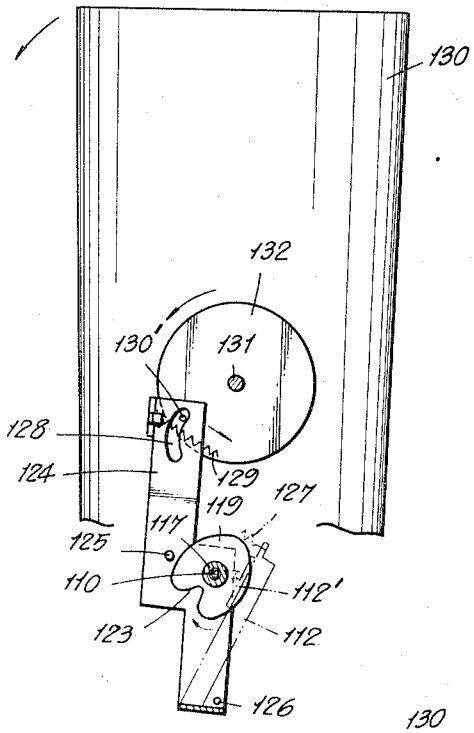


FIG. 5b

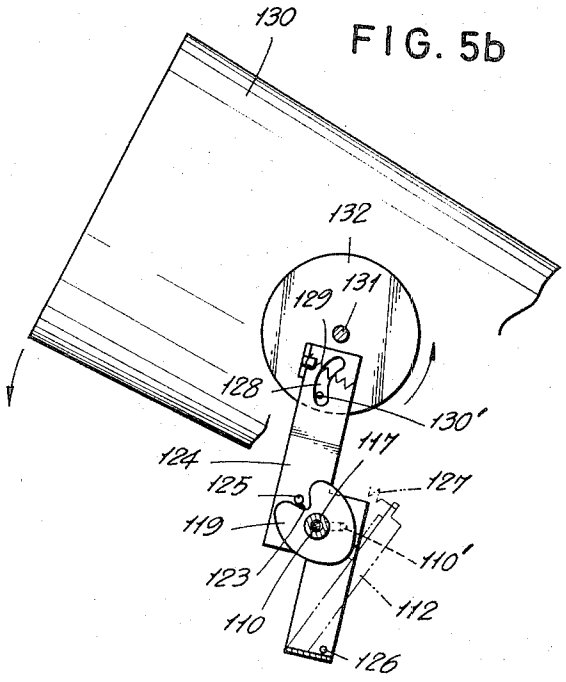


FIG. 5c

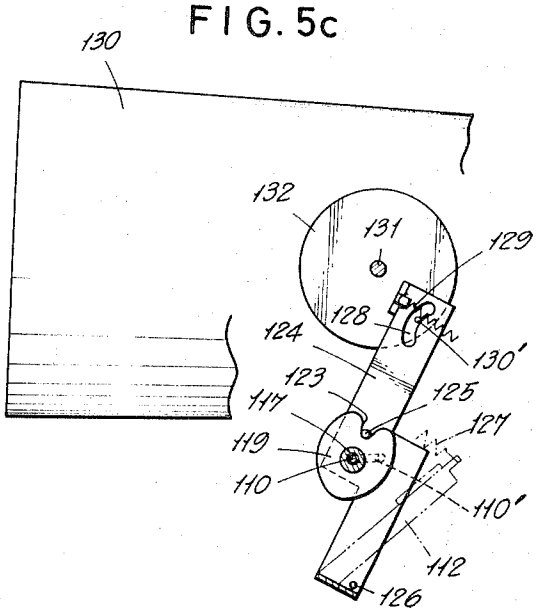
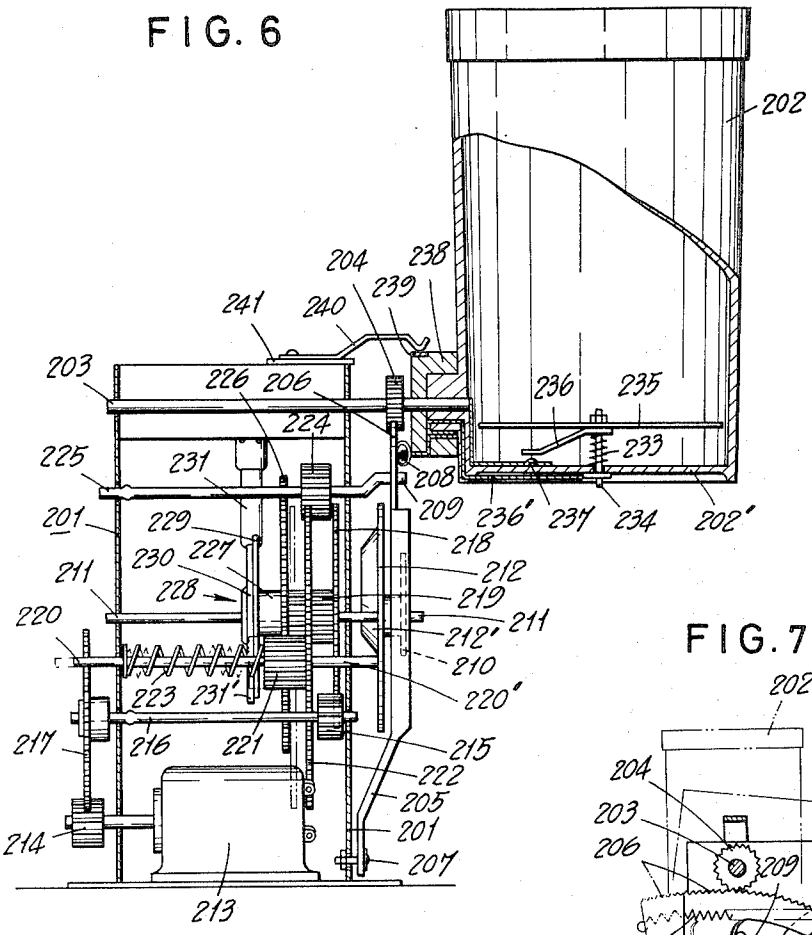


FIG. 6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238
239
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201
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218
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211
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212'
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207
213

