

Description

Combination of a signal source and a recording device for recording n pieces of music generated by the signal source on a magnetic record carrier, a signal source and a recording device to be used in the combination.

The invention relates to a combination of a signal source for generating a number of n successive pieces of music and a device for recording the n pieces of music on an A-side and a B-side of a magnetic record carrier, each of the n pieces of music having a time duration of $T(i)$ ($i = 1, \dots, n$) and the total time duration of the n pieces of music being shorter than the total play time of the A and B-sides of the record carrier, the signal source is an arrangement for reproducing the n pieces of music from a second record carrier, for example, an optical record carrier, on which the n pieces of music are recorded in a specific order, the signal source furthermore being arranged for generating time information related to the time duration of each of the n pieces of music, the combination comprising:

- a memory for storing the time information,
- computing means for deriving from the time information a first group of g_1 pieces of music of the n pieces of music to be recorded on the A-side, and a second group of g_2 pieces of music to be recorded on the B-side, where $g_1 + g_2$ is equal to n , and the computing means further being arranged for generating control signals and for supplying the control signals to the recording device and, in addition, the recording device being arranged for recording the group of g_1 pieces of music on the A-side of the record carrier and the group of g_2 pieces of music on the B-side of the record carrier in response to these control signals, and in which the computing means is arranged for establishing the total time duration T_{tot} of the n pieces of music, and is arranged for establishing the first group of g_1 pieces of music and the second group of g_2 pieces of music by dividing the n pieces of music in such a way that the time durations of the first group of g_1 pieces of music and of the second group of g_2 pieces of music are both nearest to half the total time duration of the n pieces of music.

The invention likewise relates to a signal source and a recording device to be used in the combination.

A combination of the type mentioned in the preamble is known from United States Patent No. 4,916,681. In this combination the n pieces of music are intended to be grouped in such a way that they are distributed over the two sides of the record carrier in the best way possible.

It is an object of the invention to provide a combination of a signal source and a recording device for obtaining record carriers on which the pieces of music are recorded differently.

Therefore, the combination according to the invention is characterized in that the computing means is further arranged for establishing the sequence of the groups g_1 and g_2 , respectively, pieces of music, the sequence being selected from the sequence having said specific order and sequences being different from said specific order, such that the total time durations of the first group and of the second group are both nearest to half the total time duration of the n pieces of music, and is arranged for generating a sequence control signal in accordance with the groups of g_1 and g_2 respectively, pieces of music, and in that the reproduction device is arranged for reproducing first the first group of g_1 pieces of music from the record carrier and then the second group of g_2 pieces of music from the record carrier in response to the sequence control signal.

The invention is based on the understanding that it is possible to shorten the (sometimes long) search times which are necessary for changing from reproducing a specific piece of music to reproducing a next piece of music.

Therefore, according to the invention, the order of the pieces of music to be recorded is changed before the filling of the record carrier is initiated. Thus, the two groups may be selected more advantageously, so that the total time durations of the two groups can come closer together so as to shorten the search times of pieces of music to be reproduced successively. One group is then recorded on one side (side A), whereas the other group is recorded on the other side (side B) of the record carrier. The two groups of pieces of music are recorded on both sides of the record carrier in such a way that, seen in longitudinal direction of the record carrier, they largely overlap each other. Consequently, start and end positions of the pieces of music are closer together on average so that the search times can be shorter.

One option is that the recording device is arranged for recording the first group of g_1 pieces of music on side A of the record carrier and the second group of g_2 pieces of music on side B of the record carrier in such a way that, seen in longitudinal direction of the record carrier, the location of the end of the first group of recorded pieces of music on side A is approximately equal to the location of the beginning of the second group of recorded pieces of music on side B of the record carrier.

Another option is that the recording device is arranged for recording the first group of g_1 pieces of music on side A of the record carrier and the second group of g_2 pieces of music on side B of the record carrier in such a way that, seen in longitudinal direction of the record carrier, the location of the beginning of the first group of recorded pieces of music on side A is approximately equal to the location of the end of the second group of pieces of music recorded on the record carrier.

This achieves that the initial positions of pieces of music are even closer together on average, so that the search time for a next piece of music to be reproduced can even be shorter.

The combination may further be characterized in that the computing means is arranged for establishing the first group of g_1 pieces of music as well as the second group of g_2 pieces of music, so that, seen in longitudinal direction of the record carrier, the locations of the transitions between the pieces of music of the first group correspond in the best possible way to the locations of the transitions between the pieces of music of the second group. This may produce an even further reduction of the search times.

