The following statement is a full description of this invention, including the best method of performing it known to us:

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<td>Related Art</td>
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DR. GERHARD DICKOPP

Nil
AN IMPROVED RECORDING CARRIER

An improved recording carrier of the type wherein the signals are recorded in the form of depressable raised portions of the surface thereof which are played back by means of pressure scanning and which has a signal recorded thereon which results in variable heights for the raised portions along the scanning path corresponding to an envelope function of the recorded signal. The raised portions are such that the distances of the base planes thereof from a reference plane disposed perpendicular to the extent of the heights of the raised portions along the scanning path vary according to one of the envelope functions of the recorded signal while the peaks of the raised portions lie substantially in a single peak plane which is parallel to the reference plane. A number of alternative methods for modifying the signal to be recorded so as to produce the desired record are also disclosed.
BACKGROUND OF THE INVENTION

The present invention relates to a recording carrier for the storage of signals by means of depressable raised portions of its surface for the purpose of pressure scanning and to a method of recording signals on such record carriers. The term pressure scanning is understood to mean a method for playing back stored signals by means of a recording carrier whose surface is provided with undulations or deformations corresponding to the time sequence of the signal amplitude values and from which these signal values are reproduced by means of a pickup which with its contact surface exerts a pressure force on the carrier surface as the carrier is moved relative thereto so that with the given modulus of elasticity of the carrier material employed, the change in shape of the carrier surface effected by the pressure force is substantially greater than the oppositely directed deflection of the contact surface of the pickup as a result of the compression.

Such a pressure scanning method is generally already known from applicants U.S. Pat. No. 3,652,809 issued Mar. 28th, 1972, and from a publication by ALLGEMEINE ELECTRICITAETS-GESELLSCHAFT AEG-TELEFUNKEN and TELDEC Telefunken-Decca-Schallplatten GmbH bearing the title "Weltpremier Bildplatte Berlin 1970": (World Première Picture Record, Berlin, 1970) which was published in June, 1970 and a further publication which appeared in the magazine "Funktechnik" Issue 14, 1970, pages 511-516. The above mentioned patent with its teaching to scan a recording carrier with a substantially soft body which resiliently
yields under the pressure of the pickup having a high deflection hardness, constituted a contradiction of the previously valid view in the art that, in order to have as wide as possible an expansion of the upper frequency limit of the reproduction band, the recording carrier must be as hard as possible and the pickup as resiliently soft as possible. A suitable example for the unsuccessful conventional view regarding an expansion of the reproduction range toward higher frequencies is the publication "Factors Affecting the Stylus-Groove Relationship in Phonograph Playback Systems" by G.R. Bastiaans JOURNAL OF THE AUDIO ENGINEERING SOCIETY, Oct. 1967, Volume 15, No.4, pages 389-399, since it contains a detailed explanation of the theory of the relationships and gives values for the attainable upper frequency limits for the type of phonograph playback systems then in use.

In the above-mentioned patent a pickup, whose skid-shaped portion, which is in engagement with the surface of the recording carrier and performs only a very slight movement in amplitude while the undulations on the surface of the recording carrier which contain the signal experience substantially stronger compressions, made available a further contiguous frequency range up to a few MHz beyond the upper limit frequencies of the frequency range utilizable with conventional disc recording means. The extension of this upper frequency limit, which had heretofore been considered to be unexceedable, means that now a good, usable recording and playback possibility is available for practical application. Such a system provides the possibility of recording and playing
back a broadband signal which may serve, for example, for recording and playing back a television broadcast with accompanying sound or for recording and playing back a plurality of audio channels. As previously mentioned, a skid-type pickup is used for this purpose. This skid-type pickup has a leading end which slowly approaches the surface of the recording carrier, so that the undulations on the record carrier "Creep" into the contact range at the leading end during playback and a trailing end which has a relatively sharp edge where the undulations quickly leave the contact range of the pickup during playback.

