PORTABLE DRILL HAVING AN INTERNAL COMBUSTION ENGINE

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ABSTRACT

A portable drill having an internal combustion engine and a shiftable gear mechanism is provided. The gear mechanism has an output shaft for driving a tool. An input shaft of the gear mechanism is driven by a crankshaft of the internal combustion engine. The gear mechanism is provided with a neutral speed or gear setting in which the output shaft is uncoupled from the input shaft.
PORTABLE DRILL HAVING AN INTERNAL COMBUSTION ENGINE

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a portable drill that has an internal combustion engine and a shiftable gear mechanism that is accommodated in a housing. The gear mechanism has an output shaft for driving a tool, and an input shaft that is driven by the crankshaft of the internal combustion engine.

[0002] GB 2 187 664 A discloses a hand-holdable drilling machine having an internal combustion engine, the crankshaft of which drives an input shaft of a gear mechanism. Interposed between the input shaft and the internal combustion engine is a centrifugal clutch. The gear mechanism is a step gear mechanism that can be shifted via a gear shifting mechanism, which is embodied as a rotary knob for controlling the displacable gears, so that as a function of the selected gear an output shaft and a drill chuck, which is fixedly held thereon and is provided with a drilling tool, are rotatable at various speeds.

[0003] If during operation of such a hand-holdable drilling machine the load moment exceeds a prescribed value, which is the case if the drilling tool becomes stuck, the result is that the internal combustion engine stalls and hence the operation is interrupted. It is therefore necessary to restart the internal combustion engine which depending upon the circumstances can be a laborious and time consuming process.

[0004] It is therefore an object of the present invention to improve a portable drill of the aforementioned general type in such a way that it is easier to handle.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] This object, and other objects and advantages of the present invention, will appear more clearly from the following specification in conjunction with the accompanying schematic drawings, in which:

[0006] FIG. 1 is a side view of one exemplary embodiment of an inventive portable drill that has an internal combustion engine;

[0007] FIG. 2 is a view of the gear mechanism of the portable drill showing an actuating element of the gear shifting mechanism in the neutral speed or gear stage;

[0008] FIG. 3 is a view of the gear mechanism with the actuating element in the position for the first speed or gear setting; and

[0009] FIG. 4 is a view of the gear mechanism with the actuating element in the position for the second speed or gear setting.

SUMMARY OF THE INVENTION

[0010] The portable drill of the present invention is characterized primarily in that the gear mechanism is provided with a neutral speed or gear setting in which the output shaft is uncoupled from the input shaft.

[0011] To simplify the handling of the portable drill, especially if the drilling tool becomes stuck, and to enable a restarting of the internal combustion engine, a neutral speed or gear setting is provided in the gear mechanism. If the neutral gear setting is selected, the output shaft, to which the drill chuck is fixedly connected for driving the tool, is uncoupled from the input shaft of the gear mechanism and is freely rotatable, so that when the engine starts up no load acts upon the crankshaft.

[0012] In addition to the neutral gear setting, the gear mechanism is expediently provided with two speed or gear settings, and a gear setting for reversing the direction of the tool. So that after the internal combustion engine has been restarted, various speed or gear settings having different transmission ratios can be selected from the neutral gear setting, it is expedient to design the neutral gear setting in the gear mechanism such that, for example by appropriate arrangement of shifting gears, it is possible to shift directly from the neutral gear setting not only into the first but also into the second speed or gear setting. The operational control of the internal combustion engine with the tool is designed in a suitable manner, for example by the provision of a shiftable coupling or a centrifugal clutch, such that the gear shifting mechanism can be actuated not only when the internal combustion engine is not running, but also when the engine is in operation.

