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The invention relates to an automatic correction system according to the preamble of the first claim.

The scanning of rotating information carriers by optical scanners may be disturbed in various ways. CD players for example react to external jolts in the same way as to scratches or similar faults on the disc to be scanned. There is either a track loss or at least the scanning system jumps forward or back by one track at the point of the disturbance. According to the prior art when there is a break down of the present servo system this condition is detected and a corresponding reactivation is introduced. During this time the audio data is operated mute, in order to avoid unpleasant interference noise.

Once the control circuits have been stabilised the mute operation is stopped. The disadvantage of this technique is that with the breakdown of the servo system and also in the other mentioned disturbance situation the instantaneous or last valid scanning point is lost and once the disturbance phase is over or at the end of the disturbance effect one continues at some chance scanning point. This means that not only are interruptions audible due to the mute switching, but that regular data displacements, caused by the chance set down point, are found to be acoustically very disruptive.

From Patent Application No. G.B. 20 60 217A on page 10, 1st paragraph, is shown how a track fault correction system operates in two specific types of fault, namely during "sticking" ("locked groove or track") and during "forward jumping" ("skipped forward"). In both cases control algorithms are proposed. From this prior art it is also already known to undertake a correction matched to the type of fault and the action on the scanner due to the type of linking of the circuit parts of the servo system depending on the selection of the amount of the presetting and the magnitude of a counter state. The first case occurs in particular when scanning CD discs, which have disc faults such as scratches or "black dots". The second case occurs in particular when there are jolts from outside against the device.

The object underlying the present invention is for the first case of disturbance, which can lead to "sticking", to improve the known system of correction to the effect that there is no loss of the last valid scanning point in the case of disturbance so that the "sticking" is safely prevented and to make the system react so quickly that in cases of disturbance typical with discs of the said types virtually nothing can be perceived acoustically, while the scanning system is operated beyond the point of disturbance. In addition, a positioning signal has to be supplied to the servo system depending on the type and magnitude of the fault.

The solution of this object is achieved in accordance with the invention according to claim 1.

Further details and developments are to be gathered from the dependent claims and the following description of an embodiment.

According to the invention the last valid scanning point before the beginning of the disturbance phase is held, the disturbance phase being detected by servo specific indicator signals. Moreover, a correction signal corresponding to the disturbance is formed and undertakes automatic correction on to the last valid scanning point. Thus advantageously information gaps are avoided. If the correction system operates sufficiently quickly, mute phases are scarcely audible in effect and thus are not disruptive.

Below two embodiments are discussed by way of the drawing. In which

Figure 1 shows a block circuit diagram of a correction system which is especially suitable for faults due to external action, as is known from the prior art;

Figure 2 shows a block circuit diagram of a correction system which is especially suitable for the correction of faults due to scratches or similar.

Figure 1 shows an embodiment of an automatic correction system. The main component parts are the blocks 6 (comparison + correction) and 7 (store for the current Subcode). In block 7 during normal operation, i.e. scanning for playback without disruption, the current address information is continuously stored away by means of the block 4 (Data check) and a gate circuit 9. As soon as disturbance occurs in the servo system 3 the latter activates the block 6 with the aid of the recognition signal "focus not ok / track not ok" via a latch component 5. The block 6 immediately causes the gate 9 to be blocked via the OK line, so that initially there is no further entry of data possible in store 7. Furthermore, component 5 is deactivated. As a result, the signal "focus not ok / track not ok" is held in block 5. If the servo system 3 has stabilised again after a disturbance and thus new address data is again transmitted by block 4, then the comparison between old and new data takes place in block 6 and a correction signal is produced therefrom which positions the scanning system (pick-up system) 1 on to the last valid scanning point before the point of disturbance. If this value is achieved, the comparison stage 6 emits an "ok" signal which resets the latch component 5 and causes a new data entry via the gate 9 in the store 7. This comparison and correction

system is especially suitable for removing disturbance due to external actions, such as shock or jolting, applied to the optical scanning.

Figure 2 shows a correction system improved according to the invention in a block circuit diagram, said system being built on to a known servo system, such as that according to Figure 1, and cooperating therewith. Without disturbance in the normal scanning mode the current data is emitted by the data check block 4, said current data being proportional to the scanning point, and is deposited continuously to a store in the block 5. A counter 8 is in its basic state and a gate 11 is opened so that data is also continuously stored in the reference store 9. As long as there is no disturbance, the current data is present at the same time the stores 5 and 9 and other circuit parts are inactive. When there is disturbance in scanning, i.e. when the scanner (pick-up) 1 jumps back on the track for example because of a scratch, the servo system 3 emits a "not ok" signal which activates the comparator 17. Since now the stores 5 and 9 have the same data the comparator 17 emits an "ok" signal to the counter 8, which counts the scanning points lost at the same point.