In the process according to the above-mentioned patent, a plurality of narrow band signals can be stored in the known multichannel technique corresponding to the broad continuous operating frequency band with an upper limit frequency of several MHz, or a broadband signal, for example, a video signal, can be recorded and played back which occupies the entire available frequency range. In the latter case the requirement might arise for the accommodation of one or more further signals, e.g., an audio signal or a color information, in the same recording.

The principle of pressure scanning a frequency modulated carrier wave which was basically outlined seems initially to be unsuited for superposition of an additional signal oscillation or modulated carrier wave because such a superposition would eliminate the advantage of identical heights of the recorded oscillations to be scanned. It can be seen that two superimposed re-
corded signals would result in an oscillation with different height levels for the peaks of the raised portions. The skid-type pickup possibly could therefore no longer cover the raised portions of lower amplitude which lie in the dales of the envelope of the resulting curve.

A solution for this problem has already been proposed in the copending U.S. application of Thuy et al, Ser. No. 155,910, filed June 23rd, 1971, and assigned to the same assignee as the present application. According to the teachings of this application, at least one further signal at a frequency lower than the carrier oscillation of the broadband signal is superimposed on a broadband signal recorded as a frequency modulated carrier oscillation. The amplitude of this further signal with respect to that of the higher frequency broadband signal is selected to be so low that the pickup edge of the skid-shaped surface of the pickup which is in engagement with the surface of the record bearing the undulations when it picks up a number of peaks of the higher frequency broadband signal which are higher than the average peaks as a result of a superposition of a lower frequency signal recording, still contacts the corresponding peaks of the broadband signal which coincide with a dale in the lower frequency signal recording and which are consequently lower than the average peaks.

According to this solution of the problem, on which the present invention is also based, the force with which the pickup surface presses on the raised portions of the signal recording is dimensioned or selected so that the highest raised portions on the surface of the recording
are always depressed during playback at least to the level of the lowest raised portions and the pickup surface also remains in contact with the individual raised portions even in the dales of the envelope curve connecting the peaks of the raised portions. It is clear that in this manner an uninterrupted scanning of the signal recording is assured but only because the pressure placed on the pickup surface is selected particularly for this scanning process. However, limitations result, which in other respects, according to newer experiences, are undesirable.

**SUMMARY OF THE INVENTION**

It is therefore the object of the present invention to provide an improved recording carrier which overcomes the above mentioned problem and, when such a carrier is used for recording and playing back according to the pressure scanning method, one or a plurality of additional signal oscillations can be added without there occurring any unexpected interference during the scanning process from the different peak levels of the raised portions.

It is a further object of the invention to provide a record carrier which solves the above problem and which does not result in any such limitations or restrictions regarding the selection of the pressure placed on the pickup surface.

The above objects are achieved according to the present invention in that a recording carrier for storing signals by means of depressable raised portions in its surface for playback by means of pressure scanning, which
record has a signal recorded thereon which results in variable heights for the raised portions along the scanning path according to an envelope function, the distances of the base planes of the raised portions from a reference plane lying perpendicular to the extent of the heights of the raised portions along the pickup scanning path are variable according to one of the envelope functions of the recorded signal while the peaks of the raised portions lie substantially in a single peak plane which is parallel to the above-mentioned reference plane.

In a recording carrier for pressure scanning the raised portions having different height dimensions form, so-to-speak springs of different lengths which exert different counterforces on the pick-up surface corresponding to their different lengths, the mutual compression by the skid-shaped surface of the pickup being identical. According to the above-mentioned earlier proposals, the peaks of the raised portions lie on different levels and the above-mentioned difficulties arise with regard to the maintenance of a perfect contact by the pickup with those raised portions which lie in a dale of the envelope curve. In the recording carrier of the present invention however, all of the peaks of the raised portions are substantially at the same level but their base surfaces lie on the envelope curve which represents the additional amplitude modulation or which has arisen from the superposition of the signals. Thus the difficulties regarding safe contact with all peaks on the part of the pickup are eliminated and the additional signal is determined by the different height levels of the base surfaces and
thus different spring lengths of the individual raised portions.

