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(54) **Shaft lock and on/off switch arrangement for a rotary power tool**

(57) A rotary tool (10) of the type which comprises an electric motor (4), which is connected to an output shaft (6) for mounting a variety of interchangeable working tools, is provided with an on/off switch 44 for con-

trolling the supply of electrical energy to the motor (4), and a shaft lock (38) for securing an output shaft (6) against rotation. The on/off switch 44 is provided with means (46,50) for preventing activation of the shaft lock (38) while the on/off switch (44) is in the on position.

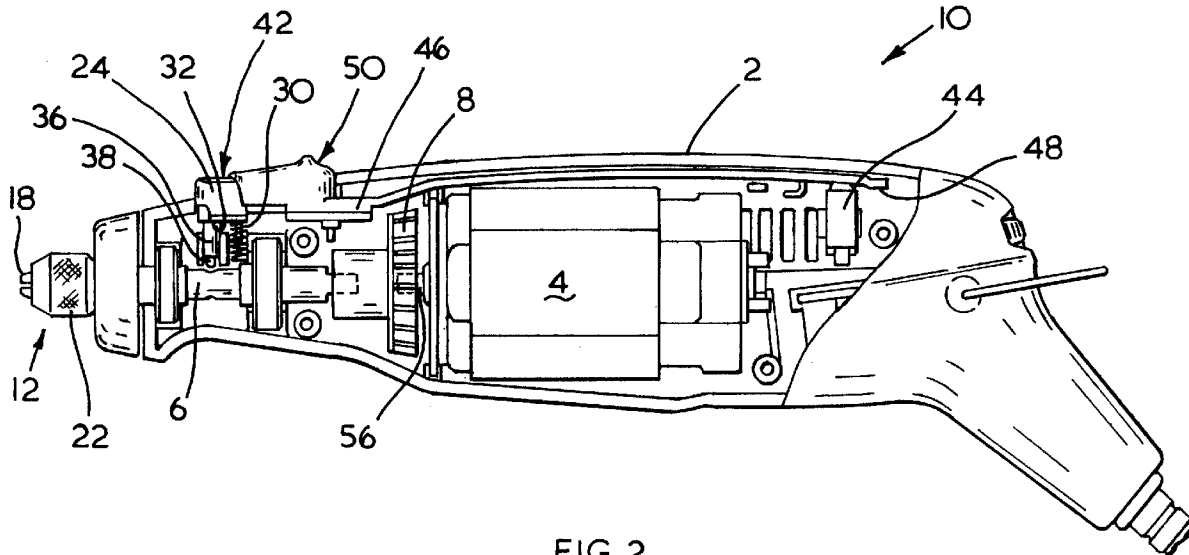


FIG. 2

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Description

The present invention relates to a rotary tool, in particular a rotary tool which is designed to drive a rotary working tool such as a rotating disc, screwdriver head, or engraving disc. The invention relates in particular to a rotary tool which is designed to drive a variety of interchangeable rotary working tools.

The present invention further relates to an on/off switch for a power tool.

In a rotary tool which is designed to drive a variety of interchangeable rotary working tools, the tool comprises a housing in which an electric motor is provided which motor drives a tool output shaft either directly or through intermediate elements. The output shaft terminates at its free end remote from the motor in a mount for releasably retaining one of a plurality of rotary working tools.

Known retaining elements include a collet structure (disclosed in US Patent No. 2,218,168) in which the output shaft is hollow and receives a collet in the forward end. Both the output shaft and the collet extend externally of the housing of the tool. A variety of working tools, each of which is provided with a shank, may be mounted on the output shaft by means of the collet.

In order to remove the working tool from the output shaft, the shaft must be secured against rotation. US Patent No. 3,873,863 discloses a shaft lock which is activated by a push button which extends through an opening in the housing.

Known rotary tools further comprise an on/off switch for controlling the supply of electrical energy to the motor. The tool may be cordless, comprising a battery, or may be provided with a cord for connection to a source of supply of electricity.

