Feb. 12, 1963 E. D. METKO 3,077,547

PORTABLE ELECTRIC DRILL

Filed Feb. 13, 1959

Fig. 1.

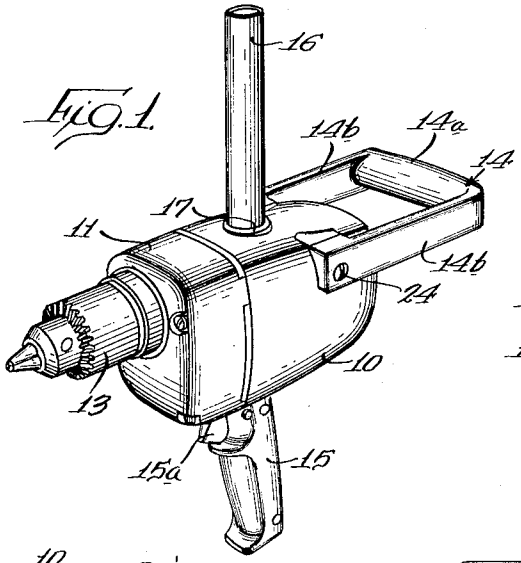


Fig. 5.

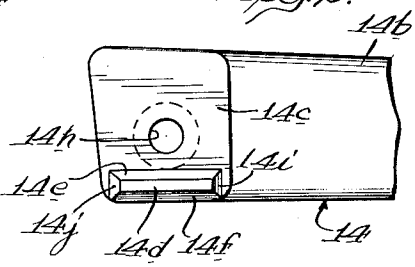


Fig. 2.

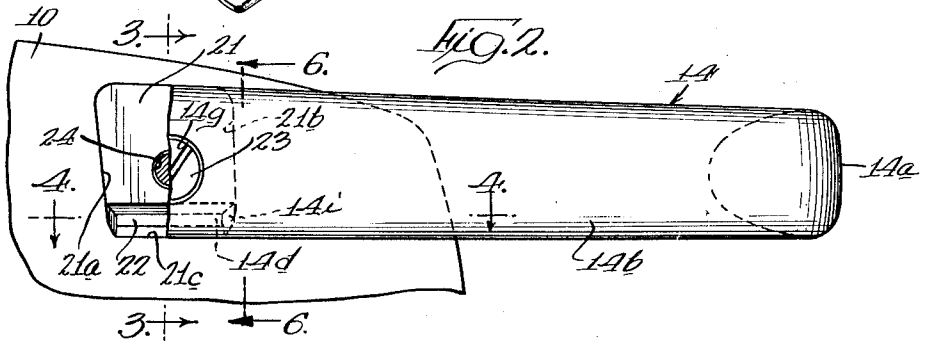


Fig. 6.

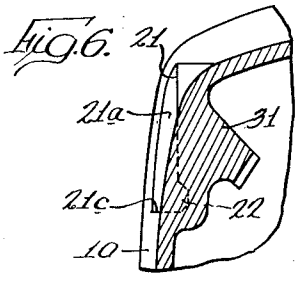
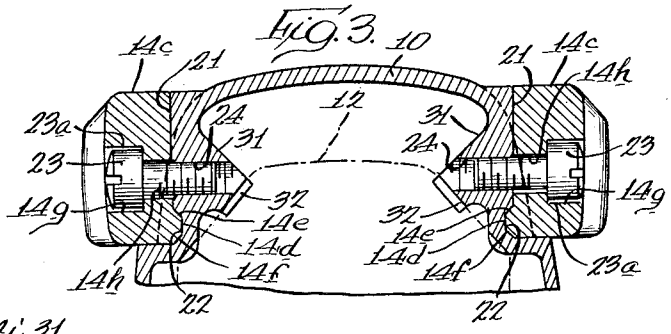


Fig. 3.



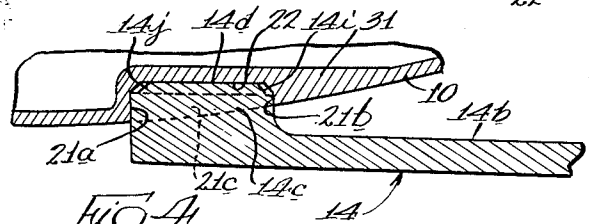


Fig. 4.