The present invention also relates to the method for recording a signal on a recording carrier according to the present invention. According to one embodiment of the method of the invention wherein the signal to be recorded is a modulated carrier signal whose positive and negative maximum elongations or amplitudes along the time axis or base line are variable in size according to approximately parallel envelope functions, the modulated carrier signal is amplitude modulated in a special manner with a signal which is a substantially in-phase or an opposite phase signal corresponding to one of the envelope functions so that all maximum elongations or amplitudes in one direction or polarity (positive or negative) become at least approximately equal with respect to one another, and the resulting signal is recorded on the carrier as the signal value in such a direction that the maximum elongations or amplitudes of identical height result in the peaks of the raised portions of the record containing the signal recording.

According to a further embodiment of the method of the present invention for recording a signal on a recording carrier as defined in the present invention wherein the signal to be recorded is a modulated carrier signal whose positive and negative maximum elongations or amplitudes along the time axis or base line are variable in size according to envelope functions which are approximate mirror images with respect to the time base line, a signal which is in-phase or of opposite phase and has substantially the same amplitude and...
follows one of the envelope functions of the modulated carrier signal is superimposed or mixed with the modulated carrier signal so that all maximum elongations or amplitudes of the modulated carrier signal in one direction (positive or negative) become at least approximately equal, and the resulting signal is then recorded on the carrier as the signal value in such a direction that the maximum elongations of identical value result in the peaks of the raised portions of the carrier containing the signal recording.

According to still a further embodiment of the method of the present invention for recording a signal on a recording carrier as defined in the present invention wherein the signal to be recorded is a modulated carrier signal whose positive and negative maximum elongations or amplitudes along the time axis or base line are variable in size according to envelope functions which are approximate mirror images with respect to the time base line, the modulated carrier signal is either rectified or the peaks of one polarity clamped so that all maximum elongations or amplitudes of the modulated carrier signal in one direction (positive or negative) become at least approximately equal, and the resulting signal is then recorded on the carrier as the signal value in such a direction that the maximum elongations of identical value result in the peaks of the raised portions of the carrier containing the signal recording.

The present invention can be used with particular advantage for recording a resulting oscillation which contains a carrier oscillation of a higher frequency which
is frequency or phase modulated with a video luminance signal and a lower frequency carrier oscillation which contains the associated video chrominance signal preferably in amplitude modulation. To adapt the present invention to existing standards in the recording of a video signal, the chrominance signal may be the standard chrominance subcarrier signal of the PAL, NTSC or SECAM system with a carrier frequency which has been reduced by down-mixing to such an extent that it lies below the frequency sweep range of the frequency modulated broadband signal. According to experiments, a suitable frequency for the chrominance subcarrier may lie between 300 and 1,000 kHz.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic illustration of an arrangement for pressure scanning according to the prior art with which the recording carrier and the method of the present invention can be used.

Fig. 2 illustrates the oscillation signal resulting from the superposition of two oscillating signals of greatly differing frequencies.

Fig. 3 illustrates an amplitude modulated oscillation signal or the oscillation signal resulting from the superposition of two oscillating signals whose frequencies differ only slightly from one another.

Fig. 4 is a partial view of a recording carrier of the type used for pressure scanning whose raised portions containing the recorded signal were produced by directly recording the signal of Fig. 2.

Fig. 5 is a partial view of a recording carrier of the type used for pressure scanning whose raised portions
containing the recorded signal were produced by directly recording the signal of Fig. 3.

Fig. 6 is a block circuit diagram of one arrangement with which the resulting signal of Fig. 2 can be so modified according to the invention that maximum elongations of the same size result in the one deflection direction.

Fig. 7 is a partial block circuit diagram of an arrangement similar to that of Fig. 6 with which the signal of Fig. 3 can be so modified according to the invention that maximum elongations of the same height result in one of the deflection directions.

Fig. 8 is a cross-sectional view of a portion of a recording carrier according to the present invention which can be made by using the circuit arrangement according to Fig. 6 or a similar arrangement and by using the signal in Fig. 2.