[0013] The gear shifting mechanism is provided with an actuating element for the manual selection of the various speed or gear settings, and is itself preferably mounted in the gear housing. The actuating element is expediently embodied as a rotary knob or handle, with the aid of which the gear settings can preferably be selected with the following sequence: reversal of direction of rotation—first gear setting—neutral gear setting—second gear setting, and conversely in the opposite direction. For the manual operation of the rotary knob it is expedient to provide a crossbar or elongated grip element on the rotary knob, one end of which points to the symbols for the gear settings that are disposed about the actuating element on one of the housing parts. The symbols for the individual gear settings are expediently monolithically embodied with the housing component of the portable drill, and in particular in the manner of a relief or embossment, i.e. are either stamped into the surface of the housing component or project therefrom. Pursuant to one particularly preferred embodiment of the invention, the actuating element, or the rotary knob, is disposed on a side surface of the portable drill or of the gear housing. With the aid of the inventive neutral gear setting and its disposition between the first and second gear settings it is possible during starting of the internal combustion engine, or after an interruption of the operation of the internal combustion engine due to a drilling tool becoming stuck, to select the neutral gear setting prior to restarting the internal combustion engine, whereby in such neutral gear setting the internal combustion engine can be operated over the entire speed range without transmitting torque to the drilling tool. After setting the internal combustion engine to the idling speed, one of the gear settings can be selected and by increasing the speed of the internal combustion engine, as well as by the coupling of the centrifugal clutch that is caused thereby, the drilling tool can be moved.

[0014] Further specific features of the present invention will be described in detail subsequently.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0015] Referring now to the drawings in detail, the side view of FIG. 1 shows a portable drill 1, which essentially
comprises a motor housing 20 with an internal combustion engine 2, which has a crankshaft 9, disposed therein as a drive motor. The internal combustion engine 2 can be a valve-controlled or port-controlled two-cycle engine, a four-cycle engine, or some other type of internal combustion engine, such as a rotary piston engine. By means of a centrifugal clutch, the internal combustion engine 2 drives a schematically indicated input shaft 8 of a gear mechanism 5 that is disposed at one end of the motor housing 20. The gear mechanism 5 is disposed in an encased manner in a gear housing 3. Projecting out of the gear housing 3, in the direction of the longitudinal axis 21 of the portable drill 1, is an output shaft 6 that has a drill or tool chuck 22. A front handle 24, which can be fixed in any desired position of rotation, is rotatably disposed on a neck 23 of the gear housing 3, preferably by means of an annular flange. Disposed on that end that in the longitudinal direction of the portable drill 1 is opposite the tool chuck 22 is a handle 25 that spans the end face 26 of the motor housing 20 in a U-shaped manner. The internal combustion engine 2, and the gear mechanism 5 that is fixed in position on the motor housing 20 thereof, form a rigid unit. The gear housing 3 is disposed with adequate play relative to the front end face of the motor housing 20.

[0016] As shown in FIGS. 1 to 4, disposed on a side surface 19 of the gear housing 3 is an actuating element that is embodied as a rotary knob or handle 15, and that has a circular base. The rotary knob 15 is part of a gear shifting mechanism 4, which serves for the selection of three speeds or gear settings 16 and a neutral speed or gear setting 10 of the gear mechanism 5. For manual actuation thereof, the rotary knob 15 is provided with a grip element 17 that extends from the base thereof and is in the form of a crossbar. The grip element 17 is provided at one of its ends with a projection 26 that extends beyond the base of the rotary knob and via which the grip element is directed in the manner of a pointer toward a respective one of the symbols 18 that indicates a selected gear setting.

[0017] In the illustrated embodiment, in FIG. 2 the projection 26 of the grip element 17 is directed toward the symbol “N” on the side surface 19 of the gear housing 3. In this connection, “N” signifies the neutral gear setting 10 in which the output shaft 6 is uncoupled from the input shaft 8. FIGS. 3 and 4 show the positions of the grip element 17 as directed toward the symbols “1” or “2”, with such operating positions indicating a first gear setting 11 or a second gear setting 12. The first and second speed or gear settings 11 and 12 differ from one another by their respective transmission ratio, and hence different, possible speeds of the output shaft 6 which can be expediently set by gears that can be displaced and fixed in position upon the output shaft 6. In addition, the gear mechanism 5 is provided with a gear setting 13 for reversing the direction of rotation of the output shaft 6, whereby the gear setting 13 on the side surface 19 of the gear housing 3 is characterized by the symbol “R”.

