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GOTHAM AUDIO CORPORATION

ENGINEERING BULLETIN

AEU 80 AUTOMATIC GROOVE ECHO SUPPRESSION

One of the quality diminishing effects in the production of phonograph records is the formation of groove preview and echo. This is a mechanical copying process involving the modulation of neighboring prooves which takes place principally during the plating/pressing process. The demand for long playing times per side have greatly aggravated this problem, since the formation of this preview/echo effect is directly related to the groove spacing.

The most careful handling of both the plating and pressing during the manufacturing process will serve to diminish this effect, but it cannot be eliminated completely. NEUMANN has therefore developed the AEU 80 Echo Suppression System in connection with its VMS 80 Disk Mastering Lathe. It knowledgeably increases the groove-to-groove spacing only at those locations where the danger of groove preview/echo is greatest. This knowledgeability includes the consideration of all psychoacoustic properties affecting the audible annoyance caused by this effect.

The AEU 80 is an accessory to the VMS 80's pitch and rest space recognition system, and assures that groove spacing is increased only where necessary and then only for the time and in the amount required, thus preserving maximum playing time per side.

Both pre-echo and post-echo effects are recognized and suppressed. The control signal obtained is modulation dependent and may also be adjusted by the mastering engineer to suit the preview/echo forming conditions of the ensuing plating and pressing processes.

The AEU 80 is an accessory to be ordered together with a new VMS 80. Lathes up to serial number 061 may be readily upgraded by ordering an AEU 80 Upgrade Kit.

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Another problem existing in disk records is the groove echo problem and this problem exists as long as disks have been cut.

The more closely grooves are cut, the bigger is the danger that echos occur. In recent years the variable pitch control systems have several times been improved with the aim of the optimum utilisation of the available modulation space in order to increase the playing time. This problem became especially important with the introduction of the VMS 80, especially then, when the advantages of the new control system are completely used for the extension of the playing time. One important parameter for the echoeffect is of course the distance between the grooves.
To diminish this risk, the groove distance must be increased in those places which especially suffer from this echo-problem. Since this again leeds to a loss of playing time, a procedure must be found which contains all known criteria of the echo-problem and which is able to apply the echo-diminishing distance increase in just sufficient amount and at the proper time.

Only a system such as this will provide the necessary groove echo relief, while not negating the advantages of the VMS 80's modern pitch control system.
It was therefore necessary to define exactly the echo-producing criteria, not only with regard to their cause, but also with regard to their psychoacoustic influences.
How is groove echo created. Echo on the disk is the copying of the modulation contents from one groove into the adjacent groove. We differentiate between pre-echo and post-echo, depending on wether the echo exists in the preceding or in the following groove. The echo is the result of a mechanical copying process which is the result of mechanical tensions, the vector-diagram of which is defined by the modulation contents. The influence of this tensions on the grooves is a function of time, temperature and the make up of the material. As we know, echo is mainly found on the pressed record, which means that the problem lies mainly in the plating process, although echo-effects may even be recognized on the cut lacquer itself under certain conditions.

AKS 80

GANGED LEVEL CONTROL WITH PREVIEW DELAY ~~AKS 80~~

It is often necessary to make level corrections during a tape-to-disk transfer. Up to now most people have done this using the ganged controls found on NEUMANN transfer consoles in which preview and modulation are controlled in tandem. This sort of control, however, is not precise in view of the fact that any influence on program must begin in the preview channel and must be effective in the modulation channel with the preview distance delay. The AKS 80 unit performs this function precisely and indeed delays the level control for the half revolution of preview used with the VMS 80 Lathe. For the control of this function there are two digital inputs available. The first of these must be fed from the VMS 80 Lathe's sync signal labled "16 f_D" (16 times the turntable rpm = 8.88 Hz for 33 1/3 rpm) and produces the half revolution delay normally provided by the preview distance. If this sync signal is missing, the delay is automatically cancelled. The delay may also be cancelled if the second digital input DEL EN H (Delay Enable High) is connected to 0 volt (high if unconnected).

When used with the VMS 70 or VMS 66 Lathes, this sync signal must be generated externally.

PRELIMINARY TECHNICAL DATA:	0.775 V ≙ 0 dB
Nominal powering voltage:	±15 V ±10%
Current consumption at above voltage:	≤ ±100 mA
Level control range:	±6 dB linear, with detent in center at 0 dB point.
Tracking for all four channels:	0.1 dB
Frequency range:	20 - 20,000 Hz ±0.1 dB
Input impedance:	≥30 kohm unbalanced
Output source impedance:	≤50 ohm unbalanced
Minimum termination:	2kohm
Max. input/output level at nominal powering voltage:	+20 dB
Crosstalk over response range:	≥70 dB
THD over response range (+20 dB into 2 kohm)	≤0.3%
Unweighted and Wtd noise levels at V≙0 dB:	
Mechanical Dimensions:	Stereo linear motion fader in A1 cassette (40 x 190 mm) with mechanical linkage, disconnectable, control path 120 mm.
Housing depth behind panel:	109.5 mm

