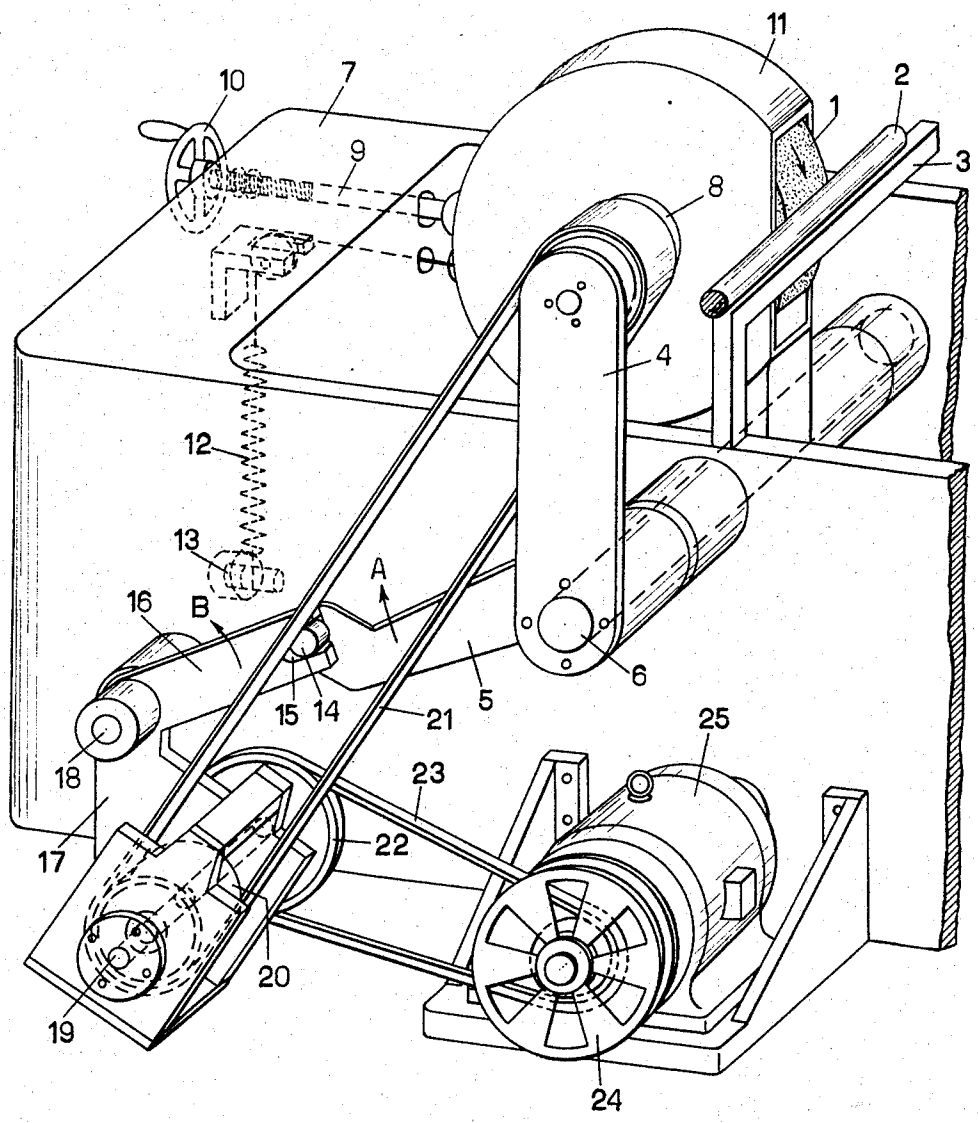
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CENTERLESS-GRINDING MACHINES FOR CYLINDRICAL WORK PIECES

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CENTERLESS-GRINDING MACHINES FOR CYLINDRICAL WORK PIECES

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This invention relates to centerless-grinding machines for cylindrical work pieces having one grinding disk or two cooperating grinding disks designed to machine the work pieces which are fed axially through the machine while being rotated around their longitudinal axis.

The efficiency and output of grinding machines of this kind is dependent on the peripheral speed of the grinding disks. If the diameter of the disks reduces by wear the admissible maximum peripheral speed can no longer be attained, unless there is provided a driving motor with infinitely variable speed regulation. A decrease of the peripheral speed entails an increased wear of the disks and a higher surface roughness of the work pieces. In case of disk wear it is therefore important to restore the admissible maximum peripheral speed by correspondingly increasing the number of revolutions of the disks. The propositions hitherto made for overcoming this difficulty could only be realized by costly and complicated means.

The invention has for its object to so improve machines of the kind in question by a peculiar but simple arrangement of the grinding disks in combination with their driving means and the means for taking up the wear of the disks that on each operation of the last-said means the admissible maximum peripheral speed of the disks is absolutely and accurately maintained.

According to the invention, a centerless-grinding machine for cylindrical work pieces, which comprises at least one grinding disk, driving means for the disk and means for taking up the wear of the disk has the grinding disk mounted in one arm of bell crank levers adapted to be rocked about their axis of rotation by the means for taking up the wear of the grinding disk, and includes other bell crank levers carrying by one arm the drive for the grinding disk and adjusting means for a power-driven infinitely variable speed transmission, the free arms of the different bell crank levers being in slot and pin connection and the ratio of lengths of these arms being so that the relative movement between the said slot and pin is straight-lined.

With this arrangement every readjustment of the grinding disks made to compensate for the disk wear so acts on the logarithmic motion of the adjusting means for the power-driven infinitely variable speed transmission that the resultant change of the number of revolutions of the drive causes the admissible maximum peripheral speed of the grinding disks to be kept up.