INVENTOR.

Earl D. Metko

BY

George R. Clark

Atty.

United States Patent Office

3,077,547

Patented Feb. 12, 1963

3,077,547

PORTABLE ELECTRIC DRILL

Earl D. Metko, Chicago, Ill., assignor to Sunbeam Corporation, Chicago, Ill., a corporation of Illinois

Filed Feb. 13, 1959, Ser. No. 793,087

5 Claims. (Cl. 310—50)

This invention relates to a portable power unit, and more particularly to a portable electric drill.

Portable electric drills of the larger sizes such as three-eighths and one-half inch drills are customarily provided with a motor housing having a gear and spindle housing secured to the front end thereof, a pistol grip handle projecting from the bottom thereof, a socket in the top thereof for receiving a pipe-like handle and a U-shaped rear handle secured to the rear portion of the motor housing. In many cases, the U-shaped rear handle has been detachably secured to the housing. The rear handle projects to the rear of the motor housing and may be secured thereto by means of screws extending through the free ends of the U-shaped handle into the motor housing. Where the presence of the rear handle would make the drill too long for convenient manipulation, it may be removed and the pipe-like handle secured to top of the drill.

In the prior art drills having the detachable rear handle, the assembly screws through the rear handle take most of the load between the handle and the motor housing and sometimes work loose during use because of the high load and vibration. In some instances the rear handle has been secured to the motor housing so near the end thereof that during heavy use the handle has caused the rear portion of the motor housing to fracture and break away from the remainder of the housing. It would be desirable to provide a drill in which the rear handle is secured to the motor housing by structure which does not work loose during use and to a portion of the housing which will not break during heavy use.

It is accordingly an object of the invention to provide new and improved handle structure for a portable electric drill.

Another object of the invention is to provide a rear handle for a power drill keyed to the motor housing by ribs on the handle interlocking with grooves in the motor housing.

A further object of the invention is to provide a motor housing for a portable drill which has heavy interior rib portions designed to seat the motor and has exterior handle sockets in the sides thereof at the heavy rib portions so that the handle is secured to reinforced portions of the housing.

A still further object of the invention is to provide a power drill in which a U-shaped rear handle has keying ribs on the ends of its arms which fit into keying grooves formed in portions of the motor housing having heavy, thick-walled ribs for mounting the motor field.

Another object of the invention is to provide a U-shaped rear handle for a portable drill having keyed portions in resilient engagement with portions of the drill housing, and camming portions to disengage the keyed portions when the handle is rotated in a predetermined direction.

Other objects of the invention will become apparent from the following detailed description of a portable drill forming a specific embodiment thereof, when read in conjunction with the appended drawings, in which—

FIG. 1 is a perspective view of a portable drill forming one embodiment of the invention;

FIG. 2 is an enlarged, fragmentary, side elvation of the drill shown in FIG. 1 with portions thereof broken away;

FIG. 3 is a vertical section taken along line 3—3 of FIG. 2;

FIG. 4 is an enlarged vertical section taken along line 4—4 of FIG. 2;

FIG. 5 is an enlarged, fragmentary, side elevation of a portion of the handle of the drill shown in FIG. 1; and

FIG. 6 is a vertical section taken along line 6—6 of FIG. 2.

The invention relates to a portable electric power unit such as, for example, an electric drill, having a motor housing, a pistol grip type handle and a detachable U-shaped rear handle. The rear handle is provided with opposed ribs or keys which snap into keying grooves in the motor housing to lock the handle to the housing. The ribs are held in engagement with the housing by the resilience of the U-shaped handle. Screws may be provided to hold the handle in interlocking engagement with the housing and to prevent accidental disengagement in the manner described below. The housing may have internal ribs for supporting the motor and so located as to strengthen the housing at the portions of the housing to which the handle is secured.

There is shown in FIG. 1 of the drawings a portable electric drill having a hollow motor housing 10 to which is secured a gear or spindle housing 11. The housing 10 supports therein an electric motor 12 (FIG. 3) of known construction. A drill chuck 13 is journalled on the front wall of gear housing 11 and is drivingly connected to the motor by means of reduction gears (not shown) in the gear housing 11.