FIG. 7

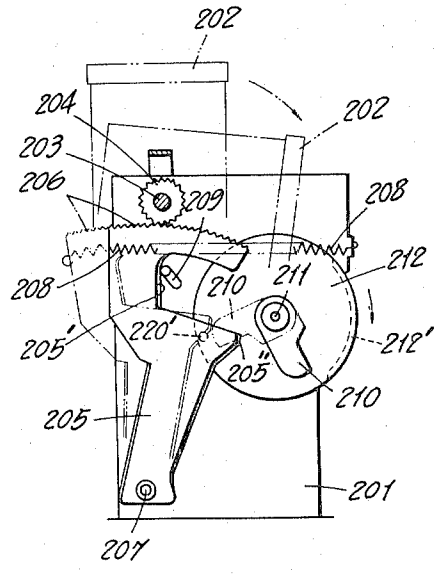
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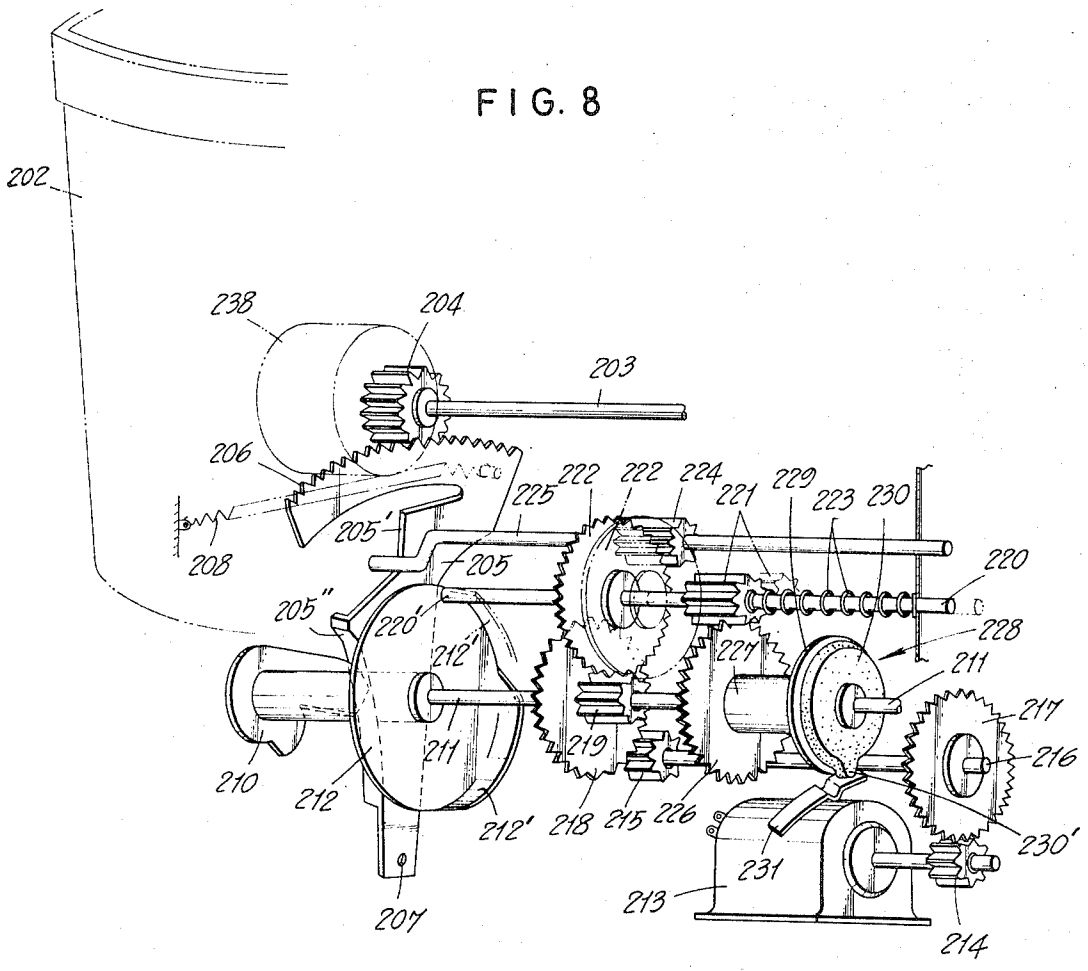
FIG. 8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222
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212'
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226
230'
231
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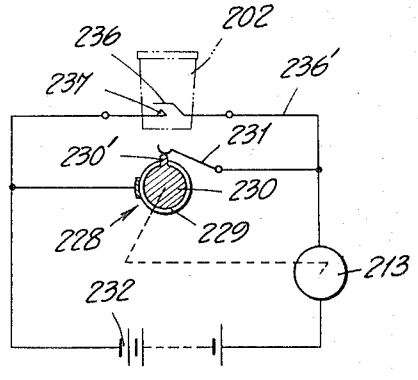
FIG. 9


202
236
236'
234
231
230'
230
228
229
213
232

AUTOMATIC DICE SHAKING DEVICE

The present invention relates to an automatic disc shaking cup in which a die or dice in a cup is shaken left and right, and then tilted down to cast out the die or dice contained in the cup.

A main object of the invention is to provide a dice shaking cup which is automatically shaken left and right, and casts out the die or dice contained therein without any manual operation.

Another object of the invention is to provide an automatically shaken dice cup which is electrically operated by means of an electric motor for a given period of time, after the die or dice are cast into the cup.

A further object of the invention is to provide an automatically shaken dice cup which makes all kinds of games using a die or dice more amusing.

