April 19, 1949. J. V. O'BRIEN ET AL 2,467,849

PORTABLE ELECTRIC ROTARY DRAIN CLEANER

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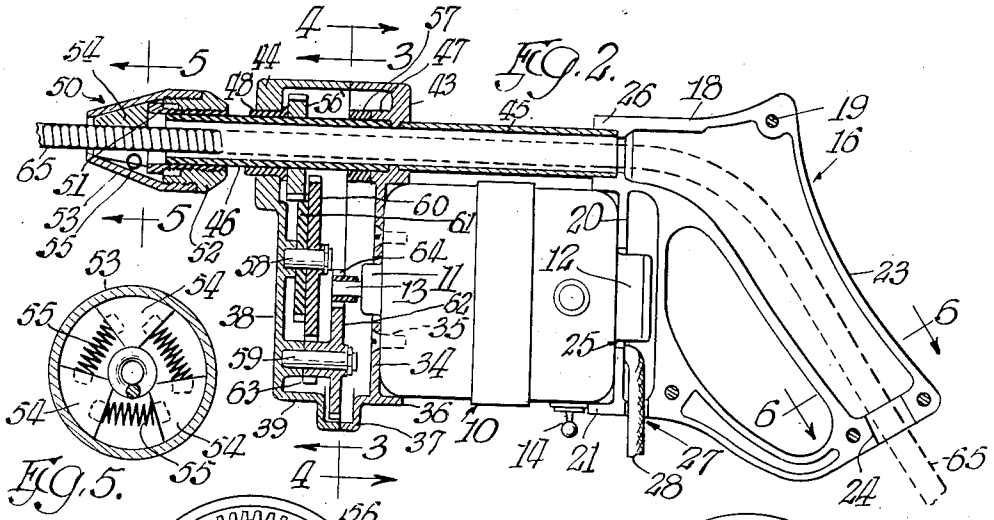


FIG. 2.

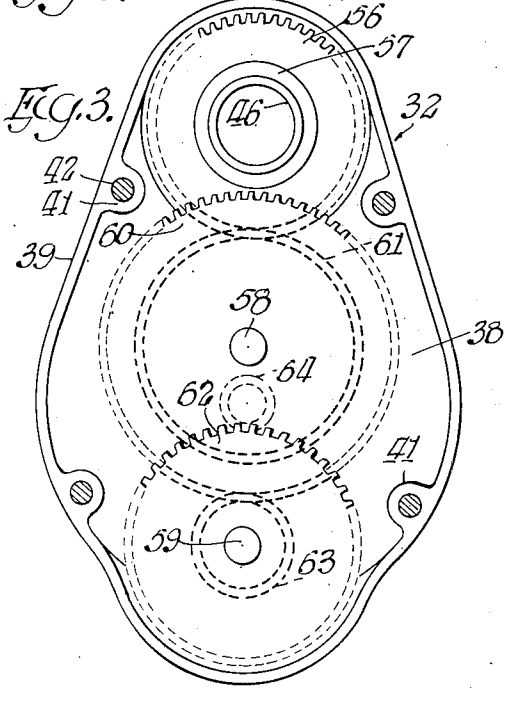


FIG. 3.

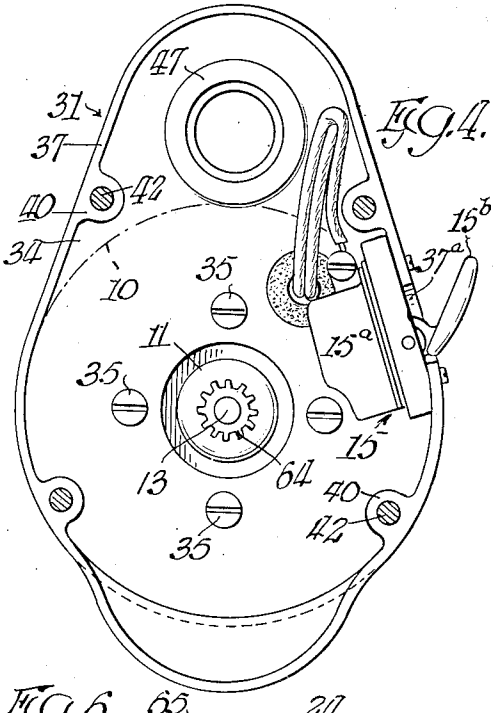


FIG. 4.