Integrally formed with the housing 10 and extending downwardly therefrom, is a conventional pistol grip handle 15. Conveniently positioned on the forward edge of the handle 15 is a finger-operated switch 15*a* which controls the energization of the motor 12. This type of handle is used on small and large portable drills, but in the case of the large drills, it has been found desirable to provide additional handles for guiding and applying force to the drill when performing heavy duty work. For manipulation of the drill when used in unobstructed places, one of the additional handles takes the form of a detachable U-shaped rear handle 14. When the drill is used with the U-shaped rear handle 14, the operator normally grasps the pistol grip handle 15 in the right hand and the U-shaped handle in the left hand. The handle 14 is positioned substantially in axial alignment with the chuck 13 so that the force applied to the handle 14 will be directed axially of the drill bit and will have no tendency to deflect the drill out of alignment with the hole being made.

In many areas where a portable drill is used, there is not sufficient clearance between the work surface in which a hole is to be made and the nearest obstruction above the hole location to permit the drill to be used with the rearwardly extending handle 14. To permit use of the drill in such locations, the rearwardly extending handle 14 is detachable secured to the drill housing 10 and alternative handle 16 is detachably secured to the side of the housing 10 extending in the opposite direction from the pistol grip handle 15. The handle 16 resembles a short piece of pipe which is threadedly received in a tapped bore 17 in the upper side of the housing 10. As is evident from FIG. 1, the handle 16 extends perpendicular to the axis of the drill and does, not therefore, occupy any space rearwardly of the drill housing 10. By having the handle 16 extending transversely of the axis of the drill and in substantial alignment with pistol grip handle 15, it is possible to apply a powerful axial force to a drill bit mounted in chuck 13 by merely applying an equal force to each of the handles 15 and 16.

To secure the handle 14 rigidly to the housing 10, the

housing 10 has shallow, three-sided sockets 21 formed in the upper sides thereof at the level of the chuck 13. The U-shaped handle 14 has a grip portion 14*a* and stiff arms 14*b* having opposed inwardly projecting generally rectangular bosses 14*c*. The bosses 14*c* are so spaced that the opposed faces of the bosses may be moved into simultaneous engagement with the bottoms of sockets 21 formed on the housing 10. When the bosses 14 are in engagement with the sockets 21, the three side walls of the sockets 21 are in supporting engagement with the side portions of the bosses 14*c*. Thus, when the handle 14 is moved into engagement with the housing 10, the bosses 14*c* must be slid in from the top of sockets 21 to seat with the walls of the bosses 14*c* in engagement with the side walls of the sockets 21.

To retain the handle 14 in assembled position with the bosses 14*c* engaging the sockets 21, the bosses 14*c* are provided with inwardly directed ribs 14*d* which serve to key the handle to the housing 10 and prevent displacement and relative rotation therebetween under some conditions as will be explained below. Cooperating with the ribs 14*d* in keying the handle to the housing, there are complementary grooves 22 extending along the lower edges of the sockets 21. When the lower edges of the bosses 14*c* fit against the bottom edges of the sockets 21, the ribs 14*d* on the bosses 14*c* fit into the keying grooves 22 in the housing 10. The ribs 14*d* are provided with sloping upper faces 14*e* and sloping lower faces 14*f* which act as camming surfaces to facilitate springing the arms 14*b* temporarily apart for assembling the handle with the housing 10 and removing the handle therefrom.

To prevent accidental disengagement of handle 14 from housing 10, screws 23 are threaded into tapper bores 24 in the housing 10 locking the bosses 14*c* in positions seated in the sockets 21. The screws have heads 23*a* fitting into counterbores 13*g* in the bosses and project through bores 14*h* in the bosses.