Known rotary tools of this type have the disadvantage that the on/off switch for the supply of energy to the motor is independent of the shaft lock. This could lead to the motor being switched on while the shaft lock was engaged which could cause damage to the tool.

It is an object of the present invention to provide a rotary tool in which the above disadvantages are reduced or substantially obviated.

It is a further object of the invention to provide an improved on/off switch for a rotary tool of the type described above.

The present invention provides a rotary tool of the type which comprises an electric motor, which motor is connected to an output shaft for mounting a variety of interchangeable working tools, and is provided with an on/off switch for controlling the supply of electrical energy to the motor, and a shaft lock for securing the output shaft against rotation, characterised in that the on/off switch is provided with means for preventing activation of the shaft lock while the on/off switch is in the on position.

The present invention further provides an on/off switch for a rotary tool of the type which comprises an

output shaft for mounting a variety of interchangeable working tools and is provided with a shaft lock to secure the shaft against rotation during removal and subsequent fitting of a working tool, characterised in that the on/off switch is provided with means for preventing activation of the shaft lock while the on/off switch is in the on position.

A preferred embodiment of a rotary tool will now be described with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a rotary tool;

Figure 2 is a view of a rotary tool, with the housing partially broken away, showing the on/off switch in the off position;

Figure 3 is a similar view to Figure 2, showing the on/off switch in the on position; and

Figure 4 is a partial view, to a larger scale, of the output shaft and shaft lock of a rotary tool.

A rotary tool, shown generally at 10, comprises a housing 2, in which is located an electric motor 4. A tool output shaft 6 is driven by the motor 4 through intermediate elements, including a fan 8.

The output shaft 6 is hollow, and receives a collet 12 in the end 20 remote from the motor 4.

The output shaft 6 and collet 12 extend externally of the housing 2.

The collet 12 has a cylindrical base and a tapered head and is split such that the head includes several forward end portions 18 which are generally biased slightly radially outwardly. The forward end 20 of the output shaft 6 is screw-threaded, and receives an internally screw-threaded collet nut 22 which is also hollow, and which is disposed about the collet head 16. Forward of the screw-threading, the collet nut 22 has a smooth tapered interior surface.

A variety of working tools may be used with the rotary tool 10 for example, a rotating disc, screwdriver head, engraving disc, etc. Each working tool includes a shank.

In order to mount a working tool on the rotary tool 10 the collet nut 22 is loosened by unscrewing. As the nut 22 moves forwardly, the split forward end portions 18 of the collet head move away from each other due to their bias. The shank of the working tool is inserted through the open end of the nut 22 and between the forward ends 18 of the collet head. The nut 22 is tightened, forcing the forward ends 18 of the collet 12 together to hold the working tool shank securely within the output shaft 6. Rotation of the output shaft 6 causes rotation of the collet 12, and thus the working tool, due to the frictional contact between each element. In addition, the squeezing of the collet forward end portions 18 against the working tool shank by the nut 22 serves to retain the collet 12 and working tool within the output shaft 6, as well as to increase the frictional grip of the collet 12 on the working tool shaft.

The rotary tool 10 includes a push button 24 which extends through an opening 26 in the housing 10. The button 24 includes an integrally formed downwardly extending pin 28.

A coil spring 30 is disposed about the pin 28 and extends between the internal surface 32 of the button 24 and an inner ledge 34 formed in the housing 2 so as to bias the push button 24 radially outwardly away from the tool output shaft 6.

The rotary tool includes a push button 24 which extends through an opening in the housing. The button 24 further includes a downwardly extending shaft 34 having a cylindrical main section 36 having a lower protrusion 38 of reduced diameter.

The output shaft 6 includes two openings 40 formed therein. The coil spring 30 biases the push button 24 away from the output shaft openings 40 so that the protrusion 38 does not interfere with normal operation. However, when the button 24 is pushed at its external surface 42, the shaft 34 is forced radially inwardly against the spring bias until the protrusion 38 contacts the outer surface of the shaft 6. With the button 24 held down, the output shaft 6 may be rotated by grasping and rotating the collet nut 22, until the protrusion 38 is aligned with one of the openings 40 in the shaft 6. The inward pressure on the button 24 causes the protrusion 38 to enter the opening 40, thereby securing the output shaft 6 against rotation. Further rotation of the nut 22 while the output shaft 6 is held stationary allows the nut 22 to be loosened and removed.

