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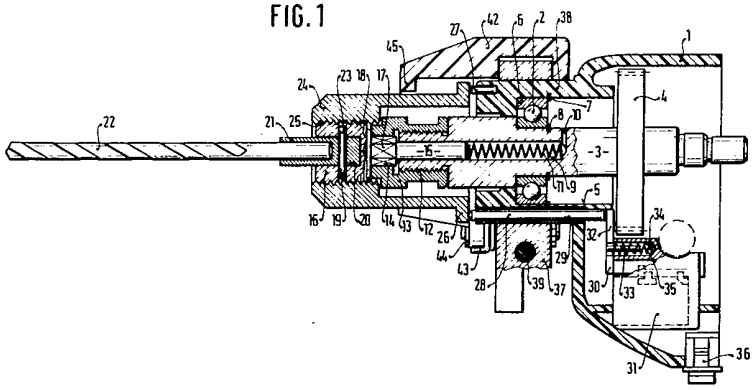
(54) **A control device for machine tools**

(57) A control device for machine tools includes a sensor 29 which contacts a control surface of a tool adaptor member 24 of an inserted tool 22, and initiates regulation of the tool drive to suit the characteristics of the identified tool, e.g. through a sliding switch 30,31, controlling the current supply to a driving motor.

FIG. 1



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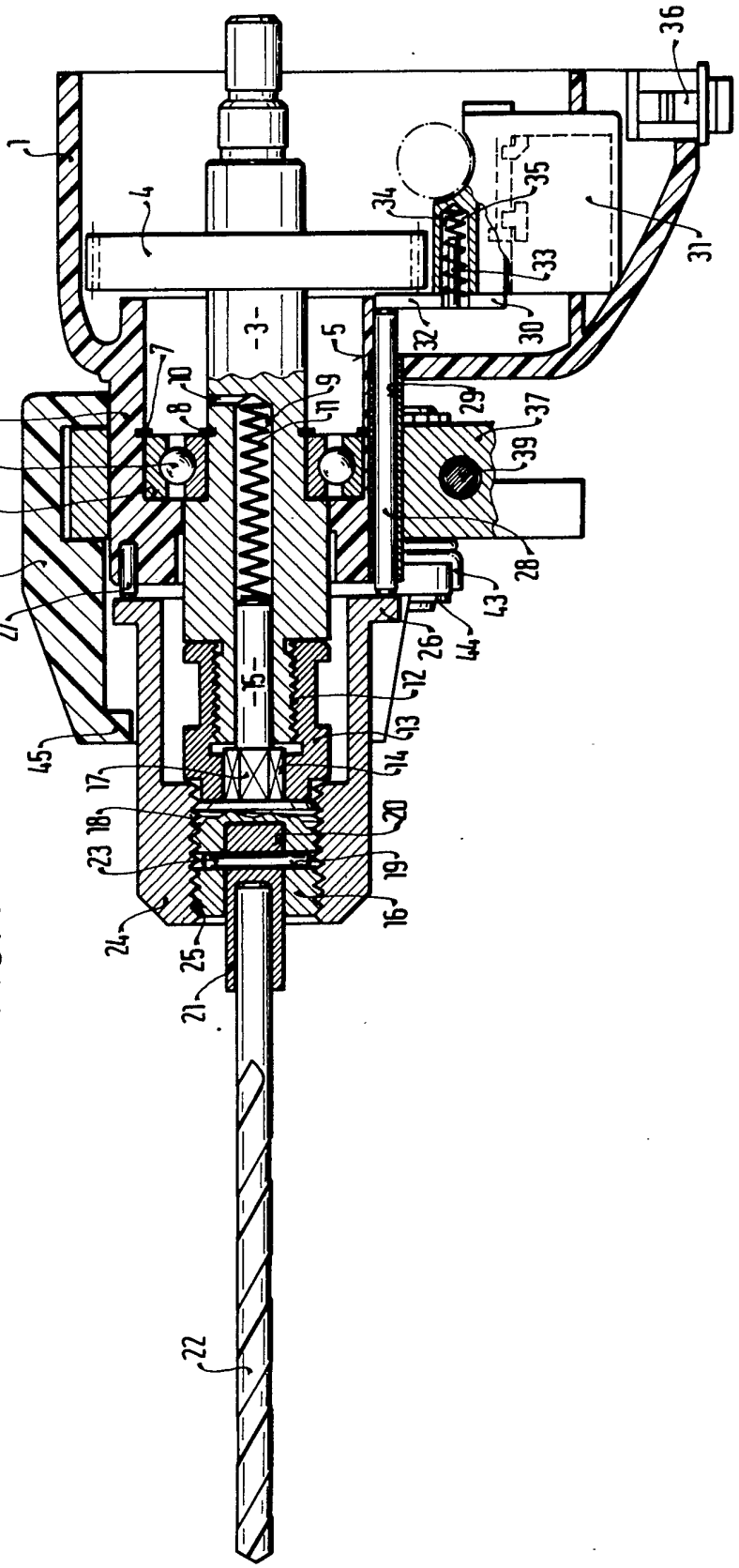
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FIG. 1

