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Klett et al.

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[54] **TOY ELECTRIC POWER TOOL**

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[51] **Int. Cl.**.....**H02k 7/14**

[58] **Field of Search**.....46/39, 243 M; 35/19 A, 10, 35/13; 310/47, 50, 1, 247, 240, 42

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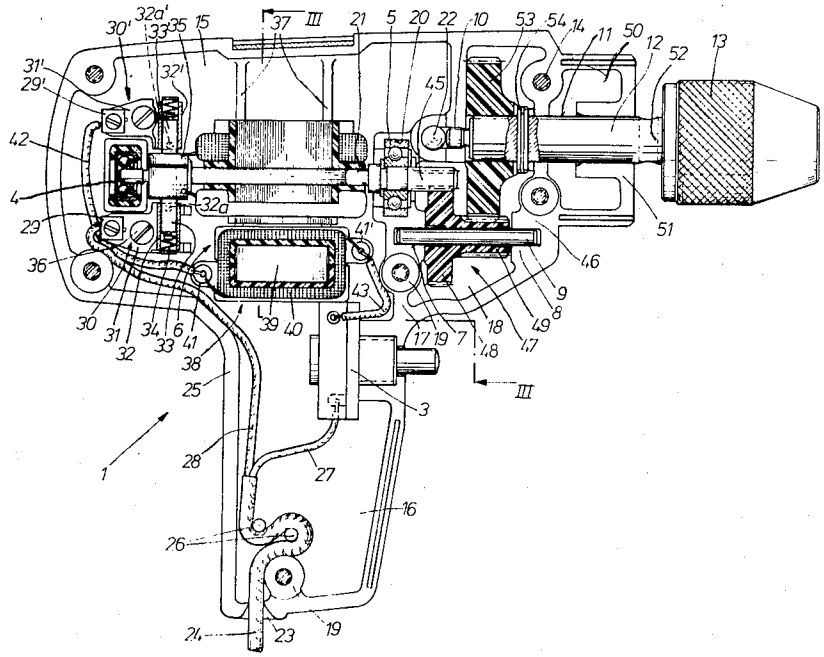
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[57] **ABSTRACT**

A toy device which is a full-size replica of an electric power tool, particularly of a portable electric drill. Its housing is at least partially transparent to permit observation of the assembled parts and/or the operation of its motor which is connectable only to a source of low-voltage current. The tool spindle of the toy device can carry a chuck, a gear, a grinding wheel, a pulley or it can be connected to another torque transmitting or receiving component, for example, to the driven part of another toy device such as a toy saw, a toy grinder, a toy fan or the like. The housing of the toy device carries markings to facilitate the laying of conductors. When taken apart, the components of the toy device are stored in the compartments of a box.