S.F. TEMMER

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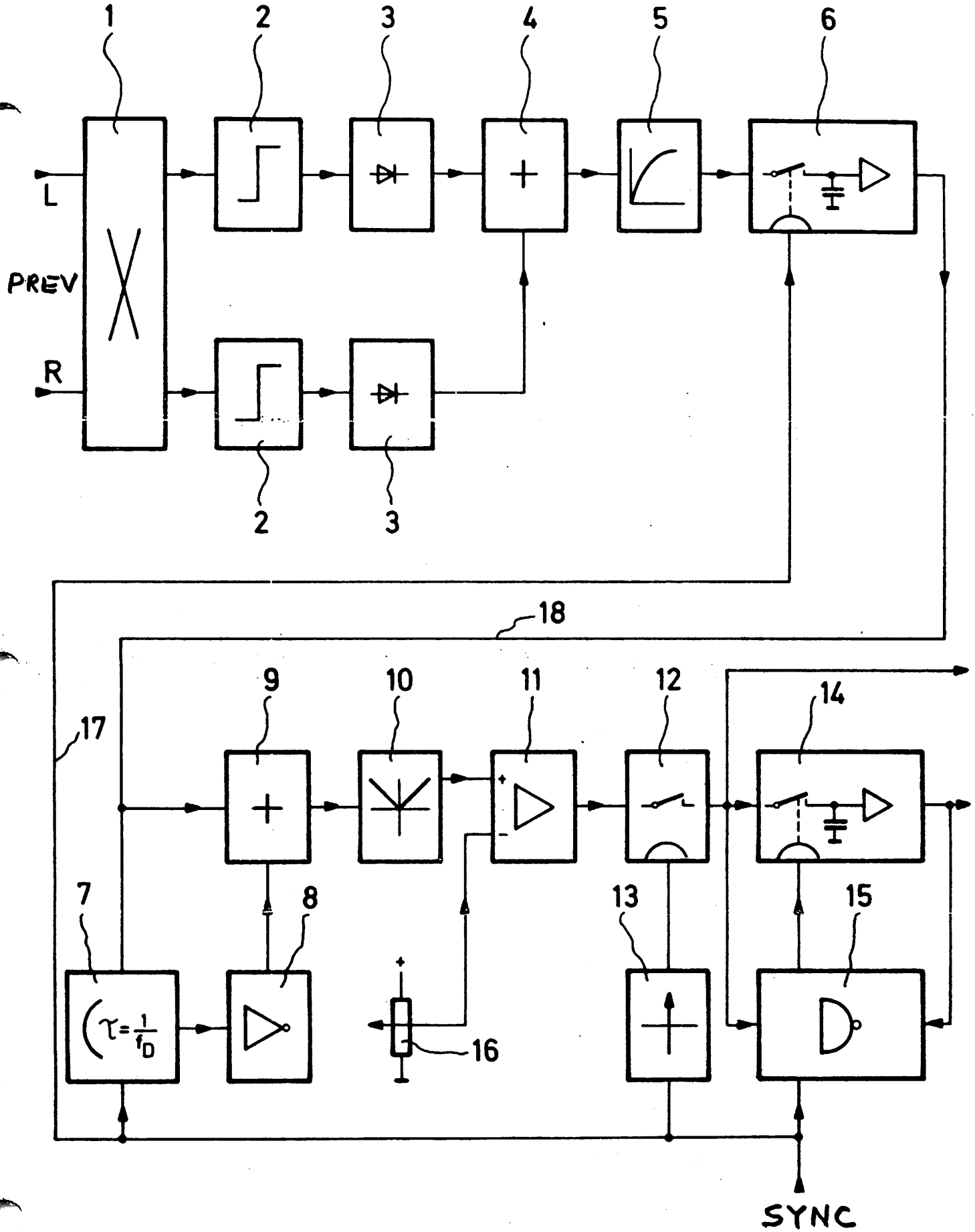
We therefore have a two-channel signal processer before the summing amplifier (4), beginning with a sum+difference matrix (1) the equilization (2) as already previously described (ear characteristic and amplitude response) and the rectification (3). The resulting signal is converted to a logarithmic scale in the log amplifier (5) (in our example 60 dB). In the ensuing stage (6), the signal is time quantized by means of a central clock in such a way, that the maximum value, which lies within one 100 ms measuring period, in our example is stored untill the measuring period ends. The maximum value at the end of a measuring period is now delayed by exactly one turntable revolution in the delay line (7) and after an inversion in stage (8) is added in the adding stage (9) with the undelayed signal to form a difference between these two signals, the delayed and the undelayed.

This difference signal between two adjacent grooves may also have a negative value. It has therefore to be converted in stage (10) into an absolute magnitude. Stage (11) is the point for the introduction of the above mentioned control factor. This is done in such a way that the difference signal is combined with an adjustable dc voltage to form another difference signal, the magnitude of which is used to control the groove distance to prevent the echo. This adjustable dc voltage creates a threshold for the difference signal. At a higher threshold level, the difference between the echo causing modulation signal and the echo itself is smaller, so that the level differences necessary to cover the echo effect must be reduced in level.

The switch (12) makes sure that only those signals from the previously described process at the end of the measuring period are fed to the output. This switch (12) is controlled from the central clock through the pulse processing stage (13).

The signal at the output of switch (12) is a pulse signal which is formed at the preview time of an echo endangered point of the groove. The amplitude of this pulse signal corresponds to the difference signal diminished by the adjustable threshold value. This signal represents the nominal information for the



AEU80

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