The invention will be further explained in the following with reference to a number of exemplary embodiments, in which:

Fig. 1 shows the combination of the invention;
Fig. 2 shows in Figs. 2a and 2b known manners for recording pieces of music on the record carrier and in Fig. 2c a manner of recording in accordance with the invention;
Fig. 3 shows a further embodiment of the computing means; and
Fig. 4 shows a different manner of recording in accordance with the invention.

Fig. 1 shows in a diagram a combination of a signal source 1 for generating a number of n successive pieces of music and a device 2 for recording the n pieces of music on an A-side and a B-side of a magnetic record carrier 3. The signal source 1 may, for example, be a reproduction device for reproducing the n pieces of music from a record carrier, for example, an optical record carrier 4, such as a compact disc. The signal source 1 is then a compact disc digital audio player. On the compact disc 4 the n pieces of music are recorded in a specific order. By switching the player 1 to reproduction, these n pieces of music are reproduced and applied to an output 5 in the same order. In response to a sequence control signal which can be applied from the exterior, for example, by operating the appropriate programme buttons (not shown) on the player 1, or by applying the sequence control signal to the player through a control signal input 6, the order in which the pieces of music are reproduced can be chosen different from the order in which the pieces of music have been recorded on the carrier 4. In that case the n pieces of music appear at output 5 in a different order in accordance with the sequence control signal.

The device 2 may be a stereo cassette recorder in which the pieces of music can be recorded as a stereo signal on the (two) stereo tracks of the A and B-sides by means of a record button 7. The device 2 is of the autorverse type. This means that when the end of the tape is detected, for example of the A-side, the direction of transport of the tape is reversed subsequent to which a change is made to recording a signal on or reproducing a signal from the other side, that is to say, in this case the B-side.

This change can also be realised in response to a reverse control signal applied to the device 2 from the

exterior through a control signal input 8. The device 2 can also be a recording device for recording a digital signal on an A-side and a B-side of a magnetic record carrier. In this connection a SDAT recorder as is described in the book entitled "The Art of Digital Audio" by J. Watkinson, Focal Press 1988, Chapter 9, more specifically, Chapter 9.20 may be considered. Another option is the digital cassette recorder as is described in NL-A-90.00.039 (PHN 13.209).

The combination further includes a memory 9 and computing means 10. The signal source 1 is further arranged for producing time information indicating the time duration $T(i)$ of each of the n pieces of music $MP(i)$, or time information from which the time duration $T(i)$ of each of the n pieces of music $MP(i)$ can be derived.

In the example of the CD player the compact disc 4 contains in a lead-in track information indicating the initial addresses of all pieces of music in the form of an absolute time indication. From this information the time duration of each of the n pieces of music can be derived.

The time information, or the derived time durations already derived therefrom, is produced at an output 11 and applied to an input 12 of memory 9. In the memory 9 the time durations are first derived from the time information, if so required, and stored. The time durations $T(i)$ are applied to an input 14 of the computing means 10 through an output 13. The computing means 10 derives the total time duration of n pieces of music by summing the time durations $T(i)$ to $T(n)$. Then, the computing means establishes two groups of pieces of music from the n pieces of music, that is to say, a first group of g_1 pieces of music and a second group of $g_2 (=n-g_1)$ pieces of music. The two groups have each a total time duration, so that these time durations are the nearest approximates to half the total time duration of the n pieces of music. Then, at an output 15, the computing means generates a control signal to be applied to the recording device 2 and at an output 16 a control signal to be applied to the signal source 1. In response to the control signal at the output 16 the signal source 1 generates at its output 5 first the first group of g_1 pieces of music and then the second group of g_2 pieces of music.

In response to the control signal at output 15 the recording device 2 commences to record the first group of pieces of music on the A-side of the record carrier 3 after which the direction of transport of the record carrier is reversed and the second group of g_2 pieces of music is recorded on the B-side of the record carrier.

This method will be explained with reference to Fig.

2.

Fig. 2a shows a record carrier 3 as described in a combination known from EP-A-0.276.143. Fig. 2 shows merely schematically the A and B-sides in that only a single track is represented for each side. For the standard audio cassette on which a stereo signal is recorded on each side, there are two tracks on each side. If a SDAT cassette is concerned, each side comprises twenty tracks for recording the digital audio signal and an aux-

iliary track. A DCC cassette comprises on each side eight tracks for recording the digital audio signal and an auxiliary track. In both cases the auxiliary tracks are intended for recording the sub-code information. For example, time information, date information, programme numbers (pieces of music), addresses of pieces of music on the record carrier, text and graphical information if possible are concerned here.

