ABSTRACT
Toys that simulate power tools, including pull-string motors that drive mechanisms which vibrate the housing and make noises. One toy has a housing representing an electric drill and a rotatable shaft in the shape of a drill chuck and drill. An eccentric weight is mounted in the chuck to vibrate the drill when the output shaft is rapidly rotated.

3 Claims, 12 Drawing Figures
POWER TOOL TOYS

BACKGROUND OF THE INVENTION

This invention relates to toys that simulate power driven equipment.

Toys that simulate common tools and appliances that children are generally not allowed to use, often make entertaining playthings. Common power driven devices such as electric drills and electric mixers are often very interesting to children not only because they are used only by adults, but also because they have rapid movements and make noise. Toys that simulate such articles can be made especially interesting by including apparatus for making noises and movements appropriate to the simulated tool and even in an exaggerated amount.

SUMMARY OF THE INVENTION

In accordance with one embodiment of the present invention, a toy simulating “real life” power driven equipment is provided, which simulates movements and noises created by the real life equipment as well as having a similar appearance. The toy includes a pull-string motor that drives an output shaft with an eccentric weight thereon that vibrates the toy housing. A multi-tooth wheel fixed to the shaft is engaged by a leaf spring that extends to an acoustical amplifier for making noise as the shaft rotates and the toy housing vibrates. A manually controlled trigger can engage a toothed wheel on the output shaft to prevent shaft rotation until a child operates a trigger or the like that simulates the switch on the real life tool.

In one toy, which simulates an electric drill, the output shaft has an outer portion that has the shape of a drill chuck and drill bit. A weight is mounted in the drill chuck at one side of the axis of rotation to vibrate the drill. The location of the weight in the chuck results in wobbling of the drill bit that simulates movements of real drills due to torques often encountered in drilling.

Another toy represents an electric mixer wherein at least one of the mixing blades is thicker than the others to create vibrations when the blades rotate. Still another toy represents a chain saw, and includes an enclosed shaft carrying a large eccentric weight to vibrate the housing. The pull-string of the chain saw motor extends with a rearward directional component to simulate the starting cord on a real gasoline engine chain saw. Another toy represents a helicopter with an unbalanced rotor for vibrating the helicopter housing. Yet another toy represents a sewing machine with a pressure foot and needle that oscillate up and down and which hit the housing on every downstroke to generate noise.

The novel features of the invention are set forth with particularity in the appended claims. The invention will best be understood from the following description when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partially sectional side view of a toy electric drill constructed in accordance with a first embodiment of the present invention;

FIG. 2 is a view taken on the line 2—2 of FIG. 1;

FIG. 3 is a view taken on the line 3—3 of FIG. 1;

FIG. 4 is a view taken on the line 4—4 of FIG. 1;

FIG. 5 is a partially sectional side view of a toy chain saw constructed in accordance with another embodiment of the invention;

FIG. 6 is an enlarged, cross-sectional view taken on the line 6—6 of FIG. 5;

FIG. 7 is a partially sectional side view of a toy electric mixer constructed in accordance with still another embodiment of the invention;

FIG. 8 is an enlarged, cross-sectional view taken on the line 8—8 of FIG. 7;

FIG. 9 is a view taken on the line 9—9 of FIG. 7;

FIG. 10 is a sectional side view of a toy helicopter constructed in accordance with yet another embodiment of the invention;

FIG. 11 is a perspective view of a toy sewing machine constructed in accordance with a still further embodiment of the invention; and

FIG. 12 is a partial, enlarged perspective view of the sewing machine of FIG. 11, showing the operating mechanism thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1–4 illustrate a toy drill 10 which includes a housing 12 representing that of a common electric drill, and an output shaft 14. The output shaft 14 projects through a hole 16 in housing 12, and has an outer portion 18 in the shape of a drill chuck 20 with a drill 22 therein. A motor 23 mounted within the housing is coupled to the output shaft 14 to rapidly rotate it. The motor is of the pull-string type which is operated by pulling and releasing a string 24.

