

GRINDING MACHINE

The invention relates to a grinding machine for sharpening scissors, knives and the like, comprising at least one grinding wheel rotatable with a shaft which is arranged to be driven by a motor and which is supported so as to be slidable in both axial directions, the grinding wheel being positioned in a rest position by spring action in both axial directions and being slidable axially from this position under a lateral grinding pressure.

In a grinding machine of this kind which is known from US patent 2 114 106, two adjacent grinding wheels are interference-fitted on a shaft, on which, additionally, two helical springs are fitted, each of which presses against the side of one of the two grinding wheels, so that the two grinding wheels are positioned on the shaft in a rest position from which they can be displaced under the action of a lateral grinding pressure. The shaft for its part has a drilled axial hole by means of which it is slid on to the motor shaft, a pin-and-slot connection between the two shafts being provided for transmission purposes, so that the shaft carrying the two grinding wheels can be slid in both axial directions on the motor shaft. A construction of this kind is relatively costly and has various other disadvantages because the rest position of the two grinding wheels is not unambiguously determined since the shaft carrying the grinding wheels is freely movable on the motor shaft because of the pin-and-slot connection between the two shafts and because the grinding wheels are carried round only by their interference fit on the shaft, which only permits a limited power transmission.

The invention aims to provide a grinding machine of the kind referred to in the opening paragraph, in which, with constructionally simple means, unambiguous positioning of at least one grinding wheel in a rest position is obtained, from which position the grinding wheel can be displaced in defined fashion in both axial directions against spring action, depending on the direction in which a lateral grinding pressure is exerted on the grinding wheel, being otherwise subject to no limitation arising

from slippage in relation to a drive element.

According to the invention there is provided a grinding machine comprising at least one grinding wheel rotatable with a shaft which is arranged to be driven by a motor and which is supported so as to be slidable in both axial directions, the grinding wheel being positioned in a rest position by spring action in both axial directions and being slidable axially from this position under a lateral grinding pressure, wherein the grinding wheel is fixed rigidly to the shaft and the latter carries two rotation surfaces which lie in radial planes and are located a certain distance apart in the axial direction and each of which is arranged to take up said spring action in one of the two axial directions, and wherein at least one strip-shaped leaf spring is provided for applying the spring action to the two rotation surfaces, the spring or each spring resting with each of its two opposite sides or with one of its two opposite sides, respectively, at its free end laterally beside and, in a respective one of the two axial directions, behind a respective one of the two rotation surfaces.

This construction provides a simple means of ensuring slidability in both directions, against spring action, of the grinding wheel, together with the shaft which carries it, and also unambiguous positioning of the grinding wheel in a rest position, and of ensuring that grinding-wheel drive is obtained without possible slippage. It should be mentioned that there are known methods, as DE-OS 29 36 982, for example, shows, of fixing a grinding wheel to a drive shaft, but in which no provisions are made for slidability of the grinding wheel against spring action in both directions.

For positioning of the grinding wheel in its rest position it is possible to arrange that this is done in both directions under constant spring action and that, even with the grinding wheel in its rest position, the leaf spring or each leaf spring rests at its free end with pre-tension against the two rotation surfaces or the respective rotation surface. It has, however, proved

advantageous to position the grinding wheel in its rest position with a certain play, in which case the leaf spring or each leaf spring rests at its free end against the two rotation surfaces or the respective rotation surface without contact pressure. The rest position of the grinding wheel is also defined by this arrangement and the lateral grinding pressure on the grinding wheel in both axial directions is also opposed by a corresponding spring action but with the additional result that, with the grinding wheel in its rest position, no additional frictional load is exerted on the driving device, i.e. the motor of the grinding machine. This is particularly advantageous when the motor used is a self-starting single-phase synchronous motor, in which, as is well known, it is important for reliable starting that the motor should be started under the least possible load.

To apply the spring action in both axial directions to the two rotation surfaces a single leaf spring can be used, the two-sides of the spring at the free end thereof each cooperating with a respective one of two rotation surfaces which face towards each other, which basically yields a very simple design. For greater reliability, however, it has proved advantageous to have two strip-shaped leaf springs for applying the spring action to the two rotation surfaces, each spring resting with one of its two opposite sides at its free end laterally beside and, in a respective one of the two axial directions, behind a respective one of the two rotation surfaces.