In the example represented in Fig. 2a nine pieces of music had to be recorded on the record carrier. The serial numbers of the pieces of music will be shown hereinafter with the time durations of the pieces of music stated in minutes behind them in brackets: 1(6), 2(3), 3(5), 4(2), 5(3), 6(4), 7(4), 8(2) and 9(5).

The above order of the pieces of music is the order in which the pieces of music have been recorded on the compact disc. Since the total play time of the nine pieces of music is equal to 34 minutes, a one-hour cassette (thirty minutes on each side) is to be used.

It is an object of the combination known from the EP-A-0.276.143 to have as many pieces of music on one side of the record carrier 3 as possible. This results in recording the numbers on both sides as is represented in Fig. 2a. Side A is practically completely filled with music, whereas only the ninth and last pieces of music are recorded on side B. The hatched area indicates the blank portions of the tape. As appears from Fig. 2a side A is not fully filled. At the end there is a 1-minute long unrecorded area. If the prior-art combination were capable of selecting a different order in which the numbers on the compact disc are reproduced, the sixth piece of music could have been reproduced last, thus after the ninth piece of music. In that case the ninth piece of music could still be recorded on side A so that side A would be filled completely. The sixth piece of music would then be recorded on side B.

The recording as represented in Fig. 2a is disadvantageous in that sometimes long searches are necessary for playing a next piece of music. If the device 2 is in the reproduction mode in which piece of music number 1 is reproduced and if the seventh or ninth piece of music is to be read out, the device will change over to fast forward until the beginning of the seventh or ninth piece of music is detected, after which the device can change back to reproduction. Since the two pieces of music are situated practically at the other end of the record carrier 3, there will be a long pause between the reproduction of the first piece of music and the next piece of music 3 (seventh or ninth).

Fig. 2b shows the order in which the pieces of music are recorded on the record carrier by the combination known from US-A-4,916,681.

The computing means 10 establishes that the total play time of the nine pieces of music is 34 minutes. Half of this is 17 minutes. Then, the computing means establishes that the total play time of the first five pieces of music is 19 minutes. The total play time of the remaining pieces of music is 15 minutes.

The computing means 10 generates control signals at the outputs 15 and 16 in response to which the signal source commences to reproduce the first group of five pieces of music, whereas the device 2 is switched to recording so that these five pieces of music are recorded on the A-side of the record carrier. In response to a second control signal from, for example, the computing means 10, which signal occurs once the five first pieces of music have been recorded on the A-side, the direction of transport of the record carrier 3 is reversed, so that the second group of the remaining four pieces of music is subsequently recorded on the B-side of the record carrier, compare Fig. 2b. In this case the end of the recording of the first group, seen in longitudinal direction of the record carrier, has the same position as the beginning of the recording of the second group.

Fig. 2b distinctly shows that the search times are now much shorter because the transport time necessary for transporting the record carrier 3 to the beginning of a piece of music to be reproduced next is much shorter.

Fig. 2c shows how the combination according to the invention can record on the pieces of music on the A and B-sides of the record carrier. It is thereby assumed that the order in which the nine pieces of music of the compact disc 4 are reproduced can be changed. The computing means 10 again establishes a first and a second group of pieces of music. They are: a first group of the pieces of music numbered 1, 2, 3 and 5 and a second group of the pieces of music numbered 4, 6, 7, 8 and 9. The two groups have each a total time duration of 17 minutes. The computing means 10 is to generate a sequence control signal for the signal source 1 through the output 16 so that the signal source 1 reproduces the nine pieces of music in the order laid down by the computing means 10. Fig. 2c shows how the nine pieces of music have been recorded on the record carrier 3.

Needless to observe that in the combination of Fig. 1 more electrical connections are necessary than represented in the Figure, for having the combination operate as it should do. The computing means 10 is to know, for example, when the reproduction of the first group of pieces of music has terminated so that it can give a switch signal to the device 2 for the direction of transport of the record carrier to be reversed. Actually, a control signal link from the signal source 1 to the computing means 10 is necessary for this purpose. Such a signal link is not shown to avoid the description of the invention being concentrated on too many side matters not directly relating to the invention itself. In addition, without any further inventiveness it is possible for the expert to realise an operational combination based on above description.

In the foregoing the time durations for the nine pieces of music were selected so that groups of g_1 or g_2 pieces of music could be assembled having exactly the same total time durations, cf. Fig. 2c. Alternatively, it is possible that the two groups of pieces of music are obtained not having exactly the same total time durations. In that case, the location of the end of the recording of the first

group of g_1 pieces of music on the A-side, seen in longitudinal direction of the record carrier, could be permitted coinciding with the beginning of the recording of the second group of g_2 pieces of music on the B-side, as is represented in Fig. 2b.