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FIG. 2

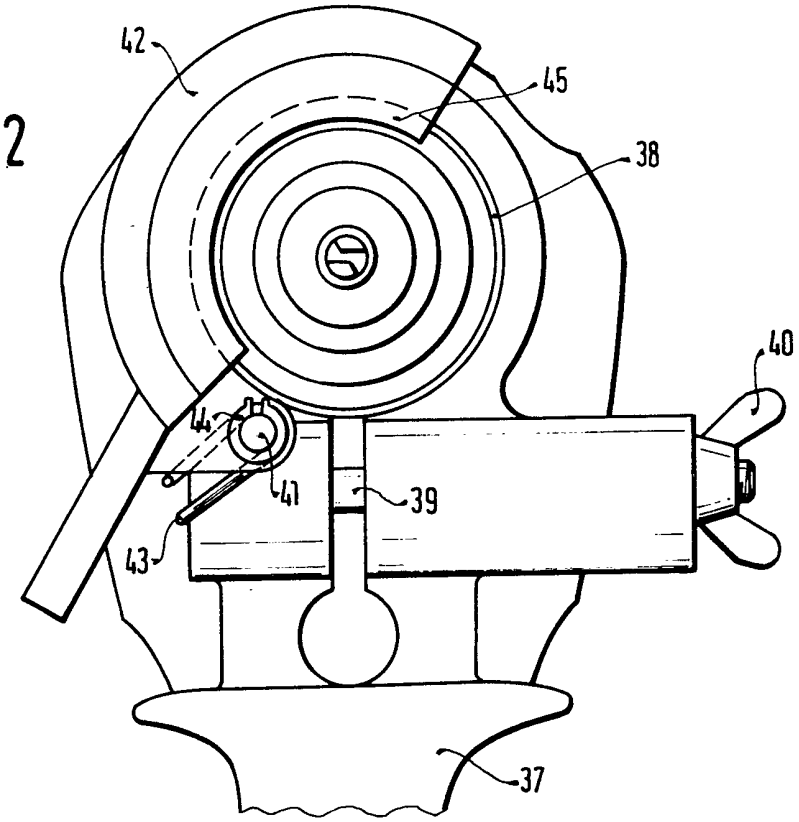
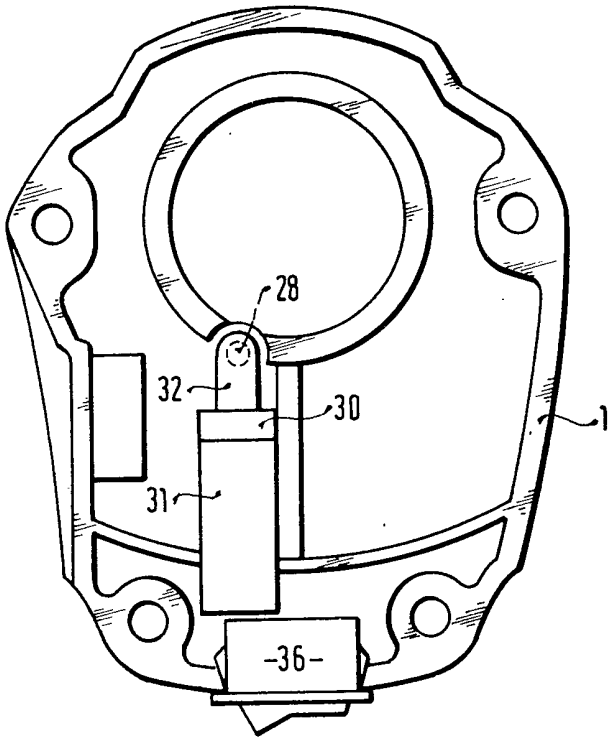