As can be seen in Figures 2 and 3, the on/off function is controlled by an internal on/off push-button switch 44 disposed near the rear of the housing 2. A sliding switch 46 is disposed within and extends longitudinally along the housing 2 and includes a radially inward rear flange 48 which is disposed adjacent the internal button 44. At the forward end, the sliding switch 44 includes a cover portion 50 which is disposed through a housing slot 52 adjacent and behind the shaft lock push button 24. The cover portion 50 is hollow and includes a forward opening 54 which surrounds the rear portion of the push button 24.

With the slide switch 46 in the rear position, the rear flange 48 is out of contact with the internal on/off push button switch 44 and the cover portion 50 is disposed rearwardly of the external shaft lock push button 24. Accordingly, the tool is switched off, and the user has access to the shaft lock push button 24. Thus, the shaft lock can be actuated to change the tool and/or collet. When the slide switch cover portion 50 is slid forwardly, the rear flange 48 contacts the internal on/off push button 44 to switch the tool on. Furthermore, the cover portion 50 is slid completely over the shaft lock push button 24 so as to prevent the shaft lock button 24 from being pushed. Accordingly, inadvertent actuation of the shaft lock when the tool is switched on is prevented.

With further reference to Figures 2 and 3, the fan 8 is disposed between the tool output shaft 6 and motor

output shaft 56. The fan 8 is secured upon the motor output shaft 56, and the tool output shaft 6 is really a driven shaft disposed within an opening in the fan 8. In addition, the fan 8 is non-conductive to isolate the motor 4 electrically from the metallic tool output shaft 6 and thus the working tool.

Claims

1. A rotary tool (10) of the type which comprises an electric motor (4), which motor (4) is connected to an output shaft (6) for mounting a variety of interchangeable working tools, and is provided with an on/off switch 44 for controlling the supply of electrical energy to the motor (4), and a shaft lock (38) for securing an output shaft (6) against rotation, characterised in that the on/off switch 44 is provided with means (46,50) for preventing activation of the shaft lock (38) while the on/off switch (44) is in the on position.
2. A rotary tool according to claim 1 characterised in that the on/off switch (44) is located internally of a housing (2) for the tool (10).
3. A rotary tool according to claim 1 or claim 2 characterised in that the tool output shaft (6) is provided with a collet assembly (12) for securing a working tool.
4. A rotary tool according to any of claims 1 to 3 characterised in that the shaft lock (38) comprises a protrusion (38) for engagement in an opening (40) provided in the shaft (6).
5. A rotary tool according to any of claims 1 to 4 characterised in that the shaft lock (38) is activated by a push button (24) which projects through an opening (26) in the housing (2) and is biased radially outwardly by means of a coil spring (30).
6. A rotary tool according to any of claims 1 to 5 characterised in that the means for preventing activation of the shaft lock (38) while the on/off switch (44) is in the on position comprises a slide switch (46) which terminates at one end in a cover portion (30) and at the other end in a flange (48).
7. A rotary tool substantially as herein described with reference to the accompanying drawings.
8. An on/off switch (44) for a rotary tool (10) of the type which comprises an output shaft for mounting a variety of interchangeable working tools and is provided with a shaft lock 38 to secure (9) the shaft (6) against rotation during removal and subsequent fitting of a working tool, characterised in that the on/

off switch (44) is provided with means (46,50) for preventing activation of the shaft lock (38) while the on/off switch (44) is in the on position.