However, it would be possible to permit the location of the beginning of the recording of the first group of g_1 pieces of music on the A-side coinciding with the end of the recording of the second group of g_2 pieces of music on the B-side. This means that at the end of the recording of the first group of pieces of music the direction of transport of the record carrier is reversed and rewinding is to take place before the second group of pieces of music can be recorded. In addition, this means that the computing means, after the first group of five pieces of music has been recorded, is to apply a pause signal to the signal source 1, so that the recording is interrupted until the moment at which the device 2 has assumed the position in which the recording is to be commenced on the B-side.

Locating the correct position on side B where the recording of the second group of pieces of music is to be commenced, is a method known per se. For this purpose, the device 2 comprises detection means, for example, in the form of a tachogenerator comprising a counter that indicates the position of the write head 7 relative to the track on the record carrier, seen in longitudinal direction of the track. This position corresponds to the time necessary for reaching this position during the recording of the first group of pieces of music. Since the difference in total time duration of the two groups of pieces of music is known, the position at which recording is to be commenced on the B-side can be computed.

Fig. 3 shows a further embodiment of the memory 9 and the computing means 10. In response to a control signal supplied to the memory 9 through line 31 by the central processor 30 belonging to the computing means, the time durations of the n pieces of music are applied to an accumulator 32 that adds together the time durations of all n pieces of music so as to obtain the total time duration T_{tot} and subsequently divides this time duration by two. The value for $T_{tot}/2$ is applied to comparators 33 and 34.

In response to control signals applied to the memories 9, 37 and 38 through the lines 31, 35 and 36, first and second groups g_1 and g_2 ($=n-g_1$) respectively, of serial numbers of pieces of music are formed of which the time durations of the pieces of music in these groups are added together in the accumulators 39 and 40 to obtain total time durations $T_{tot}(g_1)$ and $T_{tot}(g_2)$ respectively, of the two groups of pieces of music. These time durations are fed to the respective comparators 33 and 34. A comparator 33 (34) generates a control signal at an output 41 (42) in accordance with the different time durations $T_{tot}/2 - T_{tot}(g_1)$ and $T_{tot}/2 - T_{tot}(g_2)$ respectively. These control signals are applied to the central processor 30. In response to these control signals the central processor 30 will produce control signals on the lines 31, 35 and 36 until the requirement is fulfilled that both $T_{tot}(g_1)$ and

$T_{tot}(g_2)$ are nearest to $T_{tot}/2$. This is realised by exchanging pieces of music between the two groups while considering the smallest difference values. The groups g_1 and g_2 then stored in the memories 37 and 38 are applied to the central processor 30 over the lines 35 and 36 so that the central processor 30 is capable of generating the proper control signals at the outputs 15 and 16.

For a further explanation of this procedure of exchanging pieces of music between the first and second groups of pieces of music, reference be made to, for example, EP-A-0.374.921.

Fig. 4 shows yet a different order in which the pieces of music are recorded on both sides of the record carrier 3. The order is chosen in such a way that a maximum number of transitions between the pieces of music on the A-side, seen in longitudinal direction of the record carrier, correspond to the transitions between the pieces of music on the B-side.

The great advantage of this measure is that an even shorter search time is possible now. It will be clear that if the reproduction head in a random play mode reaches the end of one of the numbers 1, 3, 4 or 6 of the A-side, a switch can immediately be made to the reproduction of the respective numbers 2, 9, 8 and 7 by a mere autorverse action of the reproduction device.

The combination of Fig. 1 can be accommodated in two housings in such a way that the signal source, the memory 9 and the computing means 10 are located in one housing, for example, that of the compact disc player. In that case there is a control signal line 18 leading from the compact disc player to the recording device 2 for controlling this device with respect to transport speed and direction of transport and for switching the recording mode on and off for the A or B-side.

In lieu of being accommodated in the compact disc player, the computing means 10 and possibly also the memory 9 can be accommodated in the recording device. In that case a control signal line 19 from the recording device to the signal source 1 is necessary for actuating this signal source 1, for switching the device into the reproduction mode and for selecting the order in which the pieces of music are reproduced. The outputs 5 and 11 could be combined so that both the time information and audio information can be transmitted from the signal source to device 2 and memory 9 through the same output.

Claims

1. Combination of a signal source for generating a number of n successive pieces of music and a device for recording the n pieces of music on an A-side and a B-side of a magnetic record carrier, each of the n pieces of music having a time duration of $T(i)$ ($i=1, \dots, n$) and the total time duration of the n pieces of music being shorter than the total play time of the A and B-sides of the record carrier, the signal

group of g_1 pieces of music on the A-side, seen in longitudinal direction of the record carrier, could be permitted coinciding with the beginning of the recording of the second group of g_2 pieces of music on the B-side, as is represented in Fig. 2b.