[0018] As can be seen from FIGS. 2 to 4, and the arrangement of the symbols (R, 1, N, 2) on the gear housing 3, the rotary knob 15 is rotatable in a clockwise manner from the gear setting 13 for the reversal of direction via the first gear setting 11, and the neutral gear setting 10 to the second gear setting 12. The gear shifting mechanism 4 is designed such that it can be actuated not only when the internal combustion engine 2 is stopped, but also when it is in operation. The rotary knob 15 can preferably be automatically arrested in every gear setting and is rotatably secured in the gear housing 3 against a reaction force out of such a prescribed position.

[0019] As shown in FIGS. 2 to 4, the neutral gear setting 10 is disposed between the first and second gear settings 11 and 12, so that a direct transition to one of these settings is possible. This has the advantage that even if the light conditions are poor, or some other conditions exist that obstruct visibility, the first and second gear settings of the portable drill 1 can be easily and directly set from the neutral gear setting “N” without having to pass through other arresting positions. An operator can quickly become familiar with the arrangement of the gear setting “1” in a counterclockwise direction and the gear setting “2” in a clockwise direction, so that this “blind” locating causes no difficulty. As a consequence of the present invention with a neutral gear setting, a load-free starting of the internal combustion engine is made possible independently of the type of remaining components of the portable drill. The reversal of the direction of rotation provided in a further embodiment enables not only a normal manner of operation in both directions of rotation, but can also be utilized to assist in the release of tools that have become stuck.


[0021] The present invention is, of course, in no way restricted to the specific disclosure of the specification and drawings, but also encompasses any modifications within the scope of the appended claims.

I claim:

1. A portable drill having an internal combustion engine with a crankshaft, comprising:

a shiftable gear mechanism that is accommodated in a housing, wherein said gear mechanism has an output shaft for driving a tool, and has an input shaft that is driven by said crankshaft, and wherein the internal combustion engine is driven by said crankshaft, and wherein said gear mechanism is provided with a neutral gear setting in which said output shaft is uncoupled from said input shaft.

2. A portable drill according to claim 1, wherein said gear mechanism is provided with at least a first gear setting and a second gear setting.

3. A portable drill according to claim 2, wherein said gear mechanism is provided with a further gear setting for reversal of a direction of rotation of said output shaft.

4. A portable drill according to claim 2, wherein said neutral gear setting of said gear mechanism is disposed in such a way that it is possible to directly select therefrom either said first gear setting or said second gear setting.

5. A portable drill according to claim 2, wherein a gear shifting mechanism is provided on said gear mechanism and is actuable during non-running of said internal combustion engine.

6. A portable drill according to claim 2, wherein a gear shifting mechanism is provided on said gear mechanism and is actuable in an idling speed range of said internal combustion engine when the latter is in operation.

7. A portable drill according to claim 2, wherein a gear shifting mechanism is provided on said gear mechanism and is provided with an actuating element for a manual selection
of one of said gear settings, and wherein said actuating element is mounted in said housing of said gear mechanism.

8. A portable drill according to claim 7, wherein said actuating element is a rotary knob, and wherein by rotation of said rotary knob it is possible to select the following gear settings of said gear mechanism: reversal of direction of rotation, first gear setting, neutral gear setting, second gear setting, and vice versa.

9. A portable drill according to claim 8, wherein said rotary knob is provided with an elongated grip element that in turn is provided with a projection that points to symbols on said housing that indicate a selected gear setting of said gear mechanism.

10. A portable drill according to claim 8, wherein said rotary knob is provided with a crossbar that is provided with a projection that points to a symbol on said housing that indicates a selected gear setting of said gear mechanism.

11. A portable drill according to claim 7, wherein said actuating element is disposed on a side surface of said portable drill or of said housing.

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