The objects and features of the invention will be better understood from the following detailed description taken with reference to the accompanying drawings in which:

FIG. 1 is a perspective view of the first embodiment of the automatic dice shaking cup device according to the invention, partly broken away.

FIG. 2 is a side view of the first embodiment, partly broken away.

FIG. 3 is a plan view of the first embodiment.

FIG. 4 is an electrical switching circuit of the first embodiment.

FIGS. 5A to 5C show each situation of the cup in the operation of the first embodiment.

FIG. 6 is a front sectional view of the second embodiment of the automatic dice shaking cup device according to the invention, partly broken away.

FIG. 7 is a side view of a part of the second embodiment.

FIG. 8 is a perspective view of the second embodiment, partly broken away.

FIG. 9 is an electrical switching circuit of the second embodiment.

Referring to the drawings of FIGS. 1 to 5C, the first embodiment of an automatic dice shaking cup according to the invention will now be described.

Gear mechanism and crank mechanism are arranged within a frame member **102** fixed on a frame member **101**, which are described below. An electric motor **103** is disposed at a bottom of the frame member **101**, which motor is operated by an electric power source, for instance, a dry cell. A driving shaft **103'** of the motor **103** is attached to a pinion **104**. A shaft **106** is rotatably supported in the frame member **102**, on which a pinion **107** and a gear **105** are fixed. The gear **105** is engaged with the pinion **104**. A crank shaft **110** is rotatably supported in the frame member **102** and an inner frame member **102'** and has a gear **108** and a pinion **109** as one body fixed thereon. The gear **108** is engaged with the pinion **107**. One end of the crank shaft **110** is projected from the inner frame member **102'** and forms a crank **110'** engageable with a lever **112** as described below. A sleeve **117** is rotatably disposed concentric on and with respect to the crank shaft **110**. A shaft **114** is rotatably supported in the frame member **102** and the inner frame member **102'** and a gear **113** and a pinion **115** are fixed thereon. The pinion **115** is engaged with a gear **116** fixed on the sleeve **117**. The gear **113** is engaged with the pinion **109**.

One end of the sleeve **117** is projected from the frame member **102** and has a cam **119** with a recess **123** fixed thereon. The sleeve **117** fixes a timer **118** which consists of a metal disc **118'** and an insulating disc **120** with a smaller diameter than that of the metal disc **118'**, attached to the metal disc **118'** and having a projection **120'** on its periphery projecting from the periphery of the metal disc **118'**. An electric contact plate **121** is fixed on the frame member **102** through an insulator **122** in such a manner that one end of the electric contact plate **121** is in contact with the periphery of the timer **118**. A pin **125** is fixed on the inner surface of a lever **124**, and is engageable with the cam **119**. The lever **124** and the lever **112** are combined as one body by a cross member to form a U-shaped member which is rotatably supported on the frame member **102** by means of a mounting hole **126**. A bend **112'** is formed on the lever **112** and can be in contact with the crank **110**. Coil springs **127** and **129** are stretched between a part of the inner frame member **102'** and a top portion of the lever **112**, and a part of the frame member **102** and a top portion of the lever **124**, respectively, so that the levers **112** and **124** are tensioned oppositely to each other. A bracket **125'** is formed on the top portion of the lever **124** to hook one end of the coil spring **129**. A curved engaging hole **128** is formed in the upper portion of the lever **124**, into which a pin **130'** fits, as described below. A rotary shaft **131** is fixed on an attachment **132** of a cup **130**, which is rotatably supported at holes **131'**, **131'** of triangular bearing members **102''**, **102''** formed on the frame members **102** and **102'**. The pin **130'** also is attached to the attachment **132** and is designed to be engaged with the curved engaging hole **128** for the shaking of the cup **130**.