However, it would be possible to permit the location of the beginning of the recording of the first group of g_1 pieces of music on the A-side coinciding with the end of the recording of the second group of g_2 pieces of music on the B-side. This means that at the end of the recording of the first group of pieces of music the direction of transport of the record carrier is reversed and rewinding is to take place before the second group of pieces of music can be recorded. In addition, this means that the computing means, after the first group of five pieces of music has been recorded, is to apply a pause signal to the signal source 1, so that the recording is interrupted until the moment at which the device 2 has assumed the position in which the recording is to be commenced on the B-side.

Locating the correct position on side B where the recording of the second group of pieces of music is to be commenced, is a method known per se. For this purpose, the device 2 comprises detection means, for example, in the form of a tachogenerator comprising a counter that indicates the position of the write head 7 relative to the track on the record carrier, seen in longitudinal direction of the track. This position corresponds to the time necessary for reaching this position during the recording of the first group of pieces of music. Since the difference in total time duration of the two groups of pieces of music is known, the position at which recording is to be commenced on the B-side can be computed.

Fig. 3 shows a further embodiment of the memory 9 and the computing means 10. In response to a control signal supplied to the memory 9 through line 31 by the central processor 30 belonging to the computing means, the time durations of the n pieces of music are applied to an accumulator 32 that adds together the time durations of all n pieces of music so as to obtain the total time duration T_{tot} and subsequently divides this time duration by two. The value for $T_{tot}/2$ is applied to comparators 33 and 34.

In response to control signals applied to the memories 9, 37 and 38 through the lines 31, 35 and 36, first and second groups g_1 and g_2 ($=n-g_1$) respectively, of serial numbers of pieces of music are formed of which the time durations of the pieces of music in these groups are added together in the accumulators 39 and 40 to obtain total time durations $T_{tot}(g_1)$ and $T_{tot}(g_2)$ respectively, of the two groups of pieces of music. These time durations are fed to the respective comparators 33 and 34. A comparator 33 (34) generates a control signal at an output 41 (42) in accordance with the different time durations $T_{tot}/2 - T_{tot}(g_1)$ and $T_{tot}/2 - T_{tot}(g_2)$ respectively. These control signals are applied to the central processor 30. In response to these control signals the central processor 30 will produce control signals on the lines 31, 35 and 36 until the requirement is fulfilled that both $T_{tot}(g_1)$ and

$T_{tot}(g_2)$ are nearest to $T_{tot}/2$. This is realised by exchanging pieces of music between the two groups while considering the smallest difference values. The groups g_1 and g_2 then stored in the memories 37 and 38 are applied to the central processor 30 over the lines 35 and 36 so that the central processor 30 is capable of generating the proper control signals at the outputs 15 and 16.

For a further explanation of this procedure of exchanging pieces of music between the first and second groups of pieces of music, reference be made to, for example, EP-A-0.374.921.

Fig. 4 shows yet a different order in which the pieces of music are recorded on both sides of the record carrier 3. The order is chosen in such a way that a maximum number of transitions between the pieces of music on the A-side, seen in longitudinal direction of the record carrier, correspond to the transitions between the pieces of music on the B-side.

The great advantage of this measure is that an even shorter search time is possible now. It will be clear that if the reproduction head in a random play mode reaches the end of one of the numbers 1, 3, 4 or 6 of the A-side, a switch can immediately be made to the reproduction of the respective numbers 2, 9, 8 and 7 by a mere autorverse action of the reproduction device.

The combination of Fig. 1 can be accommodated in two housings in such a way that the signal source, the memory 9 and the computing means 10 are located in one housing, for example, that of the compact disc player. In that case there is a control signal line 18 leading from the compact disc player to the recording device 2 for controlling this device with respect to transport speed and direction of transport and for switching the recording mode on and off for the A or B-side.

In lieu of being accommodated in the compact disc player, the computing means 10 and possibly also the memory 9 can be accommodated in the recording device. In that case a control signal line 19 from the recording device to the signal source 1 is necessary for actuating this signal source 1, for switching the device into the reproduction mode and for selecting the order in which the pieces of music are reproduced. The outputs 5 and 11 could be combined so that both the time information and audio information can be transmitted from the signal source to device 2 and memory 9 through the same output.