Fig. 9 is a cross-sectional view of a portion of a recording carrier according to the present invention which can be made by using a circuit arrangement according to Fig. 7 and the signal in Fig. 3.

Fig. 10 is a block circuit diagram of the special amplitude modulator shown as a block in Fig. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 shows a portion of a recording carrier 1 of the type used for playback by pressure scanning in a sectional view. The carrier 1 which has grooves 12 corresponds in its stability or rigidity characteristics to the requirements of the carrier of the above-mentioned co-pending application. That is, the carrier has a modulus of elasticity which is so selected that the raised portions of its surface
contained in groove 12 which represent the signal recording, are compressed under the pressure of the pick-up skid 3 in the direction of the pressure stress by a large amount than the pickup skid is deflected thereby in a direction opposite to the pressure direction. The modulus of elasticity of recording carrier 1, or at least of a layer near the surface bearing the grooves 12, may vary within wide limits within the range of the raised portions, for example the modulus of elasticity may lie between 40,000 kp/cm² and 10,000 kp/cm² or even lower. The recording carrier 1 may have the shape of a circular disc in the manner of a conventional phonograph record, or it may be in the form of a tape or strip. The raised portions containing the signal are disposed in the groove 12 in the surface of the recording carrier 1. These raised portions may have been produced in the same manner as a phonograph hill-and-dale recording for example by a stamping injection molding or casting process. During playback the illustrated portion of the carrier 1 is moved in the direction of the arrow to the left thereof relative to the pickup skid 3 of a pickup which additionally includes a mechanical-electrical transducer 2, for example, a piezoceramic element, and a clamping member 5 made of a vibration absorbing material. The output voltage furnished by the transducer 2 is obtained via leads 11 from the lateral electrical coatings (not shown) of the transducer 2. The pickup as a whole is fastened to the flattened end 7 of a guide arm 6 whose other end is fastened by means of an elastic joint 9 to a carriage (not shown) which, when a circular disc-
inhaled recording carrier 1 and a spiral groove 12 are used, is guided to correspond to the radial advance of the pickup. Advancing the recording carrier 1 in the direction of the arrow causes undulations on the left-hand side of the pickup skid 3 to come underneath the skid. However, due to the gradual pressure increase resulting from the illustrated shape of skid 3 no pulse-type pressure signal is produced when the undulations on the record surface are being depressed. Such a pulse-type signal does result, however, when an undulation appearing in the form of a raised portion leaves the contact range of the pickup on the right-hand side of skid 3 which is provided with a sharp edge. Figs. 2 and 3 illustrate wave forms which might result, for example, from the superposition of carrier signals having different frequencies. The wave form according to Fig. 3 can also be produced by amplitude modulation. The time pattern t is plotted on the abscissa while relative amplitude values are plotted on the ordinate y. Fig. 2 illustrates the case where two signals with different frequencies are superimposed. The higher frequency may be, for example, the frequency of a carrier signal for the-luminance signal of a video transmission, while the signal at the lower frequency may serve as the carrier signal for a simultaneous audio broadcast. The higher carrier frequency can be recognized in the rapid fluctuations visible in the resulting signal and leading to the formation of the positive maximum elongations 121. The signal at the lower frequency can be recognized in the bend of the center line.
34 which follows the course of the oscillations at the lower frequency. In the resulting signal the maximum elongations of the two opposite directions no longer lie on an unchanging level, but rather they show a course according to envelope functions 30 and 31, which are parallel to the center line 34 of the resulting signal. The carrier signal at the higher frequency may here be frequency modulated while the carrier signal at the lower frequency may either also be frequency modulated or amplitude modulated.

Fig. 3 shows in a corresponding manner the pattern of an amplitude modulated oscillation or the signal resulting from a superposition of two carrier signals whose frequencies differ only slightly from one another. As shown in the figure, in this case of superposition, there then result the known beats, i.e., periodic increases and decreases in the elongation of the resulting oscillating signal in the rhythm of the so-called beat frequency. It can be seen that the maximum elongations or amplitude 13 in the y direction and the oppositely directed maximum elongations or amplitude 13' have a time pattern which is illustrated by the envelope functions 32 and 33 and which lie approximately as a mirror image to the center line, i.e., the time axis, of the resulting signal. This is the significant difference compared to the envelope curves shown in Fig. 2, which are parallel to the center line 34.