FIG. 3



SPECIFICATION

A control device for machine tools

The invention originates from a control device according to the preamble of the main claim. It is known, for example, to preset the speed of a machine tool in accordance with a formula. In that case an additional stepping switch is often used, especially with drilling machines, which sets the tool drive to a slow speed for starting a bore hole in stage I. If the switch is depressed completely then it switches to stage II and causes the tool drive to proceed according to the presetting. By-pass switches are also known for drilling different successive materials in one working operation, in which the presetting can be made ineffective. In known hand machine tools, the said presetting takes place by means of small setting wheels. This kind of adjustment is quite laborious particularly when these setting wheels are incorporated in the on-off switch for the machine and are not easy to grip. Moreover, particularly with hand machine tools, such setting wheels are inconvenient because the supporting hand needs to be used additionally for the switching functions. Thus, the operator is prevented from applying a rigid grip and consequently cannot hold the machine tool securely. When the work to be accomplished requires a rapid tool change the setting by means of the known setting wheels is particularly complicated. During frequent rapid resetting operator errors cannot be avoided. In such cases, the tool drive is then not optimal. The setting operation to be accomplished is not after all difficult and time-consuming for that reason because before drilling, for example, not only the drill diameter but also other factors such as drill material and material to be operated on need be considered.

Advantages of the invention

As opposed to this, the control device in accordance with the invention comprising the characterising features of the main claim has the advantage that each tool can be provided with its control pattern for an optimal drive. This is especially for hand machine tools of many uses because in that case one and the same machine must often by used with frequent changes. In handicraft or even when used for a hobby the use of a plurality of machines each with a particular tool and tool drive preset for the purpose is generally not possible for reasons of cost. The simultaneously used rapid change device for the tools for this purpose improves the utility of such a machine tool and of its tools still futher.

Advantageous further developments and improvements of the control device set forth in the main claim are made possible by the measures set forth in the sub-claims. Of particular advantage is the automatic stopping of the tool relieved of the working pressure. It provides the rapid tool change and reduces the operating noise during pauses in the work.

Drawing

An embodiment of the subject matter of the invention is illustrated in the drawing and is described in detail in the following specification. Figure 1 shows a longitudinal section through a control device according to the invention provided with the forward cover of a hand drilling machine, Figure 2 is an end view of Figure 1 and Figure 3 is an end view of Figure 1 taken in the opposite direction to the view according to Figure 2. Moreover, the tool driving shaft with its driving wheel is omitted from Figure 2.

Description of the embodiment

The forward cover 1 of a hand drilling machine not illustrated in further detail receives a driving spindle 3 with its driving wheel 4 in a ball bearing 2. Moreover, the ball bearing 2 is retained in a bore 5 in the forward cover 1 and is secured against axial displacement in the bore 5 by a shoulder 6 in the said bore and a retaining ring 7. The axial security for the driving spindle 3 in the ball bearing 2 is guaranteed on the one hand by stepping the driving spindle 3 and on the other hand by a retaining ring 8. At the end, the driving spindle 3 has an axial bore 9 which is ventilated at its end by a radial bore 10. A helical spring 11 is inserted in the bore 9. At the end, the driving spindle 3 forms a threaded pin 12 which can receive a normal chuck not illustrated in this instance. In the example, an adapter 13 which forms a female element is screwed onto the said threaded pin 12. A guide pin 15 of a tool receiving pin 16 which also forms a shaped shaft portion 17 is inserted in the bore 9 in front of the helical spring 11. This shaped shaft portion 17 engages in the female element 14. The outer end of the tool receiving pin 16 forms a head with an external thread 18, a radial bore 19 and an axial receiving bore 20. The receiving bore 20 is designed for the reception of various tool shanks, in this case the tool shank 21. The tool shank 21 is rigidly connected to a drill 22. The radial bore 19 also passes through the tool shank 21. A cylindrical pin 23 inserted in the said bore 19 connects the tool shank 21 to the head of the tool receiving pin 16 for positive rotation therewith. A sleeve 24 is screwed onto the external thread 18 on the head of the tool receiving pin 16. Its screwthread 25 cooperating with the external thread 18 is cut in a bore in the sleeve 24 which is longer than the head of the tool receiving pin 16. The sleeve 24 extends over the adapter 13 and for the most part also over the portion of the driving spindle 3 projecting out of the forward cover 1. At its end facing the forward cover 1 the sleeve 24 forms a flange 26. In the illustrated condition, the end surface of the sleeve 24 engages the rounded end surface of a pin 27 which is fixed in the forward cover 1 and projects out of the end surface of the cover facing the sleeve 24 a pin 28 also serving as a sensor engages the said end surface of the sleeve 24. This pin 28 is guided in a bore 29 which is accommodated in the forward cover 1 parallel to the rotary axis of the tool. The pin 28 projects into the interior of the forward cover 1 and at its inner end carries the movable part 30 of a regulator 31. This movable part 30 of the regulator is also guided on the regulator 31 by the pin 28. A connecting plate 32 from the pin 28 to the movable regulator part 30 carries a pin 33 which engages in a bearing bore 34