A child can operate the drill by pulling a knob 26 attached to the string 24 to wind the motor 23. The child then grasps a handle 28 formed on the housing, and places his index finger around a trigger switch or trigger 30. When the child depresses the trigger 30, the trigger releases the shaft 14 to permit it to rapidly rotate. When the shaft rotates, the tool provides a realistic, if not exaggerated, simulation of an operating drill. The drill chuck 20 and drill 22 are seen to rapidly rotate while large vibrations can be felt and considerable realistic noise is heard.

Vibrations of the toy are produced by a weight 32 that is mounted in the drill chuck 20 near the radially outer portion thereof. The chuck 20 provides a good mounting location for the eccentric weight 32 because the chuck is an enlarged portion of the output shaft that must be provided anyway for a realistic appearance. In addition, vibrations induced at the location of the chuck 20 provide an especially realistic movement, because the weight 32 at an overhanging shaft location urges the output shaft 14 to rapidly wobble as it rotates. The drill 22 and chuck 20 therefore appear to rapidly vibrate in a manner simulating vibrations resulting from operation of a real electric drill.

A realistic noise is generated by a multitoothed wheel 36 which is fixed to the output shaft 14. A resilient member 38, of a material such as spring steel, has an outer end in the path of the teeth 40, so that the resilient member is rapidly vibrated when the shaft rotates. The resilient member 38 has an opposite end fixed to a thin and wide-area diaphragm or speaker 42 which vibrates a considerable volume of air so that a loud noise is created. Holes 44 are formed in the housing to facilitate transmission of the noise. The housing 12, which is formed in two sections 45 and 47, is con-
structured of a material which is easily formed by injection molding, such as polyethylene foam. This material tends to dampen vibrations, and the separate speaker 42 is therefore utilized to amplify vibrations instead of attaching an end of the resilient member 38 to the housing. The trigger 30, which can start and stop the tool, has an arm 46 which engages the multi-toothed wheel 36 to normally prevent output shaft rotation. The trigger 30, which is pivotally mounted at 48 on the housing, has a spring arm 50 that bears against a flange 52 of the housing. The trigger can be pivoted to the position 30a when a child operates the trigger, to disengage the arm 46 from the multi-toothed wheel and permit the motor 23 to rapidly rotate the output shaft.

The motor 23 which drives the output shaft includes a string drum 54 on which an inner end of the pull-string 24 is mounted. The drum 54 is fixed to a motor shaft 56 that is rotatably mounted on a motor frame 58. A coil spring 60, which has opposite ends respectively fixed to the shaft 56 and to the frame 58, is wound when the pull-string 24 is pulled. The wound spring then urges the shaft 56 to rotate in an opposite direction to rewind the string on the drum 54.

The motor shaft 56 is coupled to the output shaft 14 through a motor gear 62 fixed to the motor shaft 56, an idler gear assembly including an idler pinion 64 and idler gear 66 that are both fixed to an idler shaft 68, and an output gear 70 that is fixed to the output shaft 14. If all of the gears of this gear train were constantly engaged, then the output shaft 14 would be rotated when the pull-string 24 were pulled. This would be undesirable because it would make pulling of the string more difficult and because the trigger 30 would then have to be held depressed while the string were pulled. To prevent constant engagement of the gears, the motor housing 58 is provided with a pair of slots 72 (FIG. 3) which the idler shaft 68 can slide along. This permits the idler shaft 68 to slide from a first position wherein the idler gear 66 is disengaged with the output gear 70, to a second position wherein the idler gear at 66a (FIG. 4) is engaged with the output gear 70.

The slot 72 which receives the idler shaft 68, is oriented along an imaginary line 74 which extends along a radius to the axis of rotation 32 of the output gear 70 and circumferentially about the axis 76 of the motor gear 62. Accordingly, the idler pinion 64 is always engaged with the motor gear 62, but the idler gear 66 can move into and out of engagement with the output gear 70.