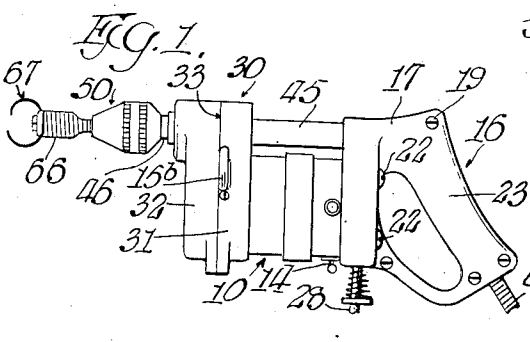


FIG. 1.

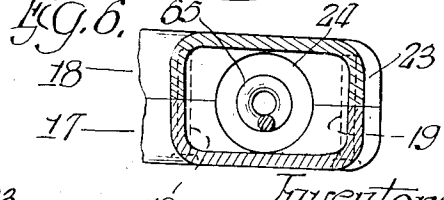


FIG. 6.

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PORTABLE ELECTRIC ROTARY DRAIN CLEANER

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5 Claims. (Cl. 15—104.30)

1

This invention relates to improvements in portable electric rotary drain cleaners of the type using a flexible coil carried tool and it consists of the matters hereinafter described and more particularly pointed out in the appended claims.

One of the objects of the invention is to provide a portable device for the purpose mentioned, including an electric motor and which device is of simple construction for economical production, is efficient in operation, and light in weight so that it may be conveniently and easily handled in use.

Another object of the invention is to provide a device of this kind which is so constructed that it is possible to employ a conventional type of motor, thus avoiding the expense of building a special motor into a special casing.

A further object of the invention is to provide a tool of this kind that includes a conventional type of motor, held at its ends by means providing a support therefor and which means includes parts throughout which the flexible coil for actuating the cleaning tool may be readily inserted and then guided when rotatively driven from the motor.

Also, it is an object of the invention to provide a device of this kind which is usable in exceedingly close quarters and which has the parts thereof so arranged that the flexible coil of the drain cleaning device may be readily gripped for a rotative drive thereof and then released for a longitudinal feed of said coil as occasion demands.

The above mentioned objects of the invention, as well as others, together with the advantages thereof will more fully appear as the specification proceeds.

In the drawing:

Fig. 1 is a view in side elevation of a portable device of the kind mentioned, embodying one form of the invention.

Fig. 2 is a view partly in longitudinal vertical section and partly in side elevation of the improved device, on a scale greater than that of Fig. 1 and with a certain handle portion removed for a better illustration of the parts involved.

Fig. 3 is a view on a further enlarged scale, when the gear casing of the device has been separated on its line of cleavage or junction and when viewed in the direction of the arrows 3—3 of Fig. 2.

Fig. 4 is a view similar to Fig. 3 when viewed in the direction of the arrows 4—4 of Fig. 2.

Fig. 5 is a transverse vertical sectional view through a certain chuck embodied in the device

2

as taken on the line 5—5 and on a scale enlarged over that of Fig. 2.

Fig. 6 is a transverse sectional view through a part of the handle portion of the device as taken on the line 6—6 and on a scale enlarged over that of Fig. 2.

In general the improved device, as here shown, includes a conventional universal motor having a current control switch and a directional control switch. Said motor may be used either with alternating current or with direct current and may be caused to run in either direction. Fixed to one end of the motor is a longitudinally separable head that is formed to provide a closed grip hollow handle. Fixed to the other end of the motor is a transversely separable hollow casing and a tubular flexible coil guiding member is fixed at its ends to said head and to said casing respectively, adjacent one side of the motor. One end of this flexible coil guiding member opens into the hollow handle and at its other end communicates with one end of a tubular shaft that is mounted for rotation in the casing. A chuck is carried by this shaft outside of the casing and this chuck is operable to grip and connect to said tubular shaft, that part of a flexible coil of a drain cleaning device that extends longitudinally through the same and through said tubular shaft, said guiding member and hollow handle respectively. In the casing before mentioned, is located speed reducing means that operatively connects the armature shaft of the motor to the tubular shaft and whereby the tubular shaft may be driven in either direction from the armature shaft.