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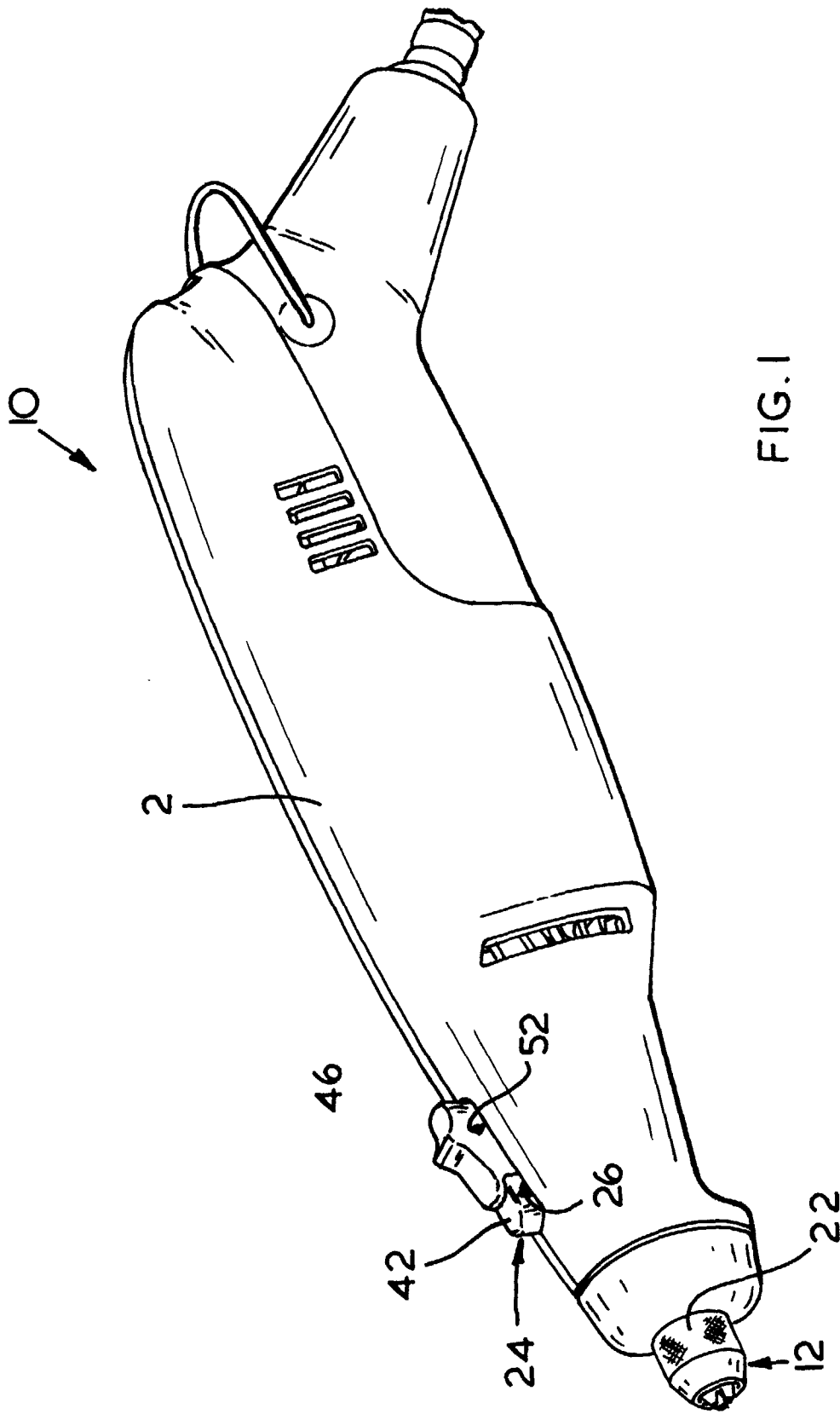