In other words, the counter (8) is increased by 1, if when releasing the comparator (17) due to the NOT OK signal from the servo part (3), it appears that the address comparison from the stores (5) and (9) is the same and the OK signal reaches the counter (8) from the comparator (17).

The OK signal of the comparator (17) is produced only when the comparison of the address data D_{AKT} and D_{REF} is given via the NOT OK signal from the servo part (3), i.e. $D_{AKT} = D_{REF}$ at the moment when the NOT OK signal is produced by the servo part (3).

A NOT OK signal is produced by the servo part (3) when the scanning is interrupted by a point of disturbance on the disc to be scanned. Since the scanning starts again at another location (or point on the disc) immediately, the servo part (3) immediately emits an OK signal again and blocks the comparator (17).

The counter (8) may be set to an overflow value (n = presetting number of the counter (8)), i.e. when overflow occurs, the signal "OVER" of the counter (8) activates the correction system (16) via "ENABLE". There, corresponding to the signal $D_{AKT} + \Delta D$ a correction D_{KOR} is passed to the servo part (3), i.e. the scanning is undertaken previously offset by ΔD as compared to the disturbance point.

In the case of the overflow $n_x = n$ the counter (8) is set to zero and thus the gate (11) is again opened for further storing of addresses.

Track loss may be due to disc faults (scratches, dirt) or due to jolting (against the device). In the 1st case there would be a "repeating effect" in the case of the scanner "jumping back", if no other measures are taken. In the 2nd case this "repeating effect" does not occur. Therefore in the 1st case it is desirable to undertake the correction of the positioning so that there is control beyond the point of disturbance of the disc. (Δ D). This is why the local presetting amount Δ D is necessary, which is not required in the 2nd case. If the correction system operates sufficiently quickly and if the preset Δ D is not selected to be too large then the disturbance is scarcely audible. For $n > 1$ any track losses cannot be detected which arise due to a "forward jump", i.e. in the direction of scanning of the scanner. Then a disruptive interruption remains audible. In this case the following happens: The counter 8 is initially set to "1". The circuit remains in this condition until a further disturbance occurs. There occurs the output of a "not ok" signal from the servo system 3. Since the data in the stores 5 and 9 now does not agree, the counter 8 is set to zero via the "not ok" signal from the comparator 17. As a result the gate 11 is through-connected, i.e. released and the last data before the disturbance is deposited into the reference store 9. The circuit is located again in the starting position (1st mode).



Patent Claims

1. An automatic correction system for the servo circuit of a device with an optical scanner for rotating information carriers, in which the servo circuit is so constituted that it produces a detector signal (NOT OK) when there are disturbances of the scanning system with respect to focus and/or track in a servo system (3) and a mute signal is supplied to the decoder (2) connected to the scanning system and thus controls its outputs mutely, and in which current address data (D_{AKT}) are compared in a comparator (17) with stored address data (D_{REF}) which are formed from previously scanned data and then if the current address data do not correspond to the predicted address data an identification signal for the disturbance is derived and further a correction signal (D_{KOR}) is formed by a correction system (16), said correction signal supplying a positioning signal to the servo system according to the type and size of the error, **characterised in that** there are provided a counter (8) having the counting capacity $n \geq 1$ and a presetting block (10) for producing a value Δ D, which are in connection with the comparator (17) and with the correction system (16) such that with a disturbance in the servo system in the case of coincidence of the current address data with the stored address data the counter content is increased, while if there is no coincidence the counter is reset, that only in the reset condition of the counter new address data may be stored and that further the correction system forms a correction signal when there is overflow (OVER) of the counter, which undertakes an advance positioning by the value Δ D with respect to the current address.

2. An automatic correction system according to claim 1, **characterised in that** the counter (8) is preset by the value 1, whereby it overflows at each disturbance and thus detects track losses in both directions, i.e. forwards and backwards, and a correction is carried out.

3. An automatic correction system according to claim 1, **characterised in that** the counter capacity (8) is preset by a value $n > 1$ and thus track losses caused by jumps backwards, i.e. contrary to the direction of playing or by sticking, are corrected when this fault has run up to the preset value of the counter (8) n times.

4. An automatic correction system according to one or more of the above claims, **characterised in that** with faults on the information carrier, such as scratches for example, or so called "black dots", the scanning system is prevented from sticking.