4 Claims, 3 Drawing Figures



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SHEET 1 OF 2

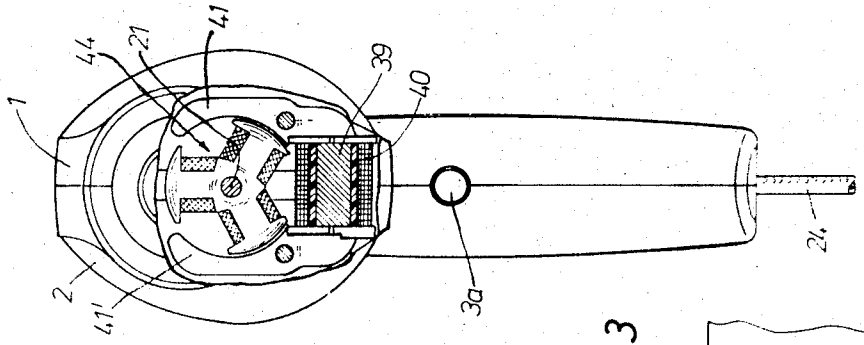


Fig.3

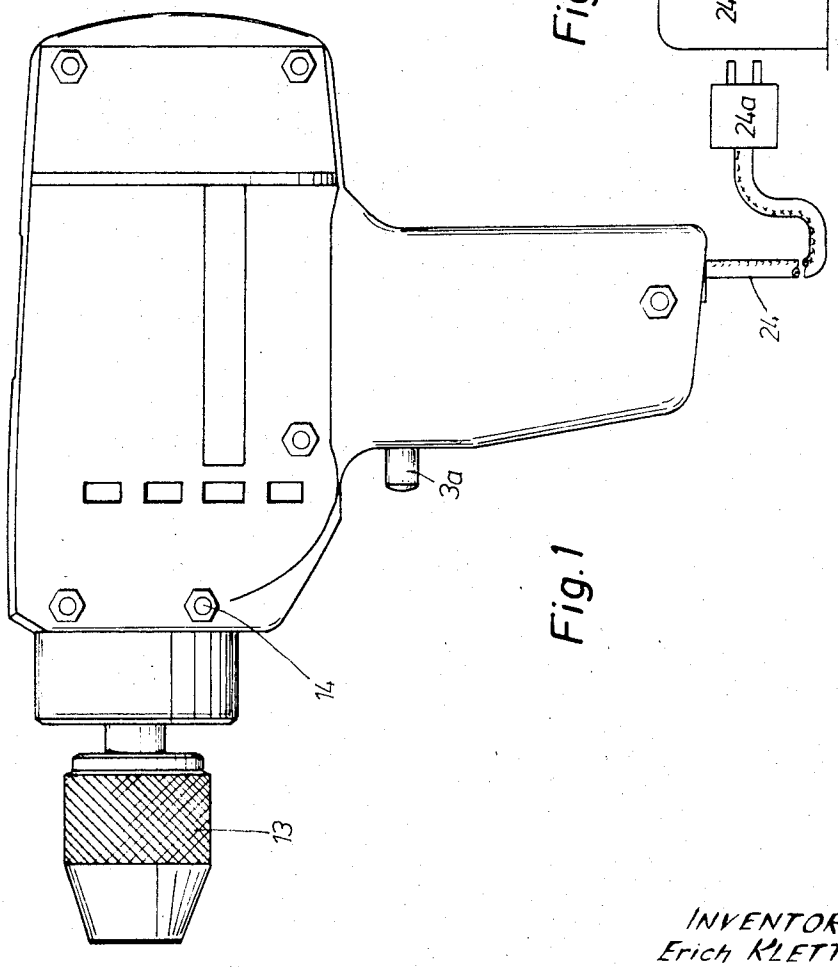


Fig.1

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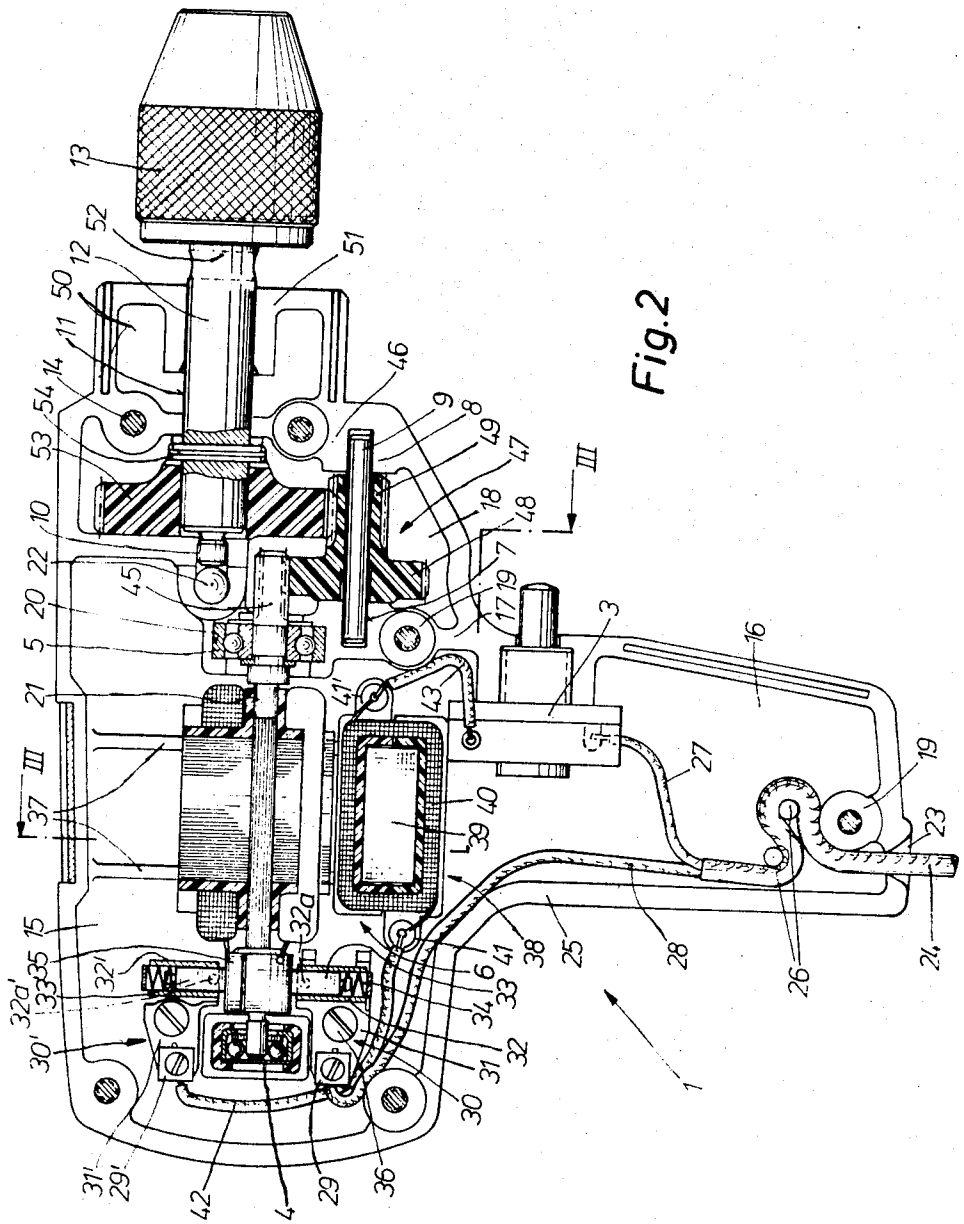