Claims

1. Combination of a signal source for generating a number of n successive pieces of music and a device for recording the n pieces of music on an A-side and a B-side of a magnetic record carrier, each of the n pieces of music having a time duration of $T(i)$ ($i=1, \dots, n$) and the total time duration of the n pieces of music being shorter than the total play time of the A and B-sides of the record carrier, the signal



source is an arrangement for reproducing the n pieces of music from a second record carrier, for example, an optical record carrier, on which the n pieces of music are recorded in a specific order, the signal source furthermore being arranged for generating time information related to the time duration of each of the n pieces of music, the combination comprising:

- a memory for storing the time information,
- computing means for deriving from the time information a first group of g_1 pieces of music of the n pieces of music to be recorded on the A-side, and a second group of g_2 pieces of music to be recorded on the B-side, where $g_1 + g_2$ is equal to n , and the computing means further being arranged for generating control signals and for supplying the control signals to the recording device and, in addition, the recording device being arranged for recording the group of g_1 pieces of music on the A-side of the record carrier and the group of g_2 pieces of music on the B-side of the record carrier in response to these control signals, and in which the computing means is arranged for establishing the total time duration T_{tot} of the n pieces of music, and is arranged for establishing the first group of g_1 pieces of music and the second group of g_2 pieces of music by dividing the n pieces of music in such a way that the total time durations of the first group of g_1 pieces of music and of the second group of g_2 pieces of music are both nearest to half the total time duration T_{tot} of the n pieces of music,

characterized in that the computing means is further arranged for establishing the sequence of the groups g_1 and g_2 respectively, pieces of music, the sequence being selected from the sequence having said specific order and sequences being different from said specific order, such that the total time durations of the first group and of the second group are both nearest to half the total time duration of the n pieces of music, and is arranged for generating a sequence control signal in accordance with the groups of g_1 and g_2 respectively, pieces of music, and in that the reproduction device is arranged for reproducing first the first group of g_1 pieces of music from the record carrier and then the second group of g_2 pieces of music from the record carrier in response to the sequence control signal.

2. Combination as claimed in Claim 1, characterized in that the recording device is arranged for recording the first group of g_1 pieces of music on side A of the record carrier and the second group of g_2 pieces of music on side B of the record carrier in a manner such that, seen in longitudinal direction of the record

carrier, the location of the end of the first group of recorded pieces of music on the A-side is about equal to the location of the beginning of the second group of recorded pieces of music on the B-side of the record carrier.

3. Combination as claimed in Claim 1, characterized in that the recording device is arranged for recording the first group of g_1 pieces of music on side A of the record carrier and the second group of g_2 pieces of music on side B of the record carrier, in a manner such that, seen in longitudinal direction of the record carrier, the location of the beginning of the first group of recorded pieces of music on side A is about equal to the location of the end of the second group of recorded pieces of music on side B of the record carrier.
4. Combination of Claim 1, 2 or 3, characterized in that the computing means is arranged for establishing the first group of g_1 pieces of music and the second group of g_2 pieces of music, so that, seen in longitudinal direction of the record carrier, the locations of the transitions between the pieces of music of the first group correspond in the best possible way to the locations of the transitions between the pieces of music of the second group.
5. Signal source to be used in the combination as claimed in one of the preceding Claims, characterized in that the computing means is incorporated in the signal source.
6. Recording device to be used in the combination as claimed in one of the Claims 1 to 5, characterized in that the computing means is incorporated in the recording device.

Patentansprüche

1. Kombination einer Signalquelle zum Erzeugen einer Anzahl von n aufeinanderfolgenden Musikstücken, und einer Anordnung zum Aufzeichnen der n Musikstücke auf einer A-Seite und einer B-Seite eines magnetischen Aufzeichnungsträgers, wobei jedes der n Musikstücke eine Dauer von $T(i)$ hat, $i = 1 \dots n$ und die Gesamtdauer der n Musikstücke kürzer ist als die Gesamtspielzeit der A- und B-Seiten des Aufzeichnungsträgers, die Signalquelle eine Anordnung zum Reproduzieren der n Musikstücke aus einem zweiten Aufzeichnungsträger ist, beispielsweise aus einem optischen Aufzeichnungsträger, auf dem die n Musikstücke in einer spezifischen Reihenfolge aufgezeichnet sind, die Signalquelle außerdem zum Erzeugen von Zeitinformation im Zusammenhang mit der Dauer jedes der n Musikstücke angeordnet ist, wobei die Kombination fol-



gende Elemente enthält:

- einen Speicher zum Speichern der Zeitinformation,
- einen Rechner zum Ableiten einer ersten Gruppe von g_1 Musikstücken der auf der A-Seite aufzuzeichnenden n Musikstücke, und einer zweiten Gruppe von g_2 Musikstücken zum Aufzeichnen auf der B-Seite aus der Zeitinformation, wobei $g_1 + g_2$ gleich n ist, und der Rechner außerdem zum Erzeugen von Steuersignalen und zum Versorgen der Steuersignale nach der Aufzeichnungsanordnung und zusätzlich die Aufzeichnungsanordnung zum Aufzeichnen der Gruppe von g_1 Musikstücken auf der A-Seite des Aufzeichnungsträgers und der Gruppe von g_2 Musikstücken auf der B-Seite des Aufzeichnungsträgers in Beantwortung dieser Steuersignale angeordnet sind, und daß der Rechner zum Versorgen der Gesamtdauer T_{tot} der n Musikstücke und zum Versorgen der ersten Gruppe von g_1 Musikstücken und der zweiten Gruppe von g_2 Musikstücken durch Teilung der n Musikstücke auf eine derartige optische Weise angeordnet ist, daß die Gesamtdauer der ersten Gruppe von g_1 Musikstücken und der zweiten Gruppe von g_2 Musikstücken nächst zur Hälfte der Gesamtdauer T_{tot} der n Musikstücke liegt,

dadurch gekennzeichnet, daß der Rechner außerdem zum Versorgen der Folge der Gruppen von g_1 bzw. g_2 Musikstücken angeordnet ist, wobei die Folge aus der Folge mit der spezifischen Reihenfolge und aus Folgen die von dieser spezifischen Reihenfolge abweichen gewählt wird, und zum Erzeugen eines Folgesteuersignals entsprechend der Gruppen von g_1 bzw. g_2 Musikstücken angeordnet ist, und daß die Aufzeichnungsanordnung zum Aufzeichnen zunächst der ersten Gruppe von g_1 Musikstücken aus dem Aufzeichnungsträger und darauf der zweiten Gruppe von g_2 Musikstücken aus dem Aufzeichnungsträger in Beantwortung des Folgesteuersignals angeordnet ist.

2. Kombination nach Anspruch 1, dadurch gekennzeichnet, daß die Aufzeichnungsanordnung zum Aufzeichnen der ersten Gruppe von g_1 Musikstücken auf der A-Seite des Aufzeichnungsträgers und der zweiten Gruppe von g_2 Musikstücken auf der B-Seite des Aufzeichnungsträgers derart angeordnet ist, daß in der Längsrichtung des Aufzeichnungsträgers gesehen, die Stelle des Endes der ersten Gruppe aufgezeichneter Musikstücke auf der A-Seite etwa gleich der Stelle des Anfangs der zweiten Gruppe aufgezeichneter Musikstücke auf der B-Seite des Aufzeichnungsträgers ist.
3. Kombination nach Anspruch 1, dadurch gekennzeichnet,

zeichnet, daß die Aufzeichnungsanordnung zum Aufzeichnen der ersten Gruppe von g_1 Musikstücken auf der A-Seite des Aufzeichnungsträgers und der zweiten Gruppe von g_2 Musikstücken auf der B-Seite des Aufzeichnungsträgers derart angeordnet ist, daß in der Längsrichtung des Aufzeichnungsträgers gesehen, die Stelle des Anfangs der ersten Gruppe aufgezeichneter Musikstücke auf der A-Seite etwa gleich der Stelle des Endes der zweiten Gruppe aufgezeichneter Musikstücke auf der B-Seite des Aufzeichnungsträgers ist.

4. Kombination nach Anspruch 1, 2 oder 3, dadurch gekennzeichnet, daß der Rechner zum Versorgen der ersten Gruppe von g_1 und der zweiten Gruppe von g_2 Musikstücken angeordnet ist, so daß in der Längsrichtung des Aufzeichnungsträgers gesehen die Stellen der Übergänge zwischen den Musikstücken der ersten Gruppe so gut wie nur möglich den Stellen der Übergänge zwischen den Musikstücken der zweiten Gruppe entspricht.
5. Signalquelle zur Verwendung in der Kombination nach einem oder mehreren der vorangehenden Ansprüche, dadurch gekennzeichnet, daß der Rechner in die Signalquelle aufgenommen ist.
6. Aufzeichnungsanordnung zur Verwendung in der Kombination nach einem oder mehreren der vorangehenden Ansprüche 1 bis 5, dadurch gekennzeichnet, daß der Rechner in die Aufzeichnungsanordnung aufgenommen ist.