A metal ring **133** is attached to the side of the attachment **132**. A contact electrode **135** is fixed on the frame member **102** through an insulating plate **134** in such a manner that it is in contact with the metal ring **133**. A mounting disc **138** is moveably supported by a supporting axis **136** and a coil spring **137** in the bottom portion of the cup **130**. An electrode **139** is attached to the back side of the mounting disc **138**. A stationary electrode **140** is fixed opposite to the electrode **139** at the bottom of the cup **130**. When a die or dice are cast into the cup **130**, the electrodes **139**, **140** come into contact with each other. The electrodes **139** and **140** are electrically connected to the rotary shaft **131** and the metal ring **133**, respectively. Reference numeral **141** represents a dry cell, shown in FIG. **2**.

Referring to FIG. **4**, one terminal of the motor **103** is connected to one terminal of the dry cell **141**, and another terminal of the motor **103** is connected to the electric contact plate **121** for the timer **118** and the electrode **139** in the cup **130**. Another terminal of the dry cell **141** is connected to the metal disc **118** of the timer **118** and the electrode **140**. Thus, the electrodes **139** and **140** form a switching means for the starting of the motor **103**.

The operation of the first embodiment as described above, is as follows:

When a die or dice are cast into the cup **130**, the mounting disc **138** sinks somewhat so as to bring the electrode **139** fixed at the back side of the mounting disc **138** into contact with the electrode **140** fixed at the bottom of the cup **130**. Consequently, since the dry cell **141** is connected to both terminals of the motor **103**, the motor **103** immediately starts to rotate. The

rotation of the motor **103** is transmitted to the gear **108** through the pinion **104,** the gear **105** and the pinion **107** to rotate the crank shaft **110** at relatively high speed. Since the pinion **109** is engaged with the gear **113,** the shaft **114** rotates. The rotation of the shaft **114** is transmitted to the sleeve **117** through the pinion **115** and the gear **116.** The sleeve **117** rotates at a lower speed than the crank shaft **110.**

Before the gear **116** starts to rotate, the insulating projecting **120'** of the timer **118** fixed on the sleeve **117** lifts up the corresponding electrode **121** so that the corresponding connection between both terminals of the motor **103** is broken there. With the start of the rotation of the gear **116** due to the actuating of the switching means in the cup **130,** the metal disc **118'** and the insulating disc **120** of the timer **118** start to rotate, and so the electrode **121** comes into contact with the metal disc **118'.** Consequently the motor **103** continues to rotate in the self-holding.

On the other hand, the crank **110'** of the crank shaft **110** which rotates at a higher speed than the timer **118,** collides with the bend **112'** of the lever **112** every revolution to rotate the lever **112** clockwise around the hole **126.** The springs **127, 129** work to restore the lever **112** anticlockwise back around the hole **126.** Thus, with the rotation of the crank shaft **110,** the crank **110'** intermittently strikes the bend **112'** to swing right and left the lever **112** as well as the lever **124** combined with the lever **112** as one body.

The pin **130'** is slideably engaged with the curved engaging hole **128** of the lever **124,** and therefore it is moved up and down along the curved engaging hole **128** with the left and right swinging motion of the lever **124.** Thus, the pin **130'** swings left and right around the rotary shaft **131** and also the cup **130.** Thus, the cup **130** swings left and right, or is shaken left and right with the swing motion of the lever **124.**

While the cup **130** is shaken as mentioned above, the sleeve **117** and therefore the cam **119** fixed at the top of the sleeve **117** rotate at the lower speed, as shown in FIG. **5***a*. When the recess **123** of the cam **119** comes to an upper position, as shown in FIG. **5**B, it is engaged with the pin **125** fixed at the innerside of the lever **124,** whereby the lever **124** is regulated to be tilted greatly to one side without the swing motion. At that time, the crank shaft **110** rotates idle. Thus, the cup **130** is tilted greatly to one side, as shown in FIG. **5**C, to cast out the die or dice contained therein. In the further rotation of the cam **119,** the pin **125** is released from the recess **123** after the die or dice has been cast out. At that time, the timer **118** performs just one revolution, and the projection **120'** lifts up the electrode **121** to break the electrical connection between the electrode **121** and the metal disc **118'** of the timer **118.** Thus, the motor **103** stops to put the cup **130** into the stationary state.