in the forward cover 1 and in which is inserted a compression spring 35. This compression spring 35 always attempts to push a pin 28 out of the forward cover 1 and thus urges it against the end surface of the sleeve 24. The regulator 31 is designed to control the tool drive from zero load when the tool is removed from the workpiece up to maximal possible load. A switch 36 is provided in the current supply circuit for the tool drive in such a manner that it can shunt the regulator 31. An extension hand grip 37 is rigidly fixed to the clamping neck 38 of the forward cover 1. In so doing, a threaded bolt 39 with a wing nut 40 serves as the clamping means. The extension handle 37 receives a bolt 41 the longitudinal axis of which is arranged parallel to the longitudinal axis of the tool. A retaining member 42 is pivotally mounted on the bolt 41. Moreover, a cylindrical helical coiled spring 43 is pushed over the bolt 41 between the extension handle 37 and the securing member 42. This spring 43 is so pretensioned that it always attempts to pivot the securing member 42 towards the clamping neck 38. A retaining ring 44 secures the securing member 42 and the spring 43 on the bolt 41. The securing member 42 has a flange 45 and in its position pivoted against the clamping neck 38 adjacent to the clamping neck 38 and parts of the extension handle 37, it can also overlap the sleeve 24. In so doing, the flange 45 is located in the range of axial movement of the flange 26 on the sleeve 24. Thus, the pin 27 and the flange 45 limit the maximal play of the sleeve 24 in an axial direction. According to the setting of the sleeve 24 on the tool receiving pin 16 this maximum axial clearance of the sleeve 24 is utilized to a greater or lesser extent. When the axial position of the sleeve 24 with respect to the tool receiving pin 16 is so selected that the said tool receiving pin 16 engages the adapter 13 before the end surfaces of the sleeve 24 comes to rest with the flange 26 engaging the end surface of the pin 27, the maximal axial clearance of the sleeve 24 is not exhausted. This means that the pin 28 always engaging the end surface of the sleeve 24 sets the regulator 31 to a lower speed for the driving spindle 3.

For operating with a machine tool which is provided with the control device according to the invention, various tools (drills) are prepared with a tool receiving pin 16 and a sleeve 24. In so doing, the sleeve 24 is arranged in such an axial position with respect to the tool receiving pin 16 by screwing onto the latter that the speed for the type of tool can be sensed from the end surface of the sleeve 24 by the pin 28. For tool changing, the securing member 42 is pivoted away from the clamping neck 38 of the forward cover 1 against the action of its spring 43. When the flange 45 is removed out of the range of axial movement of the flange 26, the tool, together with the sleeve 24, can be removed. In the beginning, the removing movement is supported by the helical spring 11. In order to insert a new tool (drill) the securing member 42 must be retained in the same position. The guide pin 15 is then inserted in the bore 9 in the driving spindle 3 and pushed in against the action of the helical spring 11 until the flange 45 can trap the sleeve 24 by gripping behind its flange 26. The released securing member 42 swings in under the action of its spring 43 into its securing position. At the same time, the tool drive is limited to a regulation of the speed from zero up to the optimal speed for the inserted tool. Moreover, the length of coupling between the female portion 14 of the adapter 13 and the shaped shaft portion 17 of the tool receiving pin 16 is so designed that, in the position of the regulator 31 for zero speed, the two coupling parts come out of engagement more positively. This matching can, of course, be such that the tool is uncoupled from its drive earlier than when the regulator has reached its zero position. This can also be varied by selection from tool to tool of the particular length of the shaped shaft portion 17.

CLAIMS

1. A control device for machine tools, especially hand machine tools, provided with an adjuster controlled by the tool for setting a fitted tool drive, characterised in that, it comprises a sensor for a control member provided at the end of the tool and which senses the said control member and transmits its characteristics for controlling the tool drive.

2. A control device according to claim 1 characterised in that the control member of the tool is a control surface the position of which with respect to the sensor determines the control of the tool drive.

3. A control device according to one of claims 1 and 2 characterised in that the sensor controlled motor regulation can be shunted by a manual switch.