Fig. 4 is a cross-sectional view through a piece of the recording carrier 1 whose signal recording was produced in a known manner by direct conversion of the resulting signal according to Fig. 2 into a hill-and-dale recording with the aid of an electromechanical transducer. The spatial
recording with the peaks 14 of the individual depress-
able raised portions has a cross-sectional shape which
is geometrically similar to the shape of the result-
ing signal in Fig. 2, i.e. the peaks 14 and the base
areas 14' of the individual raised portions along time
base line t follow the course of the envelope functions
30 and 31 respectively.

In a corresponding illustration Fig. 5 shows a
portion of a recording carrier 1 in cross section, the
recording carrier having been produced by direct
conversion of the resulting signal of Fig. 3 with the aid
of an electromechanical transducer. The peaks 15 and
the base areas 15' of the individual raised portions
follow, as in Fig. 3, the envelope functions 32 and
33 respectively.

It can be seen that for a recording carrier accord-
ing to Fig. 4 as well as for a recording carrier accord-
ing to Fig. 5 where the peaks 14 or 15, respectively, of
the individual raised portions, do not lie at constant
level or height, the pickup skid 3 of Fig. 1 would have to
be so strongly prestressed that the peaks 14 or 15 respec-
tively would depress the raised portions, even at the
points of the maximum height of the peaks, to such an
extent that the scanning edge of skid 3 would also re-
main in contact with the lower peaks of the raised por-
tions lying in the dales of the envelope curves 30 or 32,
respectively. The requirement for such a presetting of
the pickup arrangement substantially narrows the useful
range of the device and is thus undesirable.

Figs. 6 and 7 show circuit arrangements for producing,
with the use of the present invention, wave forms from the resulting oscillating signals of Figs. 2 and 3 in which the maximum elongations in one of the oscillation directions are all of the same size. If the thus modified resulting oscillation is then used for recording or producing the matrix for a recording carrier and the polarity of the resulting oscillations fed to the electro-mechanical transducer is so selected that the peaks of the raised portions correspond to the maximum elongations of uniform size, there result the spatial signal recordings as shown in Figs. 8 and 9 in which the peaks 14 or 15, respectively, lie at the same height and only the base areas 14' and 15' follow an envelope function having a correspondingly modified shape.

In Fig. 6, the block 16 represents a signal source for a luminance signal of a video transmission, while block 17 indicates a signal source for the associated chrominance signal. The output signal of signal source 16 is fed to modulator 18 wherein it modulates the high frequency carrier signal produced by carrier signal generator 20 while the output signal of signal source 17 is fed to a modulator 19 wherein it modulates the lower frequency carrier signal produced by the carrier signal generator 21. In the illustrated case the modulator 18 may, for example, be a frequency or a phase modulator while modulator 19 may, for example, be an amplitude modulator. Both modulated carrier signals obtained in this manner are then mixed or superimposed on one another in the superposition or mixer stage 22 so that the resulting signal appears as shown in Fig. 2 and as also indicated above the connection line between stages 22.
and 23 in Fig. 6.

The output signal according to Fig. 2 of the superposition stage 22 is fed to the input of the special amplitude modulation stage 23 to whose other input is fed the output signal of modulator 19, i.e. the low frequency carrier signal from source 21 modulated with the chrominance signal from source 17, so that it is either in phase or of the opposite phase, i.e., 180° out of phase, with the envelope function 30 or 31. In the special amplitude modulation stage 23 the output signal from stage 22 is modulated with the signal of the lower frequency carrier signal, i.e., the signal from modulator 19, so that the fluctuations in the height of the peaks of the signal coming from superposition stage 22 will be compensated. For this purpose the special modulator shown in Fig. 10 is suitable. There then results an output signal in the form, as indicated above the output line of special modulator stage 23, where the maximum elongations of the higher frequency oscillations in one direction now all lie at the same height, as desired. This effect is obtained by the special structure of the stage 23 which is shown in Fig. 10 and which will be described later.