One cycle of the operation is performed in the above-mentioned manner. Next, referring to FIG. **6** to FIG. **9,** the second embodiment of the invention will be described.

A cup **202** is disposed at an upper position of a base member **201.** A rotary shaft **203** is disposed at a lower position and has a gear **204** fixed thereon. The gear **204** is engaged with a rack **206** formed on an upper portion of a hook-shaped lever **205** pivoted at its lower portion on the base member **201.** A coil spring **208** is stretched between a part of the base member **201** and one end portion of the lever **205** to tension the lever **205** clockwise. A sliding surface **205'** with which a crank **209** of a crank shaft **225** is in contact, is formed on a recess portion of the lever **205,** and a projection **205''** with which a cam **210** is engageable, is formed on a center portion of the lever **205.** The cam **210** is fixed at one end of a main shaft **211,** with which a disc **212** is combined as one body. The disc **212** is provided with a curved bend **212'.** The cam **210,** the disc with the curved bend **212'** and the crank shaft **225** are interconnected through a gear mechanism, as mentioned below. A motor **213** is arranged under the base member **201** as a drive source. A rotary shaft **216** is driven by a pinion **214** fixed to the motor **213** and a gear **217** is engaged with the pinion **214** on which a pinion **215** is fixed. The pinion **215** is engaged with a gear **218** supported rotatably on the main shaft **211.** A pinion **219** is combined with the gear **218** as one body. The pinion **219** is engaged with a gear **222** fixed on a shaft **220** which is driven at a reduced speed. A pinion **221** is fixed on the shaft **220** on which a coil spring **223** is stretched between one end of the pinion **221** and the frame member **201** in such a manner that the shaft **220** can move in the axial direction. When a top end **220'** of the shaft **220** rides on a curved bend **212'** of the disc **212,** the shaft **220** is moved right hand against the coil spring **223** so that the pinion **224** fixed on the crank shaft **225** is released from the engagement with the gear **222.** The crank shaft **225** rotates only when the pinion **224** is engaged with the gear **222.** The main shaft **211** is driven by the motor **213** through the pinion **214,** the gear **217,** the pinion **215,** the gear **218,** the pinion **219,** the gear **222,** the pinion **221** and the gear **226.** A metal cylinder **227** is combined with the gear **226** as one body on the shaft **211,** on which a timer **228** is fixed. The timer **228** consists of a metal disc **229** electrically connected to the main shaft **211** and the frame member **201,** and an insulating disc **230** with a somewhat smaller diameter than that of the metal disc **229,** fixed on the metal disc **229.** A projection **230'** is formed on the periphery of the insulating disc **230,** projecting from the periphery of the metal disc **229.** An electrode **231** is disposed so as to be in contact with the periphery of the timer **228.** When the electrode **231** is lifted up on the projection **230,** the electrical connection between the metal disc **229** and the electrode **231** is broken.

FIG. **4** shows the driving circuit of the motor **213** including the electrode **231.** One terminal of the motor **213** is connected to one terminal of a dry cell **232** with another terminal of which is connected to the frame member **201.** Another terminal of the motor **213** is connected to a starting switch **236, 237** which is disposed in the cup **202.** A mounting disc **235** is supported by a supporting axis **234** and a coil spring **233** wound around the supporting axis **234** in such a manner that it can move in a vertical direction. An electrode **236** is fixed on the back side of the mounting disc **235** and a stationary contact **237** is fixed on a bottom of the cup **202.** The stationary contact **237** is electrically connected to the rotary shaft **203** and then one terminal of the dry cell **232.** The electrode **236** is electrically connected to a metal ring **239** fixed on an insulating attachment of the cup **202** through a lead line **236'.** A plate contact **240** is fixed at a part of the base member **201** through an insulating plate **241** so as to be in contact with the metal ring **239.** The plate contact **240** is elec-

trically connected to one terminal of the motor 213. The electrode 236 and the stationary contact 237 form the starting switch of the motor 213 which is closed when the die or dice are cast into the cup 202. The timer 228 is connected with the starting switch 236, 237 in parallel to self-hold the driving of the motor 213 for a given period of time.