Fig.2

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TOY ELECTRIC POWER TOOL

BACKGROUND OF THE INVENTION

The present invention to toy devices in general, and more particularly to toy devices which constitute replicas of devices or apparatus that are used by adults. Still more particularly, the invention relates to improvements in toy devices of the type which constitute replicas of devices or apparatus with which teenagers and younger children are likely to acquire skills which can be useful to them in their adult life.

It is well known that electric power tools are available in all possible sizes and shapes for use by professionals as well as by tinkers or persons who are compelled to perform drilling, sawing, boring, grinding and like operations, either to save money or to carry out repairs which must be performed immediately. It is also known that the manipulation of electric power tools by adults is likely to be observed by children who are eager to use the tools but are normally not permitted to do so because a genuine power tool is potentially a very dangerous implement, not only because it must be connected to a source of high-voltage current but also due to its size, weight and its cutting, sawing, drilling or like penetrating or severing action. It is not at all unusual to see relatively young children making simple articles of wood and/or metal by resorting to simple as well as to rather sophisticated electric power tools and/or to manipulate such tools to carry out repairs.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a toy device which imitates an electric power tool and which can be safely used by teenagers as well as by much younger children to perform simple operations and to acquire skills which can be useful to them to find employment as well as to save time and money in their homes or apartments.

Another object of the invention is to provide a toy device which is constructed in such a way that it enables a child to acquire the necessary knowledge of assembling or taking apart the components of the toy device and which is provided with information enabling the user to rapidly, safely and accurately assemble the components, for example, when such components are sold in compartmentized boxes or like receptacles in a manner similar to that employed for storage and sale of erection kits.

A further object of the invention is to provide a toy device which, in addition to or instead of being useful by itself as an electric power tool, can serve as a means for transmitting motion to other types of toy devices, for example, to toy saws, grinders, ventilators or the like.

An additional object of the invention is to provide a toy device which cannot cause serious injury even when its current-consuming part or parts are connected to a source of electrical energy.

Still another object of the invention is to provide a toy device which can be taken apart, assembled and used by children of nearly all ages above the tenderest age without supervision or with minimal supervision, and which is likely to remain interesting to children for years because it offers to children a practically unlimited number of opportunities to imitate the grownups as well as to test their own creativity.

A further object of the invention is to provide an educational toy device which can be used by children of both sexes and which can be furnished as a separate entity or as part of a complete set of various toy devices which either contain current-consuming units or require motion which is furnished by current-consuming units.

An ancillary object of the invention is to provide a novel and improved housing for a toy device of the above outlined character.