In this connection it has also proved advantageous with regard to very simple construction if the two leaf springs are formed by the two limbs of a U-shaped strap, whose centre section is fastened to a fixed part of the machine.

There are various possibilities with regard to the forming of the two rotation surfaces. For example, they could be formed by the side walls of a circumferential groove in the shaft. It has, however, proved particularly advantageous if the two rotation surfaces are each formed by a side surface of at least one collar or flange on the shaft. There is then no weakening of the shaft

carrying the grinding wheel and there is sufficient room available for the cooperation of a leaf spring with the respective rotation surface.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view of a grinding machine according to the invention, in which the two limbs of a U-shaped strap form two leaf springs by which a grinding wheel permanently fixed to a shaft is positioned in a rest position, and

Figure 2 is a sectional view of part of a grinding machine according to the invention in which a single leaf spring is used to position a grinding wheel rigidly fixed to a shaft.

The grinding machine shown in Figure 1 incorporates a part 1 which, together with a shell-type part 2 which is placed on it and fastened to it in a manner not further illustrated, forms a basic housing on which a cover 3 can be slid. The drive motor 4 (shown in full elevation) of the grinding machine is fastened to a wall 5 of part 1, e.g. by means of screwed connections, the motor shaft 6 protruding through an opening 7 in this wall 5. This motor shaft 6 is connected to another shaft 8 in such a way as to drive it, which shaft 8 carries at one end the grinding wheel 9, which is permanently fixed to shaft 8. It would, of course, be basically possible to fit two or more grinding wheels for various grinding purposes successively on this shaft 8. Shaft 8 also runs coaxially with the motor shaft in a bearing bush 10 in another wall 11 of part 1. Wall 11 of part 1 is parallel to the latter's wall 5 and is connected to it by another wall section 12. The grinding wheel 9 is placed on the end of shaft 8 projecting from wall 11 and is connected frictionally to shaft 8, for example by means of a screw 13 coaxial with the shaft and a clamping disc 14, so that by unscrewing screw 13 it is also possible to replace grinding wheel 9 easily when the need arises.

In order to give a true edge to the implements such as knives, scissors, etc. to be ground, a grinding machine of this kind is generally provided with guide passages for these implements, the

latter being inserted into and then drawn through the guide passages so as to be brought into contact with the grinding wheel at a certain grinding angle. In the present embodiment these guide passages are formed in the cover 3; in all there are three guide passages 15, 16 and 17. In the mounted position of the cover 3 shown in the drawing, which position is determined, for example, by a spring-loaded ball 18 engaging in a recess 19 in part 2 of the cover, the guide passages 15 and 16 are located in the range of grinding wheel 9 and lead past it on either side. Optionally, therefore, either side of a cutting edge can be ground, depending on the particular guide passage into which the implement to be ground is inserted. Both guide passages 15 and 16 will, for example, be used if it is desired to sharpen a knife. If cover 3 is slid in the direction of the arrow until ball 18 engages in a second recess 21 in part 2 of the housing, guide passage 17 will be adjacent grinding wheel 9. This guide passage 17 is more flatly inclined so that it is particularly suitable for the sharpening of scissors. Within the framework of the present state of the art a range of possibilities exists for the design of such guide passages.

A requirement for ensuring uniformly optimum grinding is that the implement to be ground should not be pressed too firmly against the grinding wheel and therefore that the grinding pressure should not exceed a predetermined value. When the object to be ground is applied laterally to the grinding wheel, i.e., to a side of the grinding wheel, the latter must therefore be capable of moving away in the axial direction against a spring pressure when the contact pressure is too great. When both sides of the grinding wheel are used in turn for grinding, the grinding wheel must accordingly be movable in both axial directions against the spring force. Without grinding pressure on the grinding wheel, the grinding wheel must be positioned in a predetermined rest position such that it occupies the correct position in relation to the guide passages.