Referring now in detail to that embodiment of the invention illustrated on the drawings, 10 indicates the electric motor of the tool and which is preferably a universal and reversible motor of conventional type that can be purchased in the open market. This motor has bearing bosses 11 and 12 respectively projecting from the opposite ends of the case of the motor, as best appears in Fig. 2. The armature shaft of the motor is indicated at 13 and it projects at one end beyond the bearing boss 11. The switch for controlling the direction in which the armature shaft 13 is driven is indicated at 14 and it is disposed upon one side of the motor toward that end having the bearing boss 12. The switch for controlling the operation of the motor, that is its "off" and "on" conditions is indicated as a whole at 15 in Fig. 4 and will be more fully referred to later.

16 indicates as a whole a head that is fixed to that end of the motor carrying the boss 12. Said

head is made of right and left hand substantially hollow parts 17 and 18 respectively (see Figs. 1 2) that are operatively secured together longitudinally by screws 19—19. Said head parts each include an end wall part 20 and an annular flange 21. When said parts of the head are secured together by the screws 19, the flanges 21—21 embrace the associated end of the motor and the parts 20—20 engage the associated end of the motor and are secured thereto in operative relation by screws 22—22 which appear only in Fig. 1. The said head parts 17 and 18 are made to form a closed hollow or tubular handle grip 23 and in one end thereof is an opening 24 that appears in Figs. 2 and 6. The wall parts 20—20 of the head parts 17 and 18 have registering recesses 25 to form an opening to accommodate the boss 12 on the associated end of the motor.

The head parts 17 and 18 are formed to provide a boss 26 at one side of the flange 21 and an opening 27 at the opposite side of said flange and through which a conductor 28 passes to be suitably connected to the motor to supply electric current thereto. The parts mentioned best appear in Fig. 2.

30 indicates as a whole a hollow casing that is directly associated with the other end of the motor and which is formed of inner and outer casing parts 31 and 32 respectively having a line of junction or cleavage 33 extending transversely of the device as a whole. The casing part 31 has an end wall 34 which engages the associated end of the motor and is secured thereto as by the screws 35. Said casing part also has oppositely extending flanges 36 and 37 respectively, the flange 36 being so formed as to embrace the associated end of the motor.

The outer casing part 32 has an end wall 38 and a flange 39 which mates the flange 37 of the casing part 31 and on the inside of both flanges 37—38 are registering bosses 40 and 41 respectively (see Figs. 3 and 4) to receive screws 42 whereby the casing parts are operatively but separably secured together. The casing parts 31—32 are each provided with registering bosses 43 and 44 respectively, shown in Fig. 2.

45 indicates a flexible coil guide in the form of a tube which is operatively secured at one end in the boss as formed by the parts 26 of the head parts 17 and 18 and at the other end in the boss 43 of the casing part 31. With this arrangement the first mentioned end of the guide 45 communicates with the interior of the hollow handle 23.

46 indicates a tubular shaft of substantially the same diameter as the guide 45 and which shaft communicates with the other end of said guide with which it aligns and engages in a flange 47 on the boss 43. The tubular shaft 46 is journalled at about its mid portion in a bushing 48 held in the boss 44 and its inner end bears in the flange 47 on the boss 43. The other end of the tubular shaft 46 projects some distance outwardly of the boss 44 and there has fixed to it a chuck which is indicated as a whole as at 50. This chuck includes a stop sleeve 51 upon which is threaded a nut 52, a tapering sleeve 53 being threaded at its inner end upon the nut. Within the outer and tapering end of the sleeve is a plurality of wedge-like gripping jaws 54—54, expansion springs 55 being disposed between the facing sides of adjacent jaws.

When the sleeve 53 is turned in one direction, its tapered end portion so engages the complemental surfaces of the jaws 54 as to force them inwardly into gripping position against the action of the springs 55. When said sleeve is turned in the other direction, the springs 55 function to release said jaws from their gripping position.

A gear 56 is fixed to the tubular shaft 46, in the boss 44 so as to engage the associated end of the bushing 48. A collar 57 is fixed on this shaft so as to abut against the flange 47. By this arrangement the tubular shaft 46 is free to be rotatively driven but is effectively held against endwise movement.