The direction in which the pull-string 24 is wound about the pulley 54 is chosen so that, when the pull-string is pulled, the motor gear 62 rotates in the direction of arrow 78. The teeth of motor gear 62 then move past the idler pinion in the direction of arrow 80 to urge the idler gear 64 away from the drive shaft gear 70. When the string 24 is released, the coil spring 60 rotates the motor gear 62 in the direction of arrow 82, which results in the teeth of the motor gear 62 moving past the idler pinion 64 in the direction of arrow 84. This causes the idler shaft 68 to shift its position so that the idler gear 66 engages the drive shaft pinion 70 to rotate the drive shaft. Thus, the motor is automatically disengaged and engaged with the output shaft 14 to facilitate motor winding. The idler shaft and gear assembly therefore acts not only as a speed increasing gear train but also as a direction sensitive clutch.

FIGS. 5 and 6 illustrate a toy chain saw 100 which simulates a real chain saw not only in appearance, but in the generation of realistic noises and the creation of realistic vibrations. The toy includes a housing 102 largely simulating that of a chain saw, including a forwardly extending simulated chain 104 and a rearwardly extending handle 106. A pull-string motor 108 is mounted in the housing to drive a shaft 110. A large weight 111 is mounted eccentrically on the shaft 110 to vibrate the housing when the shaft rapidly rotates. A toothed wheel 112 is also mounted on the shaft, and a resilient member 114 that extends to a speaker 118 engages the toothed wheel to generate noise. A trigger 120, pivotally mounted on the housing at 122, has a brake arm 124 normally engaging a projection on shaft 110 normal thereto. This prevents rotation of the output shaft. When the trigger is squeezed against the biasing of a spring arm 128, the output shaft is freed for rotation by the motor 108.

The housing is provided with an upstanding handle 130 of a type which is often found on chain saws. The pull-string 132 of the motor extends with a rearward directional component from the location 134 where it passes through the housing. This is a direction simulating the direction in which a starting cord generally extends from the gasoline engine of a chain saw. A child can wind the motor by pulling on a knob 136 attached to pull string 132 while holding the handle 130 of the chain saw, in a manner simulating the starting of the gasoline engine of a real chain saw. The child may then hold the top handle 130 in one hand and the rearward handle 106 in his other hand and squeeze the trigger 120 to cause the chain saw to operate. The toy chain saw then vibrates and makes considerable noise.

FIGS. 7–9 illustrate a toy electric mixer 140 which simulates a real mixer. The toy mixer 140 includes a housing 142 representing an electric mixer housing, and an output shaft 144 projecting through the housing. The output shaft 144 has an inner portion within the housing, which is motor driven, and an outer portion representing multiple mixing blades. As illustrated in FIG. 8, some of the blades 146, 148 are of greater mass than other blades 150, 152. These heavier blades 146, 148 are concentrated on one side of the output shaft to form an eccentric weight that unbalances the shaft. The mixer includes a motor 154 similar to that of the motor 23 in FIG. 1, with a drawstring 156 extending through the housing. The motor drives an output gear 158 on the output shaft to rotate it.

The upper end of the output shaft has a single tooth 160 extending therefrom which can be engaged to prevent output shaft rotation. A manually operated switch button 162 is slideably mounted on the housing and has a toothed wheel 164 at its lower end for engaging the tooth 160 of the output shaft. When the button 162 is depressed against the biasing of a pair of leaf springs 166, the teeth at 164 move down and out of engagement with the tooth 160 of the shaft to permit output shaft rotation. Noise is made by a resilient member 168 which has an end portion 170 biased against a multi-toothed wheel 172 on the output shaft. The resilient member 168 has an inner end 174 fixed to the housing and a middle portion 176 biased against a speaker 178 that amplifies vibrations.

FIG. 10 illustrates a toy aircraft 190 with a pull-string motor 192 and an output member 194 which includes a shaft with a rotor 196. The rotor has a plurality of
blades of lightweight material, and also includes a weight 198 in one of the rotors for unbalancing the output member to make the craft vibrate when the output member rotates. The toy also includes a multi-toothed wheel 200 and a leaf spring 202 for engaging the teeth of the wheel to create noise.