In order to ensure such movability of the grinding wheel 9 in both axial directions, the shaft 8 to which the grinding wheel is

secured is not only rotatable but also slidable axially in bearing bush 10, and, additionally, its drive connection with motor shaft 6 is designed so as to permit sliding movement of the shaft 8 in both axial directions. In the present case the latter is achieved by having on the motor shaft 6 a pinion 22 whose teeth mesh with corresponding internal teeth in a coaxial bore 23 in shaft 8. The rotary movement of pinion 22 is thus transmitted to shaft 8 and the latter can be slid in both axial direction in relation to pinion 22. There are, of course, other possibilities for the design of such a drive connection, e.g. in the form of a pin-and-slot connection.

Shaft 8 is additionally fitted with two collars or flanges 24 and 25, situated some distance from each other in the axial direction. The side surfaces of these flanges form radial rotation surfaces, i.e., rotation surfaces lying in radial planes, which are intended to take up spring action, each in one of the two axial directions. To this end, in the present embodiment, the rotation surfaces designated 26 and 27, which are the side surfaces of the two flanges that face away from each other, are utilised. To apply the spring action to the two rotation surfaces 26 and 27, in the present case two strip-shaped leaf springs 28 and 29 are used, each of which rests with one side of its free end laterally beside and, in one of the two axial directions, behind one of the two rotation surfaces 26 and 27. It can be seen that with this arrangement, on the one hand, that side of the free end of leaf spring 28 which faces rotation surface 26 lies behind this surface in the axial direction of motor 4, and, on the other hand, that side of the free end of leaf spring 29 which faces rotation surface 27 lies behind this surface in the axial direction of grinding wheel 9. In the present embodiment the free ends of the two leaf springs 28 and 29 are bent to a semi-circular shape in order to ensure particularly reliable cooperation with the respective rotation surface 26 or 27.

The two leaf springs 28 and 29 thus position shaft 8 and hence also grinding wheel 9 in a predetermined rest position by gripping the two collars 24 and 25 at their outer sides, that is to say, at

the rotation surfaces 26 and 27, and holding the collars between them. If grinding wheel 9 is shifted together with shaft 8 in one of the two axial directions by a lateral grinding pressure, that leaf spring 28 or 29 which is located behind the particular rotation surface 26 or 27 comes into action. This means that one or other of springs 28 and 29 always opposes the lateral grinding pressure on the grinding wheel in one or other axial direction. It can be seen that both positioning of the grinding wheel in its rest position and the creation of a counter-force to a lateral grinding pressure on the grinding wheel in either axial direction are achieved in a particularly simple manner. Since, at the same time, grinding wheel 9 is fixed rigidly to shaft 8, power transmission to the grinding wheel takes place without the possibility of any slippage, which is desirable for the grinding process itself in connection with the required grinding forces.

In the present embodiment the two leaf springs 28 and 29 are formed by the two limbs of a U-shaped strap 30 whose centre section 31 is fastened to a fixed part of the machine, e.g. by a screwed connection 32 to wall section 12 of the part 1 of the machine. This type of spring design has proved particularly simple and effective. Strap 30 could obviously be fastened in a different manner, e.g. by a clamped connection. It would, of course, also be possible to design the two leaf springs 28 and 29 as separate parts which would then be fastened separately.

As can be seen from Figure 1, the two leaf springs 28 and 29 in the present embodiment position grinding wheel 9 together with shaft 8 in the rest position with a certain amount of play, the free ends of the two leaf springs 28 and 29 being arranged to rest against the two rotation surfaces 26 and 27 without exerting any contact pressure on these surfaces so as to allow this slight play. This ensures that when motor 4 is connected to the power supply, i.e. when the grinding machine is switched on, springs 28 and 29 do not cause any additional load by friction against rotation surfaces 26 and 27. This is particularly advantageous if the self-starting single-phase synchronous motor is used for

motor 4, since, as is generally known, a motor of this kind should be subjected to as little load as possible when starting in order to ensure a reliable start. If this requirement is not specified, springs 28 and 29 can, of course, rest at their free ends, even
5 when grinding wheel 9 and shaft 8 are in their rest position, against rotation surfaces 26 and 27 with pre-tension, i.e. with a predetermined contact pressure, the positioning of the grinding wheel in the desired rest position thereby being particularly reliably effected.

