Hold that note! — guitar sustain unit

NORMALLY, each note from a guitar has a high initial volume that rapidly decays to a much lower level, and then gradually fades out. A sustain unit provides a relatively constant output level when used with an electric guitar, despite the wide range of input levels. The most simple form of sustain unit is a clipping amplifier, but these inevitably introduce quite large amounts of distortion. A better method, and the one used in this unit, is to use a compression circuit having fast attack and decay times.

This type of circuit is basically a voltage controlled amplifier, the gain of the circuit being controlled by an output level sensing circuit which varies the gain to produce a fairly consistent output level. Little distortion is produced using this method.

In the circuit here, Q1 is used as a low noise pre-amplifier having a voltage gain of about 20 dB. Its output is fed via C3 to the input of IC1, the voltage controlled amplifier device. This has a quiescent voltage gain of about 13 dB, but this can be reduced to an attenuation of over 70 dB by taking pin 2 of the device several volts positive. Capacitor C6 couples some of the output from IC1 to the output socket, and C5 couples the remaining output to a common emitter amplifier based on Q2. The amplified signal at Q2 collector couples via C9 and R7 to a conventional voltage-doubler and smoothing (C8, R6) rectifier network. The positive bias produced by this network is fed to the control input of IC1 via a low gain amplifier and buffer stage based on IC2.

With low input levels (below about 1 mV) the control signal is too small to affect the gain of IC1. Higher level signals produce a proportionately larger control voltage and lower the gain of IC1, preventing the output level from rising much above about 30 mV RMS, and giving the required virtually constant output level.

The attack and decay times of the circuit are both quite short, so that the unit responds suitably rapidly to changes in input level, but neither of these time constants are so short as to cause serious distortion.

The unit will be most effective with the volume control on the guitar set at maximum, unless the output should then be so high as to overload the unit and cause distortion.

In constructing the unit, the usual precautions regarding hum should be taken, especially avoiding ground loops. The input and output sockets should be physically quite separate, although general layout is not too critical. Capacitor C1 is a supply bypass and is best located near IC1 with its leads having short, direct connections to pins 8 and 3 of the MC3340. ●