FIGS. 11 and 12 illustrate a toy sewing machine 210 which produces movements, vibrations, and noise simulating a real sewing machine. The sewing machine includes a housing 212 with an upper housing portion 214, a lower housing portion 216, and a column 218 joining the upper and lower housing portions. A reciprocating member 220 is moveably mounted in the housing and has a lower portion representing a presser foot 222 and a needle 224, the foot 222 and needle 224 being integral. The reciprocating member 220 has a large bearing hole 226 which receives an eccentric portion 228 of a drive shaft 230. The drive shaft 230 is driven by a pull-string member 232 which is of the type shown at 23 in FIG. 1 and which is mounted in the housing. Motor 232 has a pull-string 234 extending through the column portion 218 of the housing. When the motor rotates the drive shaft 230, the eccentric portion 228 moves the middle portion of the reciprocating member 220 in a circle. This causes the pressure foot 222 and needle 224 to move, and some of the movement is in an up and down direction. At each rotation of the drive shaft 230, the reciprocating assembly 220 moves down low enough so that it strikes the lower portion 216 of the housing to create a tapping sound. The lower end or tip 236 of the needle 224 is the portion that actually contacts the lower housing portion 216, and a relatively sharp sound is made. The rapid movement of the reciprocating member 220 creates vibrations, and these vibrations and the tapping sound simulate the operation of a real sewing machine.

Thus, the invention provides toys that simulate power driven devices not only in appearance, but in the creation of vibrations and noise. Those devices such as drills, mixers, and airplanes which have rotary outputs can be made to vibrate by unbalancing the rotary output member. A device with a reciprocating output, such as a sewing machine, can be made to vibrate by rapid oscillation of a needle and other apparatus fixed to it, such as a simulated pressure foot. Noise can be created by the use of a resilient member that is repeatedly flicked by a multi-toothed wheel fixed to the drive shaft, and the sounds can be amplified by the use of a wide area acoustic amplifier or speaker that is coupled to the resilient member. In the case of a reciprocating device such as a sewing machine, noise can be created by permitting the reciprocating member to bottom-out on the housing.

Although particular embodiments of the invention have been described and illustrated herein, it is recognized that modifications and variations may readily occur to those skilled in the art and consequently it is intended that the claims be interpreted to cover such modifications and equivalents.

What is claimed is:
1. A toy simulating a power driven device with a moveable output member, comprising:
   a. a housing of substantially the same shape as that of said power driven device;
   b. a motor mounted in said housing;
   c. an output member moveably mounted on said housing and projecting therethrough, the output portion projecting out of the housing representing said output member in said useful power driven device and the output portion within the housing being coupled to the motor for movement thereby, at least one of said output portions including means for vibrating said housing when said output portions are moved; at least one of said output portions being rotatably mounted and carrying an eccentric weight for vibrating said housing;
   d. a toothed member fixed to said output member within said housing; and
   e. a manually operable trigger pivotally mounted on said housing and having a catch arm moveable into and out of engagement with said toothed member to control rotation of said output member, said motor including:
      A. a rotatably mounted string drum;
      B. a pull string having an inner end on the drum and an outer end projecting through the housing;
      C. a coil spring coupled to the drum; and
      D. means coupling the drum to said output member, so that when the string is pulled and released the spring can rotate at least a portion of said output member.
2. The toy described in claim 1 including:
   a. a speaker member having a thin and large area portion for vibrating a large volume of air; and
   b. a resilient member having a first portion engaged with the speaker member and a second portion biased into engagement with said toothed member for actuation thereby.
3. A toy simulating a power driven device with a moveable output member, comprising:
   a. a housing of substantially the same shape as that of said power driven device;
   b. a motor mounted in said housing, said motor including:
      A. a rotatably mounted string drum;
      B. a pull string having an inner end on the drum and an outer end projecting through the housing;
      C. a coil spring coupled to the drum;
      D. a motor gear and an output gear respectively coupled to said string drum and to said output member;
   c. an idler shaft;
   d. an idler gear assembly mounted on said idler shaft; and
   e. means defining an idler bearing slot extending substantially along a radius to the axis of rotation of said output gear and circumferentially about the motor gear, said idler shaft slideable along said slot so the idler gear assembly remains constantly engaged with the motor gear but may engage or disengage the output gear, said string being wound in a direction on the drum so that when the string is pulled off the drum the teeth of the motor gear move past the idler gear assembly in a direction to urge the idler gear assembly away from the output gear, and when the string rewraps onto the drum the teeth of the motor gear move past the idler gear assembly in a direction to urge the idler gear assembly towards the output gear, whereby to enable pulling of the string without rotating the output gear; and
   f. an output member moveably mounted on said housing and projecting therethrough, the output portion projecting out of the housing representing said output member in said useful power driven device and the output portion within the housing being coupled to the motor for movement thereby, at least one of said output portions including means for vibrating said housing when said output portions are moved; at least one of said output portions being rotatably mounted and carrying an eccentric weight for vibrating said housing;
said output member in said useful power driven device and the output portion within the housing being coupled to the motor for movement thereby, at least one of said output portions including means for vibrating said housing when said output portions are moved.