The output modulation signal of stage 23 is then fed to a conventional electromechanical transducer 25 for producing records with such a polarity that, when the recording carrier 1' is moved in the direction of the arrow, uniform peak heights are produced with base areas which vary in their height in the rhythm of the modulation. The result is then a matrix or a recording carrier 1 as shown in Fig. 8 in which the peaks 14 of
the raised portions lie in the same plane 28, which is disposed parallel to a reference plane 29 disposed perpendicular to the extent of the heights of the raised portions along the scanning path, while the planes of the base areas 14' are variable in height according to the envelope curve 30'. The envelope function 30' is here geometrically similar to the curve of the envelope function 30 or 31, respectively, of Fig. 2. However, it may also be varied in scale in the direction of the y axis of Fig. 2.

The special amplitude modulator 23 shown in Fig. 10 consists of a highpass-lowpass-separating filter 35/36, a usual amplitude modulator 37 and an addition or superposition stage 38. In this last stage 38 the low frequency signal of the form of the envelopes 30, 31 is added to the signal of Fig. 3 which is produced by the usual amplitude modulator 37. The ratio of the amplitude of both added signals will be such that the resulting oscillation will be of the form of Fig. 8.

Fig. 7 shows a modification of the arrangement of Fig. 6 which is particularly suited for the conversion of the curve pattern according to Fig. 3 into a shape suitable for a recording according to the present invention. Up to (but excluding) stage 22, the arrangement according to Fig. 7 is assumed to completely correspond to that of Fig. 6 so that the parts which are disposed on the left of stage 22' are not shown again in Fig. 7. It is assumed that the resulting signal at the output of stage 22' is present in the form shown in
Fig. 3. This signal may be produced by amplitude modulation of the oscillation coming from modulator 18 with the oscillation coming from modulator 19. In this case the stage 22' is a usual amplitude modulator, producing an oscillation which is symbolically indicated above the connecting line between stages 22' and 26 of Fig. 7. Provided the case, that the resulting signal oscillation at the output of stage 22' is a beat signal, this stage will be a superposition stage. The form of oscillation of Fig. 3 with maximum elongations according to envelope curves which are substantial mirror images of each other can be converted according to the invention into the signal indicated at the output of a peak leveling stage 26 which may, for example, provide a simple rectification so that the maximum elongations of the high frequency signal in one of the oscillation directions toward the zero line now practically lie at an unchanging level. Alternatively, stage 26 could also be constructed in a known manner so that, it provides a peak rectification of the peaks of one polarity, so that the maximum elongations in one reference direction (positive or negative) are brought substantially to a common level. Such a circuit is often called a clamping or clipping circuit. In the output line between stage 26 and transducer 25 there again results an output signal of the pattern indicated by the symbol, but with double the amplitude compared to the above-described simple rectification of the signal in stage 26. The output signal of stage 26 is fed, as already described in connection with Fig. 6, to the electro-mechanical transducer 25 with such a polarity that the maximum elongations
at the same height correspond to the peaks 15 of the raised portions in Fig. 9. These peaks lie, as in Fig. 8, on the level of the peak plane 28 while the base areas now follow in their height the envelope function 32 whose course corresponds to the envelope curve 32 of Fig. 3.

Instead of providing the simple rectification or clamping function described above, the stage 26 of Fig. 7 may also be replaced by a stage 26' which linearly superposes two signals. The modulated carrier signal from the amplitude modulator 22', which is symbolically indicated above the connecting line between stages 22' and 26 and whose positive and negative maximum elongations are variable in size along the time base line according to envelope functions 32 and 33 which are approximate mirror images with respect to the time base line, is superimposed in stage 26' with a signal corresponding to one of these envelope functions and is of the same or opposite phase and has the same amplitude as the envelope function. Thus, all maximum elongations in one direction (positive or negative) become at least approximately equal to one another so that the wave form which is indicated above the connection line between stages 26' and 25 is produced which can then be used in the manner described above to produce a recording carrier 1 as shown in Fig. 9. In this case the stage 26 may, for example, include an envelope detecting circuit which detects the envelope of the input signal to stage 26 and whose output is then added to the input signal to stage 26 to form the output signal to be recorded.
Figs. 8 and 9 thus show cross sections of embodiments of recording carriers according to the present invention which can be scanned according to the pressure scanning method without there being a need for meeting the undesirable restricting requirements regarding the contact pressure of the pickup skid 3.