The invention is embodied in a toy device which is an imitation of an electric power tool, for example, of a portable electric drill with a pistol grip handle or a portable electric motor without a pronounced handle. The improved toy device comprises at least one current-consuming unit (particularly an electric motor) and consists of a plurality of readily separable and reassemblable or reconnectable parts. Such parts may include screws or analogous fasteners which can be applied and/or removed by hand and/or by using the most rudimentary tools, such as screwdrivers or the like. It is preferred to construct the toy device in such a way that, whenever practicable, it closely resembles a full-sized commercially available power tool for use by adults, i.e., the components of the toy device may be identical, for example, with those of a full-sized portable electric drill, saw, grinder or the like.

At least a portion of the housing of the improved toy device preferably consists of light-transmitting (transparent or translucent) material so that the operation of one or more current-consuming units, transmissions, switches and/or other parts in the interior of the housing can be readily observed by children when the toy device is fully assembled. The housing can be provided with markings in the form of symbols or the like to facilitate the laying of conductors and/or other steps in the assembly of the toy device. This contributes to the entertainment and educational value of the toy device.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved electric power tool itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side elevational view of a toy device which embodies one form of the invention and which constitutes a replica of a portable electric drill;

FIG. 2 is an enlarged side elevational view of the toy device but with one half of the housing removed; and

FIG. 3 is a sectional view as seen in the direction of arrows from the line III—III of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1 to 3 illustrate a toy device which is a full-size operative replica of an electric power tool, namely, of a portable electric drill. The toy device comprises a housing which consists of suitable synthetic plastic material and includes two substantially mirror symmetrical halves or shells 1 and 2. The plane along which the

open sides of the shells 1, 2 meet is the central longitudinal symmetry plane of the toy device. Such plane further contains a master switch 3, the antifriction bearings 4, 5 for the output shaft 21 of an electric series-wound motor 6, the sleeve-like bearings 7, 8 for an intermediate shaft 9 forming part of a transmission which is driven by the motor 6, and the sleeve-like bearings 10, 11 for a tool spindle 12. The latter extends forwardly beyond the housing and carries a suitable chuck 13 which can removably hold and rotate drilling, boring or analogous tools, not shown. The shells 1, 2 of the housing are separably connected to each other by means of six bolts, screws 14 or analogous fasteners.

The housing which is composed of the shells 1, 2 includes an enclosure 15 for the motor 6, a hollow pistol grip handle 16 which extends downwardly substantially midway between the longitudinal ends of the housing, and a case 18 for the transmission (including the intermediate shaft 9) which transmits torque from the output shaft 21 of the motor 6 to the tool spindle 12. The case 18 is separated from the enclosure 15 by a partition 17 which has two abutting sections each forming part of one of the shells 1, 2. The partition 17 is further provided with a sleeve-like reinforcing portion 19 for reception of one of the fasteners 14. The partition 17 is integral with the rear bearing 7 for the intermediate shaft and with the rear bearing 10 for the tool spindle 12. This partition has a recess 20 for the front antifriction bearing 5 for the output shaft 21 of the motor 6. The bearing 5 is a grooved antifriction bearing. A steel ball 22 is non-removably installed in the partition 17 to serve as a thrust bearing for the inner or rear end of the tool spindle 12; the ball 22 is installed behind the rear bearing 10 for the tool spindle. Five additional reinforcing sleeves 19 for reception of fasteners 14 are provided on the marginal portions or beads 25 which define the open sides of the shells 1 and 2.

The bottom wall of the handle 16 has an opening 23 for introduction of an electric cable 24 which is trained over the adjacent reinforcing sleeve 19 and over two posts or pins 26 so as to insure that a pull on the outwardly extending portion of the cable cannot be transmitted to that part which is located in the interior of the housing. The posts 26 preferably form integral parts of one of the shells. The sheath of the cable 24 terminates close to the posts 26 so as to expose two insulated leads 27, 28 the former of which is connected with the lower contact of the master switch 3. At least one of the shells, for example the shell 1, preferably consists of transparent or translucent material and is provided with preferably integral markings or indicia which indicate the manner in which the leads of the cable 24 should be guided in the housing and connected to electrical parts of the power tool. The master switch 3 is installed in the front wall of the handle 16 and its actuating member or knob 3a can be readily engaged by one finger of the hand which grips the handle. The other lead 28 is connected to the terminal 29 of a lower brush holder 30. The brush holder 30 comprises a plate 31 the rear part of which carries the terminal for the lead 28 and the front part of which is provided with a vertical sleeve 32 having a transverse (diametrically extending) bore or passage 32a which registers with passages extending through the shells 1 and 2. The interior of the sleeve 32 accommodates a carbon brush 33 which is biased by a helical spring 34 so that it bears against a collector 35. A screw 36 or an analogous fastener is provided to secure the plate 31 of the lower brush holder 30 to the shell 1.