4. A toy simulating an electric drill comprising:
a housing in the form of an electric drill housing;
an output shaft assembly rotatably mounted on the housing and having inner and outer portions respectively inside and outside the housing; and
a motor coupled to the shaft assembly to rotate it;
said outer portion of said shaft assembly being in the shape of a drill chuck with a drill extending therefrom, and said outer portion having a weight mounted eccentric to the axis of rotation of the shaft assembly.

5. The toy described in claim 4 wherein:
said weight is mounted in said drill chuck.

6. The toy described in claim 4 wherein:
said housing has a handle extending perpendicular to the drive shaft assembly;
said motor includes a coil spring coupled to said output shaft assembly, a string drum, means for coupling the string drum to the output shaft assembly, and a string extending through the handle and having a knob thereon; and
said output shaft assembly includes a toothed wheel; and including
a trigger pivotally mounted on the housing and having an arm moveable between first and second positions respectively engaged and disengaged with the output shaft assembly;
a large area speaker; and
a resilient leaf extending between the speaker and the toothed wheel.

7. A toy simulating a power tool comprising:
a housing simulating the housing of a power tool, said housing being constructed of lightweight foam material and having at least one hole therein;
a wind up motor mounted in the housing, including a string drum, a pull string having an inner portion coupled to the drum and an outer portion extending through the housing, a spring coupled to the drum, and an output shaft coupled to the spring to be rapidly rotated by it;
an eccentric weight coupled to the shaft to vibrate the housing;
a manually operable member biased towards a first position in engagement with the shaft to prevent shaft rotation when the string is pulled to wind the spring, and manually moveable to a second position out of engagement with the shaft to permit its rotation;
a toothed wheel coupled to the shaft to be rotated by it;
a thin and large area speaker member mounted in said housing and facing the hole; and
a leaf spring member extending between the speaker member and the toothed wheel, to be alternately deflected and released thereby.

8. A toy simulating a power tool comprising:
1. a housing simulating the housing of a power tool;
2. a wind up motor mounted in the housing, including a string drum, a pull string having an inner portion coupled to the drum and an outer portion extending through the housing, a spring coupled to the drum, and an output shaft coupled to the spring to be rapidly rotated by it, said spring being constantly connected to said string drum, said motor including:
A. motor and output gears respectively coupled to said string drum and to said output shaft;
B. an idler gear assembly which includes an idler shaft and an idler gear mounted on said idler shaft; and
C. means defining an idler bearing slot extending substantially along a radius to the axis of rotation of said output gear and along a circumferential imaginary line concentric with the first gear, said idler shaft slideable along said slot so the idler shaft assembly remains constantly engaged with the motor gear but can engage or disengage the output gear, said string being wound in a direction on the drum so that when the string is pulled off the drum the teeth of the motor gear move past the idler gear in a direction to urge the idler gear away from the output gear, and when the string rewinds onto the drum the teeth of the motor gear move past the idler gear in a direction to urge the idler gear towards the output gear, whereby to enable pulling of the string without rotating the output shaft;
3. an eccentric weight coupled to the shaft to vibrate the housing; and
4. a manually operable member biased towards a first position in engagement with the shaft to prevent shaft rotation and manually moveable to a second position out of engagement with the shaft to permit its rotation.