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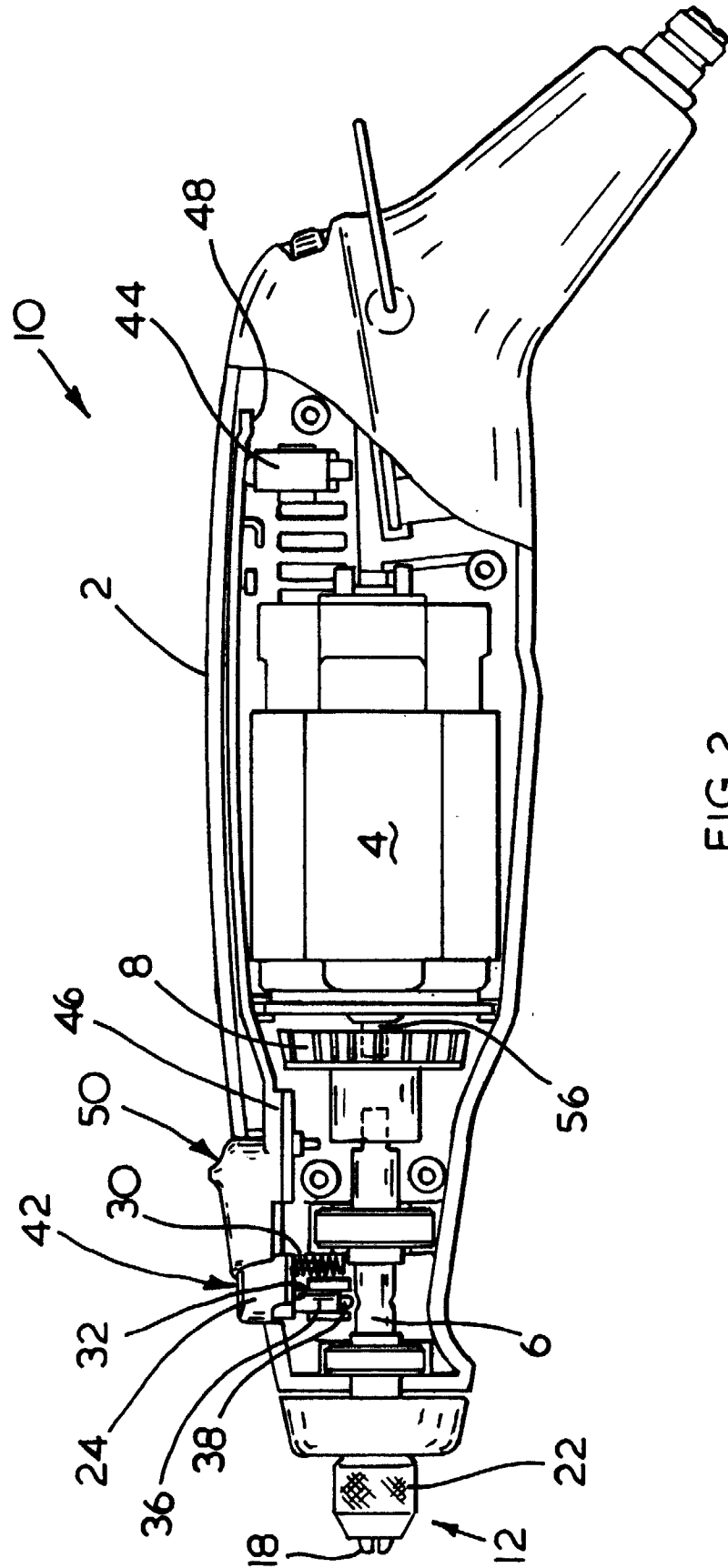