The embodiment of the invention as described above, is operated as the following:

When the die or dice are cast into the cup 202, the mounting disc 235 is moved downward by the weight of the die or dice to bring the electrode 236 fixed on the back side of the mounting disc 235 into contact with the stationary contact 237. Consequently the motor 213 is connected to the electric power source to start. Before the starting of the motor 213, the projection 230' of the timer 228 lifts up the electrode 231 so that the electric connection is broken there. The rotation of the motor 213 is transmitted to the main shaft 211 through the pinion 214, the gear 217, the pinion 215, the gear 218, the pinion 219, the gear 222, the pinion 221 and the gear 226 at a reduced speed. The electrode 231 lifted up by the projection 230 comes into contact with the metal disc 229 with the rotation of the main shaft 211, whereby the motor 213 continues to rotate in the self-holding. The crank shaft 225 is driven by the engagement of the pinion 224 with the gear 222. The crank 209 of the crank shaft 225 collides with the sliding surface 205' of the lever 205 every revolution. Since the lever 205 is pivoted at the pin 207, the lever 205 is rotated anticlockwise everytime the crank 209 collides with the sliding surface 205' of the lever 205. On the other hand, the lever 205 is clockwise tensioned by the spring 208, and therefore the lever 205 is shaken left and right with the rotation of the crank shaft 225. The gear 204 engaged with the rack 206 formed on the upper portion of the lever 205 is rotated anti-clockwise and clockwise with the swing motion of the lever 205 around the pin 207. While the crank 209 is engaged with the sliding surface 205', the gear 204 is rotated clockwise. When the crank 209 is released from the sliding surface 205', the lever 205 is rapidly drawn back by the spring 208 so that the gear 204 is rotated anticlockwise. Thus, the cup 202 is shaken left and right, or is swung with the swing motion of the lever 205. On the other hand, the timer 228 fixed on the main shaft 211 is rotated at a lower speed than the crank shaft 225. And the cam 210 and the disc with the curved bend 212' fixed on the main shaft 211 are rotated at the same speed as the timer 228. The cam 210 is rotated clockwise in FIG. 7 and meanwhile pushes up the projection 205'' of the lever 205 from the downward position. When the projection 205'' of the lever 205 is pushed up by the cam 210, the gear 204 is rotated on a larger angle, over about 45°, by the rack 206 formed on the upper end of the lever 205, whereby the cup 202 is tilted greatly clockwise or right hand in FIG. 7 to cast out the die or dice. Immediately after the tilting of the cup 202, the projection 205'' of the lever 205 is rapidly released from the cam 210 and the lever 205 is rapidly rotated clockwise by the spring 208 to put the cup 202 into the original stationary state. On the other hand, the top end 220' of the shaft 220 in contact with the margin of the disc with the curved bend 212' rides up on the curved bend 212' with the rotation of the disc 212 to be pushed in a right hand direction in FIG. 8, so that the pinion 224 fixed on the crank shaft 225 is released from the engagement of the gear 222 to stop the rotation of the crank shaft 225. Thus, the lever 205 is returned exactly to the original position by the spring 208. After the cup 202 is put into the stationary state, the disc with the curved bend 212' moreover rotates to release the top end 220' from the engagement of the curved bend 212'. Therefore, the pinion 224 again is engaged with the gear 222 by the function of the spring 223. In the above mentioned operations, the timer 228 rotates exactly once so that the projection 230' lifts up the electrode 231 to stop the self-holding of the motor 213 and therefore stop the rotation of the motor 213.

Although the invention has been particularly shown and described, it is contemplated that various changes and modification may be made without departing from the scope of the invention as set forth in the following claims.