The shell 1 further supports an upper brush holder 30' which is disposed mirror symmetrically to the lower brush holder 30 with reference to the axis of the output shaft 21. The parts of the brush holder 30' are identical with those of the brush holder 30. The rear antifriction bearing 4 for the shaft 21 is a ball bearing and is mounted between the brush holders 30, 30', namely, in a prismatic recess of the shell 1. The arrangement is such that the bearing 4 is automatically held in requisite position when the shells 1, 2 are properly connected to each other by means of the fasteners 14.

The stator 38 of the motor 6 is supported by internal ribs which are provided on the shells 1 and 2 (see the ribs 37 in FIG. 2). The stator 38 comprises an iron core 39 which is surrounded by a winding 40 and is provided with two pole shoes 41, 41'. One terminal of the winding 40 is connected with the terminal 29' of the upper brush holder 30' by means of a conductor 42. The other terminal of the winding 40 is connected with the upper contact of the master switch 3 by a further conductor 43. All leads and conductors are surrounded by Bougier tubes or analogous sheaths of insulating material.

As stated before, the output shaft 21 of the motor 6 is rotatable in the bearings 4 and 5. This shaft carries a tripartite collector 35 which is located directly in front of the rear bearing 4 and a triple-T armature 44 which is located between the collector 35 and the front bearing 5. The armature 44 is rotatable with clearance between the pole shoes 41, 41' of the stator 38. The foremost part of the output shaft 21 extends beyond the front bearing 5 and constitutes a pinion 45 which transmits torque to the aforementioned transmission.

The front bearing 8 for the intermediate shaft 9 of the transmission is installed in or forms an integral part of a reinforcement 46 on the marginal portions 25 of the shells 1, 2. The intermediate shaft 9 rotates in the bearings 7, 8 each of which is formed half by the shell 1 and half by the shell 2. The purpose of the shaft 9 is to rotatably support a gear cluster 47 which is held against axial movement by the bearing 7 and the reinforcement 46. The cluster 47 comprises a gear 48 which meshes with the pinion 45 on the output shaft 21 and a pinion 49 which meshes with a gear 53 secured to the rear or inner end portion of the tool spindle 12. The pinion 49 is preferably integral with the gear 48.

That wall of the gear case 18 which is located in front of the bearing 10 and ball 22 for the tool spindle 12 is relatively narrow and includes two of the reinforcing sleeves 19 and is located directly behind a cylindrical front end portion 50 of the housing. A part of the front end portion 50 constitutes a simple bearing 51 for the front part of the tool spindle 12. The bearing 51 can be said to form part of the marginal portions 25 of the shells 1, 2. The exposed portion of the tool spindle 12 has a diametral bore 52 which is disposed directly behind the chuck 13 and serves for reception of a pin, a needle or a like object which is held by hand during opening or closing of the chuck. Thus, an elongated object which is inserted into the bore 52 can be grasped by hand to prevent rotation of the tool spindle 12 dur-

ing insertion or removal of a tool from the chuck **13**. The gear **53** on the rear end portion of the tool spindle **12** is held against axial movement toward the chuck **13** by a pin-shaped torque transmitting member **54** which is driven into a diametrically extending bore of the tool spindle and is preferably permanently installed in such bore. The end portions of the member **54** extend into registering bores of the sleeve-like front end portion of the gear **53**. In this way, the member **54** rotates the tool spindle **12** when the gear **53** is rotated by the pinion **49** of the gear cluster **47**. The rear end portion of the tool spindle **12** has a reduced diameter and extends into the bearing **10**; this rear end portion bears against the ball **22**.

The parts **47**, **53** preferably consist of suitable synthetic plastic material and are produced in accordance with a mass-manufacturing technique, such as by molding or the like (i.e., not by shaving, grinding or a like material removing procedure).