To reinforce the portions of the housing 10 in which the sockets 21 are formed, longitudinal stepped ribs 31 formed integrally with the housing 10 are positioned in the housing at the level of the sockets 21 and extend substantially beyond each edge of the socket. The ribs 31 perform the additional function of providing seats for the field or stator of the motor 12 with the stator seated against steps or shoulders 32 of the ribs. Thus, the ribs 31 serve the dual purpose of mounting the motor stator and of reinforcing the portions of the housing to which the handle 14 is secured. The prior art drills are characterized by the use of handle assembly means engaging the housing in areas where no particular reinforcing has been provided. Because of the large forces applied to handles of this type, a fracture of the motor housing in the area of handle attachment has not been uncommon. Use of the ribs 31 as a means of reinforcing the housing at the point of handle attachment involves no additional material or expense, since it has only required the relocation of the motor supporting ribs which are a necessary part of the housing.

To remove the handle 14 from the motor housing 10, the screws 23 are unscrewed and removed. The handle 14 then is pivoted relative to the housing 10 in a clockwise direction, as viewed in FIG. 2, about corners 14*i* of the ribs or keys 14*d*. As the handle is so pivoted, the bosses 14*c* are sprung apart and the ribs 14*d* caused to slide out of grooves 22 onto the faces of the sockets 21. It should be appreciated that the resilience of the U-shaped handle 14 maintains the bosses 14*c* seated in the sockets 21 until the camming action of the walls of the sockets 21 and the ribs 14*d* move the bosses apart sufficiently for the ribs 14*d* to diengage from grooves 22. Although the resilience of the handle produces a clamping action between the ribs 14*d* and the sockets 21, the faces of the sockets are parallel so that once the ribs 14*d* are disengaged from grooves 22, they may be readily slid upwardly across the faces of the sockets until the handle 14 is completely disengaged from the housing 10.

To put the handle 14 back on the housing 10, the forward ends of ribs 14*d* are formed with sloping cam surfaces 14*j* which engage the upper edges of the sockets 21 to spring the bosses 14*c* apart and permit the ribs 14*d* to move onto the faces of the sockets 21. The bosses are then slid to the desired position with the walls of bosses 14*c* and the walls of sockets 21 in engagement. As the bosses 14*c* are moved into this position, the ribs 14*d* snap into the grooves 22. The screws 23 are then screwed into place to hold the bosses 14*c* seated in the sockets and the ribs 14*d* in the grooves 22.

The selected arrangement of the walls of sockets 21, the keying ribs 14*d* and grooves 22 results in a design in which the camming action for springing the bosses 14*c* outwardly is effective only in one direction of handle rotation. To best understand how the bosses 14*c* are cammed outwardly or sprung apart to disengage the ribs 14*d* from the grooves 22, it is necessary to examine the contour of the sockets 21. Projecting outwardly from the vertical face of each of the sockets 21 are side walls 21*a*, 21*b* and 21*c* which are located on the left side, right side, and bottom, respectively, of the socket 21 as shown in FIG. 2. The side walls 21*a*, 21*b* and 21*c* extend perpendicular to the plane of the face of the socket 21. The bottom wall 21*c* is the widest of the three walls, as can be best seen in FIG. 3. The wall 21*a* is of the same height as wall 21*c* at its lower edge but diminishes in height toward the upper edge of the socket 21. Wall 21*b* is somewhat lower than wall 21*a* and terminates about three-eights of an inch from the upper edge of socket 21, as is best shown in FIG. 6.

Since the bosses 14*c* are substantially square and are received within the complementary sockets 21, it would appear that relative rotation between the bosses 14*c* and the sockets 21 would be impossible. Such is the case when it is attempted to rotate the handle 14 counterclockwise about the sockets 21. When counterclockwise rotation is attempted, the walls 21*a*, 21*b*, 21*c* engage the adjacent walls of the bosses 14*c* and prevent any relative rotation. In normal use, the force on handle 14 will be axially of the drill, or because of forces applied to balance the moment of force applied on pistol grip handle 15, there may be some counterclockwise or upward force applied on handle 14. When the handle is subjected to this counterclockwise force, the camming action mentioned above is ineffective in disengaging the ribs 14*d* from the grooves 22 so that the handle 14 is for practical purposes locked to the housing 10 even when assembly screws 23 have been removed. It should be evident, therefore, that the bosses 14*c* cooperate with the sockets 21 to completely restrain the handle 14 against disengagement from the housing 10 under the normal conditions of use.