It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptions, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.
The Claims Defining the Invention are as follows:

1. In a recording carrier of the type wherein the signals are recorded in the form of depressable raised portions of the surface thereof which are played back by means of pressure scanning, said record having a signal recorded thereon which results in variable heights for said raised portions along the scanning path according to an envelope function of the recorded signal, the improvement wherein: the distances of the base planes of said raised portions from a reference plane disposed perpendicular to the extent of the heights of said raised portions along said scanning path vary according to one of the envelope functions of the signal, and the peaks of said raised portions lie substantially in a single peak plane which is parallel to said reference plane.

2. In a method of recording a modulated carrier signal, whose positive and negative maximum amplitudes along the time axis vary in size according to similar envelope functions, on a record carrier of the type wherein the signals are recorded in the form of depressable raised portions of the surface thereof which are played back by pressure scanning and with the heights of the raised portions along the recording path varying according to the envelope function, the improvement comprising the steps of:

modifying said carrier signal prior to recording so that all of the maximum amplitudes in one of the oscillation directions are substantially equal in amplitude, and thereafter recording the modified carrier signal on the carrier in such a direction that the maximum amplitudes of the same amplitude result in the peaks of the raised portions of the carrier containing the recorded signal.
whereby the peaks of the raised portions will lie substantially in a single peak plane which is parallel to a reference plane disposed perpendicular to the extent of the heights of the raised portions along the direction used for scanning same and the distances of the base planes of the raised portions from said reference plane will vary according to one of said envelope functions.

3. A method as defined in claim 2 wherein said envelope functions are approximately parallel to one another and are formed by the superposition of a high frequency modulated carrier and a low frequency modulated carrier, and wherein said step of modifying comprises detecting said high and low frequency modulated carriers in said carrier signal; amplitude modulating the detected high frequency carrier with a signal corresponding to one of said envelope functions; and superimposing said low frequency carrier on the signal produced by said step of amplitude modulating.

4. A method as defined in claim 3 wherein said signal corresponding to one of said envelope functions is in phase with said one of said envelope functions.

5. A method as defined in claim 3 wherein said signal corresponding to one of said envelope functions is of the opposite phase to said one of said envelope functions.

6. A method as defined in claim 2 wherein said envelope functions are approximately mirror images of each other with respect to the time axis of the carrier signal and wherein said step of modifying comprises superimposing a signal whose amplitude path follows one of said envelope functions and has substantially the same amplitude as one of said envelope functions on said modulated carrier signal.
7. A method as defined in claim 6 wherein said signal which is superimposed on said modulated carrier signal has the same phase as said one of said envelope functions.

8. A method as defined in claim 6 wherein said signal which is superimposed on said modulated carrier signal is of the opposite phase to said one of said envelope functions.

9. A method as defined in claim 2 wherein said envelope functions are approximately mirror images of each other with respect to the time axis of the carrier signal; and wherein said step of modifying comprises rectifying said modulated carrier signal.

10. A method as defined in claim 2 wherein said envelope functions are approximately mirror images of each other with respect to the time axis of the carrier signal; and wherein said step of modifying comprises clamping the amplitudes of said carrier signal in one direction at a constant level.

11. A method as defined in claim 2 wherein said modified carrier signal includes a first carrier signal which is frequency or phase modulated with the video luminance signal of a television transmission signal and a superimposed second carrier signal of a carrier frequency which is lower than the frequency of said first carrier signal and which is modulated with the associated video chrominance signal.

Dated this 15th day of January, 1976

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