4. A control device according to one of claims 1 to 3 characterised in that the tool is stopped when completely relieved of working pressure.

5. A control device according to claim 4 characterised in that the tool can be uncoupled from the drive and the uncoupled positions is set with the tool fully relieved of working pressure.

6. A control device according to claim 4 characterised in that the current supply for the driving motor can be switched by a sliding switch which takes up its off position with the tool fully relieved of working pressure.

7. A control device according to one of claims 4 and 5 characterised in that it comprises a cylindrical guide pin at the tool end, an axial bore for receiving the said guide pin in a driving spindle of the tool drive, a shaped shaft portion at the tool end for providing positive rotation, a female portion to the said shaped shaft portion, a flange at the tool end, a securing member overlapping the said flange and movable into a securing position and into a releasing position for the axial movement of the tool and a spring urging the tool in a receiving direction, wherein the axial clearance of the tool permitted by the securing member located in the securing position and the length of engagement of the cylindrical guide pin at the tool end in the associated spindle bore are greater than the length of engagement of the shaped shaft portion in the female portion and the engagement path for the coupling consisting of the shaped shaft portion and the female portion is set at the end of the engagement path of the guide

pin in its bore associated therewith and the path of the flange at the tool end in its limit position at the machine end.

8. A control device according to one of claims 4, 5 and 7 characterised in that the spring urging the tool in the removing direction is arranged in the axial bore of corresponding depth for the reception of the guide pin in the driving spindle.

9. A control device according to one of claims 4, 5, 7 and 8 characterised in that the flange is formed by a sleeve connected to the tool and which overlaps the female portion and is protected against dirt.

10. A control device according to one of claims 4, 5, 7, 8 and 9 characterised in that the female portion is formed by an adapter which has an internal screwthread for screwing onto the chuck screwthread on the driving spindle.

11. A control device according to one of claims 1 to 10 characterised in that it includes a regulator which establishes the drive for the tool independently of the position of the sensor.

12. A control device according to claim 11 characterised in that the control range of the regulator extends from switching off the current supply to the tool drive up to the full power of the said tool drive.

13. A control device according to one of claims 1 to 12 characterised in that the sleeve has an internal screwthread by means of which is can be screwed onto a screwthread at the end of the tool and that at the machine end surface of the said sleeve the sensor is made resilient so that the sleeve adjustable by screwing relatively to the tool determines the optimal control position for the operating procedure when the tool is brought by the working pressure in an axial direction up to the inner abutment position.

14. A control device according to one of claims 1 to 13 characterised in that the sensor is a pin guided parallel to the rotary axis of the tool and which is connected to the movable regulator part.

15. A control device according to claim 14 characterised in that the sensor and with it the movable regulator part are positioned under the action of a compression spring which always attempts to force the regulator out of the machine housing into a zero position and with it the pin serving as the sensor.

16. A control device according to one of claims 1 to 15 characterised in that the screwthread on the end of the tool is formed by a tool receiving pin which also forms the shape shank portion and the guide pin.

17. A control device according to one of claims 1 to 16 characterised in that the tool receiving pin has a receiving bore for a shank rigidly connected to the tool and the outer diameter of which is always the same, the diameter of its tool receiving bore being matched to the diameter of the particular tool.

18. A control device according to one of claims 1 to 17 characterised in that it comprises a constructional set which can be connected selectively to a machine tool, especially a hand machine tool, instead of a chuck.

19. A control device according to one of claims 1 to 18 characterised in that it comprises: the adapter which is screwed onto the screwthread for the chuck and forms the female portion for positively entraining rotation of the tool, the tool with the shaped shank portion fitting into the female portion, the guide pin fitting into an axial bore in the driving spindle of the machine and the flange, the securing device overlapping the flange and which is movable selectively into a securing position or a releasing position for the axial movement of the tool and a support which can be rigidly clamped to the clamping neck of the machine and which carries the securing device.

20. A control device according to one of claims 1 to 19 characterised in that the support is formed as an extension handle.

21. A control device according to one of claims 1 to 20 characterised in that the securing device is pivotally connected to the support (extension handle).

22. A control device according to one of claims 1 to 21 characterised in that the securing device is positioned under the action of a spring which always attempts to bring it into its securing position with respect to the tool.

23. A control device according to one of claims 1 to 22 characterised in that the flange is formed by the sleeve connected to the tool, the sleeve overlapping the adapter and protecting it against dirt.

24. A control device for machine tools substantially as herein described with reference to the accompanying drawings.

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