10 As already stated, the two rotation surfaces 26 and 27 in the present case are each formed by a flange or collar 24 or 25 fitted to the motor shaft 8, the two collars being a certain distance apart. This makes it possible for the two springs 28 and 29 to be spaced correspondingly far apart, which may be constructionally
15 advantageous. If desired, however, it will also be possible to have only one collar, whose two side surfaces could then form the rotation surfaces cooperating with the springs. A collar of this kind could be made integral with the shaft but it could also consist of a circular flange fitted round the shaft. It should be
20 additionally mentioned that the side surfaces of the two collars which face towards each other can be used as rotation surfaces. It is, however, also possible to use a circular groove in the shaft instead of a collar to form a rotation surface. Thus, in the embodiment shown in Figure 2, rotation surfaces 26 and 27 are
25 formed by the two facing walls of a circumferential groove 33 cut in shaft 8. If, as here, the two rotation surfaces are opposite each other, the same function described above with two leaf springs can be performed here with only one leaf spring. In the embodiment shown in Figure 2, a leaf spring 34 is clamped at one end in wall
30 12 of the part 1 of the machine and the other, free end of the spring 34 extends into the groove 33 in shaft 8. At this free end the spring 34 carries a pin 35 which projects at right angles from each side of the leaf spring 34 so that one end of the pin faces rotation surface 26 and the other end faces rotation surface 27.
35 If the groove 33 were correspondingly narrow, the pin 35 may be

omitted or the free end of the leaf spring could, by bending, for example, be so shaped that it rests directly against rotation surfaces 26 and 27.

5 This method ensures that leaf spring 34 rests with its two sides one against, and in one of the two axial directions behind, each of the two rotation surfaces 26 and 27. In this way leaf spring 34 again ensures both the positioning of shaft 8, together with grinding wheel 9, in the desired rest position and the creation in both axial directions of a counter-force to a lateral
10 grinding pressure on the grinding wheel in either of the axial directions.

As can be seen from the above, it is possible to make a number of variations on the embodiments described without departing from the scope of the invention as defined in the appended claims. That
15 applies in particular to the formation of the rotation surfaces on the shaft to which the grinding wheel is fixed and also to the way in which the spring action is applied to the two rotation surfaces with at least one leaf spring.

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CLAIMS:

1. A grinding machine comprising at least one grinding wheel rotatable with a shaft which is arranged to be driven by a motor and which is supported so as to be slidable in both axial directions, the grinding wheel being positioned in a rest position by spring action in both axial directions and being slidable axially from this position under a lateral grinding pressure, wherein the grinding wheel is fixed rigidly to the shaft and the latter carries two rotation surfaces which lie in radial planes and are located a certain distance apart in the axial direction and each of which is arranged to take up said spring action in one of the two axial directions, and wherein at least one strip-shaped leaf spring is provided for applying the spring action to the two rotation surfaces, the spring or each spring resting with each of its two opposite sides or with one of its two opposite sides, respectively, at its free end laterally beside and, in a respective one of the two axial directions, behind a respective one of the two rotation surfaces.

2. A grinding machine as claimed in Claim 1, wherein the leaf spring or each leaf spring rests at its free end against the two rotation surfaces or the respective rotation surface without contact pressure.

3. A grinding machine as claimed in Claim 1 or 2, wherein two strip-shaped leaf springs are provided for applying the spring action to the two rotation surfaces, each spring resting with one of its two opposite sides at its free end laterally beside and, in a respective one of the two axial directions, behind a respective one of the two rotation surfaces.

4. A grinding machine as claimed in Claim 3, wherein the two leaf springs are formed by the two limbs of a U-shaped strap, whose centre section is fastened to a fixed part of the machine.

5. A grinding machine as claimed in any of the preceding claims, wherein the two rotation surfaces are each formed by a side surface of at least one collar or flange on the shaft.

6. A grinding machine, substantially as herein described with reference to Figure 1 or to Figure 2 of the drawing.