Revendications

1. Combinaison d'une source de signaux pour générer un nombre de n morceaux successifs de musique et d'un dispositif pour enregistrer les n morceaux de musique sur un côté A et un côté B d'un support d'enregistrement magnétique, chacun des n morceaux de musique ayant une durée de $T(i)$, où $i = 1, \dots, n$, et la durée totale des n morceaux de musique étant plus courte que le temps de lecture total des côtés A et B du support d'enregistrement, la source de signaux formant un agencement destiné à lire les n morceaux de musique à partir d'un deuxième support d'enregistrement, par exemple, un support d'enregistrement optique sur lequel les n morceaux de musique sont enregistrés dans un ordre spécifique, la source de signaux étant, en outre, agencée pour générer des informations de temps se rapportant à la durée de chacun de n morceaux de musique, la combinaison comprenant :
 - une mémoire pour stocker les informations de temps,
 - des moyens de calcul pour déduire à partir des



informations de temps un premier groupe de g_1 morceaux de musique des n morceaux de musique enregistrés sur le côté A, et un deuxième groupe de g_2 morceaux de musique à enregistrer sur le côté B, où la somme $g_1 + g_2$ est égale à n , et les moyens de calcul étant, en outre, conçus pour générer des signaux de commande et pour fournir les signaux de commande au dispositif d'enregistrement et, en outre, le dispositif d'enregistrement étant agencé pour enregistrer le groupé de g_1 morceaux de musique sur le côté A du support d'enregistrement et le groupe de g_2 morceaux de musique sur le côté B du support d'enregistrement en réaction à ces signaux de commande, et dans laquelle les moyens de calcul sont agencés pour établir la durée totale T_{tot} des n morceaux de musique et pour établir le premier groupe de g_1 morceaux de musique et le deuxième groupe de g_2 morceaux de musique en divisant les n morceaux de musique d'une manière optimale telle que la durée du premier groupe de g_1 morceaux de musique et celle du deuxième groupe de g_2 morceaux de musique soient très proches de la moitié de la durée totale T_{tot} des n morceaux de musique, caractérisée en ce que les moyens de calculs sont, en outre, agencés pour établir la séquence des groupes de g_1 et g_2 morceaux de musique respectifs ce qui constitue ladite manière optimale, la séquence étant sélectionnée de la séquence présentant ledit ordre spécifique et des séquences différentes dudit ordre spécifique, et sont agencés pour générer un signal de commande de séquence conformément aux groupes de g_1 et g_2 , respectivement, morceaux de musique, et en ce que le dispositif de lecture est prévu pour lire tout d'abord le premier groupe de g_1 morceaux de musique du support d'enregistrement et ensuite le second groupe de g_2 morceaux de musique du support d'enregistrement et de réaction au signal de commande de séquence.

2. Combinaison selon la revendication 1, caractérisée en ce que le dispositif d'enregistrement est agencé pour enregistrer le premier groupe de g_1 morceaux de musique sur le côté A du support d'enregistrement et le deuxième groupe de g_2 morceaux de musique sur le côté B du support d'enregistrement de telle manière que, vu dans la direction longitudinale du support d'enregistrement, l'emplacement de la fin du premier groupe de morceaux de musique enregistrés sur le côté A soit approximativement égal à l'emplacement du début du deuxième groupe de morceaux de musique enregistrés sur le côté B du support d'enregistrement.
3. Combinaison selon la revendication 1, caractérisée

en ce que le dispositif d'enregistrement est agencé pour enregistrer le premier groupe de g_1 morceaux de musique sur le côté A du support d'enregistrement et le deuxième groupe de g_2 morceaux de musique sur le côté B du support d'enregistrement de telle manière que, vu dans la direction longitudinale du support d'enregistrement, l'emplacement du début du premier groupe de morceaux de musique enregistrés sur le côté A soit approximativement égal à l'emplacement de la fin du deuxième groupe de morceaux de musique enregistrés sur le côté B du support d'enregistrement.

4. Combinaison selon la revendication 1, 2 ou 3, caractérisée en ce que les moyens de calcul sont agencés pour établir le premier groupe de g_1 morceaux de musique ainsi que le deuxième groupe de g_2 morceaux de musique de telle sorte que, vu dans la direction longitudinale du support d'enregistrement, les emplacements des transitions entre les morceaux de musique du premier groupe puissent correspondre de la meilleure manière possible aux emplacements des transitions entre les morceaux de musique du deuxième groupe.
5. Source de signaux susceptible d'être utilisée dans la combinaison suivant l'une quelconque des revendications précédentes, caractérisée en ce que les moyens de calcul sont incorporés à la source de signaux.
6. Dispositif d'enregistrement susceptible d'être utilisé dans la combinaison suivant l'une quelconque des revendications 1 à 5, caractérisé en ce que les moyens de calcul sont incorporés au dispositif d'enregistrement.