What is claimed is:

1. An automatically shaken dice cup comprising an upright cup, a rotary shaft on a frame fixed to said cup, an electric motor, a switching means for energizing said electric motor on the casting of a die or dice into said cup, said switching means being arranged in said cup, a pin fixed on said cup, a pivoted U-shaped lever on said frame centrally tensioned by springs, a crank shaft, one arm of said U-shaped lever being engaged with said pin, another arm of said U-shaped lever coming into and out of contact with the crank portion of said crank shaft when said crank shaft is rotated, a sleeve on said crank shaft concentric with and rotatable with respect to said crank shaft, a cam fixed at one end of said sleeve and having a peripheral recess, an engaging pin fixed on said one arm of said U-shaped lever, said engaging pin engageable with said recess of said cam to considerably tilt said cup when said sleeve is rotated, a timer means capable of self-holding the electrical connection of said electric motor to an electric source for a given period of time, controlled by a contact disc on said sleeve, said frame supporting a plurality of gear mechanisms connecting a shaft on said electric motor to said crank shaft and said crank shaft to said sleeve, whereby said cup on the dropping of dice therein is shaken left and right on its rotary shaft by the crank portion of the crank shaft repeatedly pivoting the U-shaped lever against the tension of the springs and so said pin fixed on said cup for a given period of time, then tilted greatly by said recess of the cam engaging said engaging pin to cast out the die or dice and returned to the original upright position and the motor deenergized.

2. An automatically shaken dice cup according to claim 1 wherein said switching means comprises an electrode fixed on the back side of a mounting disc moveably supported by a supporting axis and a coil spring, and a stationary contact fixed on the bottom of said cup.

3. An automatically shaken dice cup according to claim 1 wherein said timer consists of a metal disc and an insulating disc with a somewhat smaller diameter than that of said metal disc, and a projection on the periphery of said insulating disc, projecting from the periphery of said metal disc, said disc and projection in contact with a resilient electric contact plate.

4. An automatically shaken dice cup according to claim 1 wherein said electric source is a dry cell.

5. An automatically shaken dice cup according to claim 1 wherein said contact disc controls an electrode

in contact with the periphery of said timer contact disc.

6. An automatically shaken dice cup according to claim 1 wherein said crank shaft is rotated at a higher speed than the said rotatable sleeve by means of said gear mechanisms.

7. An automatically shaken dice cup comprising a base frame member supporting a cup, a rotary shaft fixed to said cup, an electric motor, a switching means for energizing said electric motor upon the casting of the die or dice into said cup, said switching means being arranged in said cup, a crank shaft, a pinion fixed on said rotary shaft, a hook-shaped lever pivoted at a part of said base member, a spring being connected to a part of said hook-shaped lever and another part of said base member, a rack formed on an upper portion of said hook-shaped lever, said pinion being engaged with said rack, a main shaft, a timer fixed at one end of said main shaft, a cam fixed at the other end of said main shaft, a disc with a raised curved bend portion on the side thereof combined with said cam as one body on said main shaft, another shaft parallel to said main shaft supported slideably in the axial direction thereof, one end of said another shaft being in contact with the side of said disc with said raised curved bend portion of said disc axially sliding said another shaft when said disc rotates, a coil spring wound around said another shaft between a pinion fixed on said another shaft and a part of said base member to press said one end of said another shaft against the side of said disc, said timer being capable of self-holding the electrical connection of said electrical motor to an electric source for a given period of time, said hook-shaped lever having a sliding surface coming into contact with a crank portion of said crank shaft and a projection engagable with said cam, gear mechanism means interconnecting said crank shaft, said another shaft and said main shaft with a shaft of the electric motor for different rotational speeds of said shafts, whereby on dice being inserted into said cup said cup is shaken left and right by said crank portion of said crank shaft for a given period of time, then tilted considerably by said cam camming said hooked shaped lever to cast out the die or dice and recovered to its original position and said motor deenergized.

8. An automatically shaken dice cup according to claim 7 wherein said crank shaft is rotated at a higher speed than said main shaft by means of said gear mechanism means.

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