An important advantage of the improved toy device is that it can be assembled and taken apart by hand and/or by resorting to rudimentary and readily available tools, such as a screwdriver for the fasteners **14**, **36** and two needles or pins which are to be inserted into the transverse holes **32***a*, **32***a'* of the sleeves **32**, **32'** on the plates **31**, **31'**. The needles are introduced into the holes **32***a*, **32***a'* during assembly of the toy device and serve to prevent ejection of brushes **33**, **33'** by the respective springs. Once the power tool is assembled, the needles can be withdrawn so that the brushes **33**, **33'** can bear against the collector **35**. The needles can be withdrawn immediately after the stator **38** is properly installed in the shells **1**, **2**, i.e., even before the juvenile assembling the power tool secures the shells to each other by means of the fasteners **14**.

The cable **24** has a plug **24***a* which is connectable to a source **24***b* of low-voltage current. Thus, the manipulation of the toy device is safe and can be entrusted to a child. Also, since the current-consuming part **6** of the toy device is operated by low-voltage current, it need not be equipped with or used in connection with an anti-interference capacitor. The output of the toy device suffices to warrant its use by children, for example, to drill holes with a diameter of up to **6** millimeters into wood or other relatively soft materials, to drive relatively small or full-size replicas of various apparatus or machines which must be driven by a motor, or for a host of analogous purposes. However, the output of the toy device is selected in such a way that it cannot cause serious injuries to children, even if it is manipulated counter to the instructions provided on the toy device proper or accompanying the toy device. The plug **24***a* is preferably designed in such a way that it cannot be inserted into the outlets for commercial or household current so that a child is unable to attach the motor **6** to a source of high voltage. The energy source **24***b* shown in FIG. **2** can constitute a suitable transformer, for example, a transformer which is used to supply current for operation of electric toy railroads or like toy devices. It is equally within the purview of the invention to operate the toy device of the present invention with current supplied by one or more batteries or cells.

It is clear that the illustrated portable electric toy drill constitutes but one of a host of electrical toy devices which can be constructed and assembled in accordance with the concept of the present invention. Furthermore, the tool spindle **12** or another take-off of the improved toy device can be used to drive suitable attachments or adapters of other toy devices, such as the adapter for a grinder or a compass saw or fret saw. When used for such purposes, the toy device of the present invention may be given a form other than that shown in the drawing, for example, its housing may resemble a cylinder or a block such as that of a conventional built-on motor without handgrip means. The improved toy device can be designed in such a way that the intermediate shaft **9** extends from the housing to be directly connectable to a driven part or to a discrete transmission which drives one or more parts. It is equally within the purview of the invention to design the toy device as a stationary boring or drilling machine which can be installed in an upright support or the like. The chuck **13** can be readily removed to insure that the tool spindle **12** can be used as an input member which transmits torque to one or more attachments or adapters in or for additional toy devices. Also, the chuck **13** can be replaced with a spur gear, a pulley, a sheave or another rotary torque transmitting or receiving part. Furthermore, the chuck **13** can be replaced with a fan which is then capable of being driven by the motor **6**, or by other devices which can be used by teenagers or younger children for play with the purpose of imitating the activities of skilled workmen or tinkers. The components of the toy device can be sold in compartmentized cardboard or plastic boxes or analogous receptacles in the same way as the parts of an erection kit or the like.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of our contribution to the art and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

1. A toy device constituting an imitation of an electric power tool and consisting of a plurality of readily separable and reassembleable components, said device comprising at least one current consuming unit arranged to be operated at low voltage, said unit including an electric motor having brush holder means including sleeve means, said sleeve means having transverse holes for insertion of foreign objects during assembly of the toy device to constitute retainers of said brush means against the action of spring bias.

2. A toy device constituting an imitation of an electric power tool and comprising at least one current consuming unit, arranged to be operated at low voltage, said device consisting of a plurality of readily separable and reassembleable components comprising a housing consisting of a pair of substantially mirror-symmetrical shells and a plurality of rotatable components in said housing, said rotatable components being rotatably supported in said housing in a plurality of complementary bearing halves integral with said shells.

3. A toy device as defined in claim **2**, wherein said current consuming unit comprises an electric motor

having a rotor shaft constituting one of said rotatable components which further comprise an output shaft and rotary gear transmission means between said rotor shaft and said output shaft, said shafts and said gear transmission means being rotatably supported in said complementary bearing halves.

4. A toy device as defined in claim 3, wherein said gear transmission means comprises a pinion integral with one end of said rotor shaft, a gear fixed to one end of said output shaft, and a pair of integral gears respectively meshing with said pinion and said gear on said output shaft and mounted on an additional shaft parallel to said rotor shaft and said output shaft, said additional shaft being rotatably supported on said complementary bearing halves integral with said shells.

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