If it is desired to remove the handle, however, it is rotated clockwise about the sockets 21, which rotation produces the camming action to spring the bosses 14*c* apart and disengage the ribs 14*d* from the grooves 22. When subjected to clockwise rotation, the handle cooperates with the rear walls 21*b* to cam the bosses 14*c* outwardly with respect to the sockets 21 rather than being locked thereto as in the case of counterclockwise rotation. As the bosses 14*c* are rotated in conjunction with the handle 14, the upper rear corners of the bosses 14*c* tend to ride up along the upper edges of the walls 21*b* which edges are inclined with respect to the face of socket 21 as can be best seen in FIG. 6. Thus, the slope of walls 21*b* provides a camming action to spring the bosses 14*c* and the supporting arms 14*b* outwardly. The ribs 14*d* with their camming surfaces 14*e* supplement the action produced by the walls 21*b* in moving the bosses 14*c* outwardly with respect to the sockets 21. In the case of counterclockwise handle rotation, the ribs 14*d* are, of course, ineffective in camming the bosses 14*c* outwardly

since the walls 21*a*, 21*b* and 21*c* prevent relative rotation between the bosses 14*c* and the sockets 21.

The screws 23 are merely necessary to prevent accidental detachment of the handle in the event that the handle were rotated in the clockwise direction as viewed in FIG. 2. Most of the prior art handles are characterized by the use of several retaining screws to secure each leg of the U-shaped handle rigidly to the housing. Applicant has reduced to one the number of screws required in each handle connection through the use of the cooperating bosses and sockets on the handle and casing, respectively. Because of the locking action between the bosses and the sockets under the normal conditions of load, the screws 23 are actually required to assume little or none of the load applied to the handle.

While there has been illustrated and described a particular embodiment of the present invention, it will be apparent to those skilled in the art that various modifications may be made without departure from the invention in its broader aspect and it is, therefore, aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the present invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A portable electric drill comprising an elongated motor housing having a drill spindle extending from the front end of said housing and a resilient U-shaped handle detachably secured to the other end thereof, oppositely facing exterior sockets on said housing, the legs of said U-shaped handle bracketing said housing, inwardly projecting bosses on the ends of said legs engaging the walls of said sockets to limit relative movement between said handle and said housing, the resilience of said handle permitting disengagement of said bosses from said sockets to detach said handle from said housing.

2. A portable electric power unit comprising a motor housing having exterior sockets on opposite sides thereof, a U-shaped handle having its free ends bracketing said housing and in engagement with said sockets, the cooperating portions of said sockets and said handle preventing relative rotation of said handle in one selected direction around said sockets, and portions of said housing camming said handle out of engagement with said housing when said handle is rotated in a direction opposite to said selected direction.

3. A portable power unit comprising a motor housing having a pair of substantial square sockets on opposite sides thereof, a U-shaped handle having its free ends bracketing said housing, said free ends of said handle having inwardly projecting bosses of substantial square shape in interlocking engagement with said sockets, each said socket having at least one inclined wall which acts as a cam surface to disengage said bosses from said sockets when said handle is rotated in a predetermined direction around said sockets.

4. A portable power unit comprising a motor housing having a pair of exterior sockets on opposite sides thereof, grooves disposed in the bottoms of said sockets, a U-shaped handle having its free ends bracketing said housing, said free ends being provided with inwardly projecting bosses with ribs on their opposed faces, said bosses and ribs interfitting with said sockets and grooves to lock said handle with respect to said housing, and cam means on said housing permitting rotation of said handle in a predetermined direction around said sockets to disengage said bosses and ribs from said sockets and grooves.

5. In a portable power unit, a housing having thickened portions provided on opposed side walls thereof with exteriorly facing sockets having grooves therein, a U-shaped handle having a pair of arms including inwardly projecting bosses fitting into said sockets provided with wedge-shaped ribs adapted to fit interlockably in said grooves, and screw means for holding said bosses in said sockets.

References Cited in the file of this patent

UNITED STATES PATENTS

1,539,068	Brockett	May 26, 1925
1,539,069	Brockett	May 26, 1925
2,468,469	Smith	Apr. 26, 1949
2,789,798	Brace	Apr. 23, 1957