The means for taking up the wear of the grinding disks preferably consist of an adjustable threaded spindle linked with the bell crank levers carrying the grinding disks.

In a suitable form, the power-driven infinitely variable speed transmission consists of a belt pulley fixed on the shaft of the drive for the grinding disks and the said transmission consists of a self-expanding and contracting belt pulley connected by a belt with the first-said pulley.

The invention will now be described with reference to the accompanying drawing which shows a fractional perspective view of a centerless-grinding machine for cylindrical work pieces, constructed in accordance with the invention.

While the machine illustrated includes only one grinding disk with associated adjusting and driving means, it may also comprise a second grinding disk with adjusting and driving means built up symmetrically to the former elements so that the work piece is simultaneously machined at opposite sides by the two disks.

In the drawing, 1 is the grinding disk, 2 a cylindrical work piece, and 3 a supporting bar on which the work piece while being machined is fed in the direction of and simultaneously rotated about its longitudinal axis, as is well-known in the art, wherefore the respective means are not shown.

The grinding disk 1 is carried by a bell crank lever formed by the arms 4 and 5 and the shaft 6 which is mounted in the frame 7 of the machine. The disk 1 is mounted by its shaft 8 in the arm 4 of the bell crank lever.

When starting the grinding operation and after a wear of the grinding disk, the disk is adjusted or readjusted by means of a threaded spindle 9 so as to bear against the work piece 3. The spindle 9, which is mounted in the frame 7, is operated by a hand wheel 10 and, in the embodiment illustrated, linked to the protective casing 11 which is rigidly fixed to the shaft 6 of the bell crank lever 4, 5. An elastic tension member 12 attached by one end to a fixture 13 and by its other end to the casing 11 serves to prevent any play in the thread of the adjusting spindle 9.

The free end of the arm 5 is provided with a pin 14 which slidingly engages a slot 15 of an arm 16 of another bell crank lever formed by this arm, an arm 17 and a shaft 18 which is mounted in the frame 7. The free end of the arm 17 suitably shaped carries a shaft 19 on which is fastened a pulley 20 connected by a belt 21 with the grinding disk 1 for imparting rotation to same. The drive pulley 20 receives its motion from another pulley 22 which is also fastened on the shaft 19 and connected by a V-belt 23 with an infinitely variable speed transmission consisting, in the embodiment illustrated, of a self expanding pulley 24 of well-known kind mounted on the shaft of a motor 25.

When because of wear the grinding disk 1 is readjusted by means of the spindle 9, the bell crank lever 4, 5 rocks in the direction of the arrow A and thereby causes the bell crank lever 16, 17 to be rocked on its shaft 18 in the direction of the arrow B. The ratio of the lengths of the arms 5 and 16 of the two bell crank levers is so that on the bell crank lever 4, 5 being rocked the relative movement between the pin 14 and slot 15 is a straight-lined one. During this readjustment the lower arm 17 of the bell crank lever 16, 17 moves towards the expanding pulley 24, whereby the V-belt 23 is momentarily slackened allowing the pulley 24 to contract and adopt a correspondingly greater effective diameter so that the number of revolutions of the grinding disk is increased and its peripheral speed kept constant.

Instead of a self expanding pulley as infinitely variable speed transmission there may be used any other approved transmission of this kind, in which case the associated parts are changed accordingly.

While I have described a preferred embodiment of my invention it is to be understood that the invention is not limited to this particular embodiment, but that various modifications may be made therein without departing from the spirit of the invention or of the scope of the subjoined claims:

What I claim is:

1. In a centerless grinding machine for cylindrical workpieces moved linearly in a predetermined path through the machine, at least one grinding disc, a sta-

tionary motor, a driving connection between said motor and the grinding disc including automatic slack adjusting variable speed transmission means and an intermediate driving member adjustable with respect to the motor axis for controlling the said variable speed transmission means, bell crank levers carrying the grinding disc on one arm, manually operable means linked to the said lever for tilting and thereby adjusting the grinding disc to bring it into and hold it in contact with the workpiece, another bell crank lever carrying members of the driving connection between the motor and the grinding disc including the adjustable control member of the variable speed transmission on one arm, a slot and pin connection between the free arms of the different bell crank levers, and the ratio of the lengths of these arms being such that in adjusting the tiltable grinding disc the entailed movement of the different bell crank levers through the said control member so changes the variable speed transmission that the maximum peripheral speed of the grinding disc is constantly and uniformly maintained irrespective of the varying diameter of the disc.

2. In a machine as claimed in claim 1, in which the means for adjusting the grinding discs includes an adjustable threaded spindle linked with the bell crank levers carrying the grinding discs.

3. In a machine as claimed in claim 1, in which the control member for the power driven infinitely variable speed transmission includes a belt pulley fixed on the shaft of the drive for the grinding discs and the said transmission includes a self-expanding and contracting belt pulley mounted on the motor shaft and connected by a belt with the first said pulley.

4. A centerless grinding machine for cylindrical workpieces, comprising at least one grinding disc, a belt drive for said disc, bell crank levers carrying the grinding disc on one arm and tiltable by means of an adjustable threaded spindle for taking up the wear of the grinding disc and bringing same into contact with the workpiece, another bell crank lever carrying the driving pulley of the belt drive for the grinding disc on one arm, another pulley on the shaft of the first mentioned pulley connected through a belt to a power driven self-expanding and contracting pulley, a slot and pin connection between the free arms of the different bell crank levers, the ratio of lengths of said arms being such that the adjusting movement of the first said bell crank lever so moves the second mentioned bell crank lever and the pulley carried by the latter that the effective diameter of the self-expanding and contracting pulley is changed to maintain a constant maximum peripheral speed of the grinding disc.

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