The wall 38 of the casing part 32 carries a pair of inwardly extending stud shafts 58 and 59 respectively that are disposed parallel with the shafts 13 and 46 respectively. Rotatively mounted on the stud shaft 58 is a composite gear element that includes a relatively large gear 60 and a smaller gear 61, the latter of which meshes with the gear 56 on the tubular shaft. Rotatively mounted on the stud shaft 59 is a composite gear that includes a relatively large gear 62 and a pinion 63, the pinion meshing with the gear 60 just above mentioned. The gear 62 meshes with a pinion 64 on the armature shaft 11 of the motor 10. The gears mentioned constitute a speed reducing gear train between the gear 56 and pinion 64 and whereby the gear 56 is driven from the pinion at greatly reduced speed.

The casing part 32 and the tubular shaft as well as the gears 56, 60, 61, 62 and pinion 63 constitute a structure which may be entirely assembled as a unit and then applied to the casing part 31 by means of the screws 42 before mentioned.

The control switch 15 includes a casing 15*a* which is fixed to the inner surface of one side of the flange 37 of the casing part 31 and further includes an actuator 15*b* which extends outwardly through a recess 37*a* in said flange in a position convenient for actuation. When the tool is being operated, the operator grasps the handle 23 in the right hand and grasps the casing 30 in the left hand so that it brings the thumb of the left hand in position conveniently to operate the switch actuator 15*b* to stop and start the motor 10.

The tool is primarily intended for use in rotatively driving the flexible coil 65 of a drain cleaner and which coil is herein shown as a closely wound helical wire coil of considerable length and of a diameter somewhat smaller than the internal diameter of the shaft 46 and guide 45 as best appears in Fig. 2. One end of the coil 65 is made of coils 66 of a large diameter so as to have a cutting tool 67 secured thereto.

In initially inserting the coil 65 through the tool, after manipulating the chuck 50 to open the same, that end of the coil 65 opposite the end 66 is inserted through the chuck to pass longitudinally therethrough as well as through the tubular shaft 46, guide 45 and handle 23 and then out through the opening 24 to be wound upon a suitable reel (not shown).

In the use of the tool, when so provided with the coil, the chuck 50 is manipulated to cause its jaws 54 to grip that part of the coil 65 passing between them. Assuming the tool is held in the hands, as before mentioned, the switch 14 of the motor is set in a position that will drive the motor in the desired direction. After inserting the tool end of the coil 65 into the end of a clogged drain pipe, the lever 15*b* of the switch 15 is then pressed inwardly by the thumb of the left hand and this energizes the motor to drive the armature shaft 13 in the direction set by the

switch 14, in the meantime pressing the chuck end of the device forwardly as the tool 67 cuts through the stoppage in the drain pipe being operated upon. When the chuck has been so far advanced as to reach the drain pipe, the switch lever 15b is released and this stops the motor. The chuck is then manipulated to release its grip on the coil 65 when the entire tool is pulled rearwardly on said coil the desired distance, after which the chuck is again manipulated to grip the coil 65 as before. The motor is then again started and the operation goes on as before until the drain cleaning operation has been completed.

The device, though relatively light in weight for easy handling, is strong and durable and has the parts disposed for convenient actuation. With the motor arranged at the mid portion of the tool, a good balance is afforded so that tool is not tiresome to hold by the operator.

It will be understood that the cutting tool 67 is merely illustrative of a suitable tool and that various cutters of drain tools may be used by suitably affixing them to the end of the flexible coil 65.

While in describing the invention, reference has been made in detail to the construction and arrangement of the various parts of the device, the same is to be considered only in the illustrative sense so that the invention is not to be limited thereto except as may be specifically set forth in the appended claims.

We claim:

1. A portable driving tool for the flexible shaft of a drain cleaning device and embodying therein an electric motor having an armature shaft, means secured directly to one end of said motor and providing a handle for holding said tool, means secured directly to the other end of said motor and there providing a hollow casing, a member disposed between said two mentioned means and forming a stationary guide, a tubular shaft out of line with the motor arranged in line with said stationary guide and mounted for rotation in said means providing said casing, said flexible shaft being adapted to extend longitudinally through said stationary guide and said tubular shaft respectively, means carried by said tubular shaft outside of said means providing said casing and operable to grip a part of said flexible shaft so as to connect the same to said tubular shaft, and means in said casing for transmitting power from the front end of said armature shaft to said tubular shaft.

