Foreign version

Description

THIS SHEET HAS BEEN REPLACED

CD-ROM drive

The invention relates to a CD-ROM drive according to the features in the preamble of Claim 1.

CD-ROM drives are operating at ever higher rotation speeds, to satisfy the requirements for higher read performance levels. Based on single, double or currently up to 8-times the speed, corresponding drives are available with rotation speeds in the range from 500 to 6500/rpm, so that the drive can be set to various speed ranges, depending on the requirement. In contrast to hard-disc memory drives in which extremely precise adjustment and centring is possible since the hard discs are permanently installed, the problem arises with CD-ROM drives that, in this case, sufficiently accurate centring can be achieved for only a relatively small proportion of the data discs which can be inserted into the drive. Particularly as the rotation speeds increase, this results in a situation in which vibration and/or running noise occur or occurs for the majority of the data discs inserted since the positioning is not optimum, which vibration and/or running noise considerably exacerbate or prevent work being carried out on a correspondingly equipped personal computer. In addition to a high level of noise emission from the drive, which can even extend to the entire housing, this also leads to unnecessarily high mechanical stresses on the drives, which in turn results in servicing, repair and other consequential costs. Vibration occurring on the CD-ROM drive can generally also be transmitted to adjacent hard-disc or floppy-disc drives, so that their operation can also be interfered with in a sensitive manner. Finally, this leads to dissatisfaction with the customer, who will not longer entirely accept the CD-ROM drives.

This Sheet Has Been Replaced



THIS SHEET HAS BEEN REPLACED

As is known, the tracks on a compact disc are applied in the form of spirals running from the inside to the outside and, in contrast to a hard disc, all the sectors are of equal length. This means that the rotation speed of the drives is reduced linearly from, for example, 6,500 rpm to 3,000 rpm, within a predetermined high speed range, from the first sector to the last sector. If a situation now arises in which a sector cannot be read without errors, then the drive automatically switches to the next lower speed range. No analogous method of operation is envisaged when vibration and/or noise emission occur or occurs, provided the data can still be read without errors despite the vibrations.

The present invention is now based on the object of developing a CD-ROM drive in such a manner that operation that is adversely affected by vibration and/or noise emissions can be avoided by simple means, with the CD-ROM drive returning to interference-free operation again.

This object is achieved according to the invention by the features of Claim 1. In the simplest case, this can be achieved by manual push-button control. Alternatively with appropriate additional complexity, it can be done automatically using acoustic and/or vibration sensors. Advantageous refinements of the invention are specified in dependent claims.

An exemplary embodiment of the invention will be explained in more detail in the following text with reference to the drawing, in which:

FIG 1 shows the outline circuit diagram of a CD-ROM drive.

FIG 2 shows a flowchart for the method of operation, according to the invention, of the CD-ROM drive.

This Sheet Has Been Replaced

THIS SHEET HAS BEEN REPLACED

Figure 1 shows the principle of the construction of a CD-ROM drive. This comprises a spindle 2 which is driven by a motor 1 and onto which a compact disc 3 is placed centrally. The signals detected by the scanning optics 4 are fed to a data processor 5 for further processing. A further processor 6 on the one hand monitors the respective present position of a switch S and, on the other hand, supplies control signals to the motor controller 7 and to the drawer controller 8, which controls the transport of the compact disc 3 to the operating position, that is to say to the spindle 2 and from there back to the removal point again. Depending on the time for which the switch S is switched on, the processor 6 supplies either a signal to the motor controller 7 to reduce the speed, or a signal to the drawer controller 8 to transport the compact disc from the operating position to the ejection position.

The method of operation of the CD-ROM drive will be explained in more detail with reference to flowcharts, which are shown in Figure 2. In the "monitor" routine, the operation of the switch S, that is to say its on/off switching state, is monitored in predetermined polling cycles. If the switch S is now operated, the switching stage change is monitored and checked variably, for example for about 100 ns, for bounce and the active state. If the switch is no longer active after a predetermined time interval of, for example, < 0.5 seconds, a jump is made to the "SP" routine. If this is not the case, that is to say if the switch remains active for a longer time, a check is carried out to determine whether this active state has lasted for at least 2 seconds. If this is the case, a jump is made to the "E" routine, which means that the compact disc is ejected, that is to say the drawer with the compact disc is ejected. When a new data disc is inserted, the "E" routine returns to the "monitor" routine.

This Sheet Has Been Replaced

THIS SHEET HAS BEEN REPLACED

When a jump is made to the "SP" routine a check is first of all carried out to determine whether any default speed settings must be observed. If this is not necessary, then an immediate change to the next

This Sheet Has Been Replaced



THIS SHEET HAS BEEN REPLACED

lower revolution speed can be made. This process can be carried out via the monitoring routine, until the drive is rotating at single speed (approximately 500 rpm). If default speed levels are required, the revolution speed is matched and set to the requirements (for example 4-times MPEG and single-speed for audio).

In summary, this thus results in the following method of operation. If the switch S is pressed only briefly, for example for a maximum of only 0.5 seconds, then the processor 6 initiates a changeover, via the motor controller 7, to a lower speed range. This process can be repeated until vibration that has previously occurred and/or excessive noise emissions have either entirely disappeared, or it has been possible to reduce them at least to an acceptable minimum level. If the switch is pressed for a longer period, then the processor 6 initiates, via the drawer controller 8, the ejection of the compact disc, at which point the drawer together with the compact disc is ejected.

The rotation speed reduction which is desirable when vibrations and/or noise emission occur or occurs can also be brought about automatically using acoustic and/or vibration sensors whose signals are supplied via the processor 6 to the motor controller 7.

This Sheet Has Been Replaced



THIS SHEET HAS BEEN REPLACED

Patent Claims

1. A CD-ROM drive having a plurality of speed ranges which can be selected in n steps, and, in each case between the outer sector and the inner sector within each speed range, linearly reduced revolution speeds, with the proviso that, if the read result is negative, the revolution speed is automatically reduced,
characterized
in that control means are provided which produce a changeover to a lower speed range if a predetermined noise level is exceeded and/or if vibration occurs.

2. The CD-ROM drive as claimed in Claim 1,
characterized
in that acoustic and/or vibration sensors are provided on the housing of the drive, whose output signals influence associated control means in such a manner that, if a predetermined threshold value is exceeded, a control signal is sent to the motor controller for the drive, in order to reduce the rotation speed.

3. The CD-ROM drive as claimed in Claim 1,
characterized
in that the control means are assigned a push button which can be operated manually, in order to reduce the rotation speed.

4. The CD-ROM drive as claimed in Claim 3,
characterized
in that the push-button-controlled rotation speed reduction is carried out with the aid of the control push button for the CD Drawer transporter.

5. The CD-ROM drive as claimed in Claim 4,
characterized
in that the control push button for the drawer transport can be controlled in such a manner that the rotation speed is reduced if the push button is activated briefly,

This Sheet Has Been Replaced

THIS SHEET HAS BEEN REPLACED

and a transport movement of the CD drawer is initiated if the push button is pressed for a longer period.

* C L M S *

This Sheet Has Been Replaced