FIG. 2

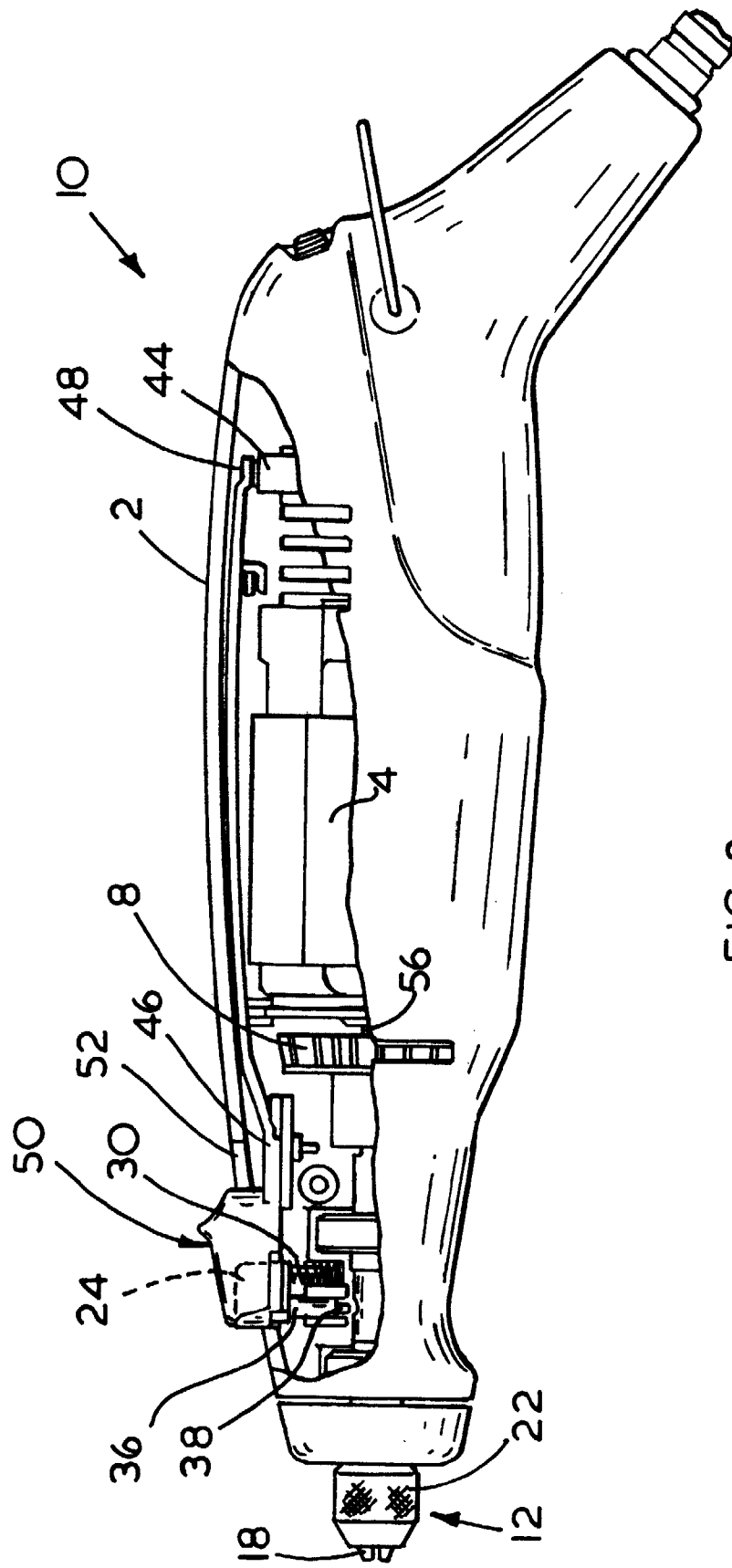


FIG. 3

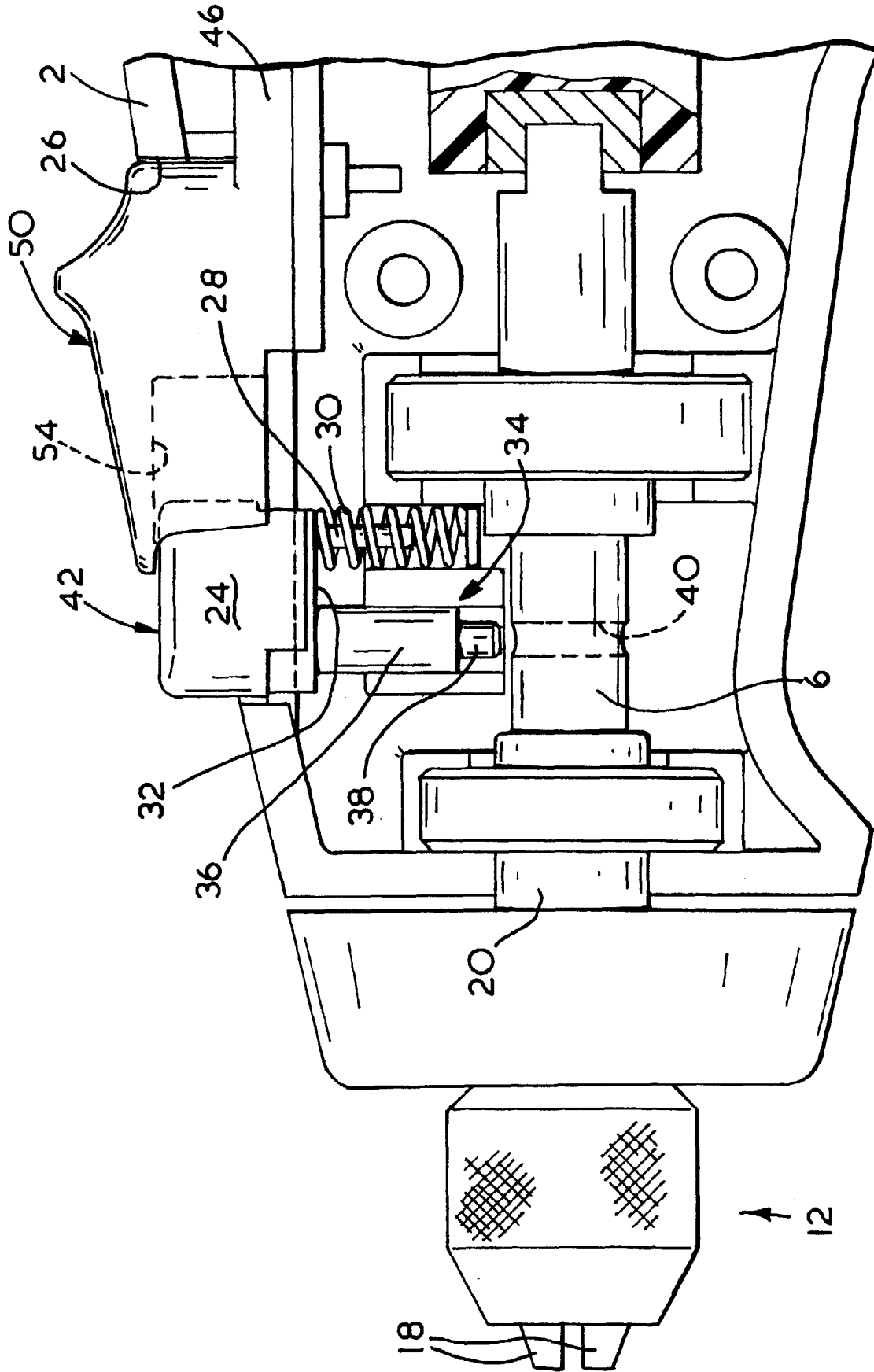


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 98 30 4909

| DOCUMENTS CONSIDERED TO BE RELEVANT | | | | |
|---|--|---|--|--------------------------------------|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int.Cl.6) | |
| X | US 5 601 483 A (RUDOLF BORIS ET AL) 11 February 1997 * the whole document * --- | 1,2,6,8 | B25F5/00 B24B23/02 | |
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| Y | | 3,4 | | |
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| Y | US 4 754 669 A (VERDIER ALAIN ET AL) 5 July 1988 * column 7, line 33-49; figure 1 * --- | 3 | | |
| Y | US 3 872 951 A (HASTINGS JR CHARLES RUSSELL) 25 March 1975 * column 2, line 29-47; figures 2,8-10 * --- | 4 | | |
| A | EP 0 612 588 A (KRESS ELEKTRIK GMBH & CO) 31 August 1994 * the whole document * --- | 1,8 | | TECHNICAL FIELDS SEARCHED (Int.Cl.8) |
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| The present search report has been drawn up for all claims | | | | |
| Place of search THE HAGUE | | Date of completion of the search 27 October 1998 | Examiner Pettersson, M. | |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>& : member of the same patent family, corresponding document</p> | | | | |

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