2. A portable driving tool for the flexible shaft of a drain cleaning device and embodying therein an electric motor unit having an armature shaft, means secured directly to the rear end of said motor unit and including a part forming a hollow handle for holding the tool, means secured directly to the front end of said motor unit and there providing a hollow casing, a member disposed between said two mentioned means alongside of said unit and providing a stationary guide communicating at one end with said hollow handle, a tubular shaft arranged in line with the other end of said stationary guide and mounted for rotation in said means providing said casing, said flexible shaft being adapted to extend longitudinally through said tubular shaft, said stationary guide and said hollow handle respectively, means carried by said tubular shaft outside of said means providing said casing and operable to grip a part of said flexible shaft to connect the same to said tubular shaft, and means in said casing for transmitting power directly from the front end of said armature shaft to said tubular shaft.

3. A portable electric rotary drain cleaner formed and adapted to be held in the hands and to drive the flexible shaft of such cleaner, embodying therein an electric motor unit, reduction gear mechanism driven by the front end of the shaft of said motor unit including a casing secured directly to one end of said electric motor unit, a handle secured directly to the other end of said electric motor unit and including a hollow conduit-like interior terminating in upper and lower openings, a tubular shaft mounted for rotation in the reduction gear casing and operatively connected to the armature shaft of said motor unit through said reduction gear mechanism, said tubular shaft being offset from the armature shaft of the motor and having a portion extending beyond the outer face of the reduction gear casing, means on said last mentioned portion of the tubular shaft for gripping the flexible shaft, and a hollow stationary flexible shaft guide aligned with said tubular shaft and having one end secured in the reduction gear casing and the other end in the handle in line with one of the openings of said hollow conduit-like interior, whereby the flexible shaft may extend through and be guided in said rotary tubular shaft, stationary flexible shaft guide and hollow conduit-like interior of the handle and be driven by said electric motor.

4. A portable electric rotary drain cleaner formed and adapted to be held in the hands and to drive the flexible shaft of such cleaner, embodying therein an electric motor unit, reduction gear mechanism driven by the front end of the shaft of said motor unit and including a casing secured directly to one end of said electric motor, a handle section secured directly to the other end of said electric motor unit and including a hollow conduit-like interior terminating in upper and lower openings, said casing and said handle section having flanges interfitted with the opposite ends of the motor unit, a tubular shaft mounted for rotation in the reduction gear casing and operatively connected to the armature shaft of said motor unit through said reduction gear mechanism, said tubular shaft being offset from the armature shaft of the motor but substantially parallel thereto, and having a portion extending beyond the outer face of the reduction gear casing, means on said last mentioned portion of the tubular shaft for gripping the flexible shaft, and a hollow stationary flexible shaft guide aligned with said tubular shaft and having one end interfitted in the reduction gear casing and the other end interfitted in the handle section in line with the upper opening of said conduit-like interior, whereby the flexible shaft may extend through and be guided in said rotary tubular shaft, stationary flexible shaft guide and may pass through said hollow conduit-like interior of the handle entering the top opening and leaving the bottom opening whereby that portion of the flexible shaft in the handle extends downwardly at an angle to the portions in the tubular shaft and the hollow stationary flexible shaft guide.

5. A portable driving tool for the flexible shaft of a drain cleaning device and embodying therein electric motor means including an armature shaft, means secured directly to one end of said motor means and providing a hollow handle for holding the tool, means secured directly to the other end of said motor means and there pro-

viding a hollow casing, means providing a passageway having a straight portion for said flexible shaft between said hollow handle and said hollow casing, a tubular shaft journalled in alignment with said straight portion of said passageway, said flexible shaft being adapted to extend through said tubular shaft, said passageway and said hollow handle respectively, means carried by said tubular shaft outside of said casing and operable to connect said flexible shaft to said tubular shaft, and means in said casing for transmitting power from said armature shaft to said tubular shaft.

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