
IMPROVED CLAMP TUBE MODULATION

by D. M. MALLETT, G3HUL

OF ALL THE SYSTEMS OF EFFICIENCY MODULATION, clamp tube modulation is about the simplest. In the usual form, the clamp tube is unbiased and holds the carrier to about one third of its maximum c.w. level. Only the negative swing of the audio cycle on the clamp tube grid is used, and this modulates the carrier in an upward direction. According to some, this should result in all manner of distortions, but in practice the signal radiated is reasonable. However, although passable, even with the use of negative feedback, diodes, etc., it still leaves much to be desired.

After seeing a circuit using a clamper tube to vary the input of a p.a. stage from full power to almost nothing (150 watts to about 10) the possibility of using this for linear modulation became apparent and the circuit of Fig. 1 was devised.

This enables the clamp tube to work under Class A conditions and the p.a. input to be at about two thirds maximum c.w. level. The p.a. can be any normal tetrode such as an 807 or TT11, etc., utilising the drive power to bias it. R_1 is calculated to provide correct bias. R_2 acts as a voltage divider to bias the clamp tube to any value of negative voltage from maximum p.a. grid voltage to zero. The value of R_4 depends on the p.a. tube used and should be the same value as for normal c.w. ratings, but it must also be able to handle the extra current used by the clamp tube. Audio is applied to the clamp tube via C_5 , R_3 acting as the grid load resistor.

Setting Up

R_2 should be set with the slider towards C_3 and the r.f. choke, and the Tx should be loaded up for maximum c.w. operation. R_2 should then be turned in the opposite direction and the p.a. anode current should then go down to a low value. R_2 is then set half-way between maximum and minimum anode current. The audio gain is then advanced until the p.a. needle just starts to kick on speech peaks. If R_2 is set too low, the p.a. anode current meter needle will kick upwards, and downwards if too high. It is possible to modulate quite deeply with the p.a. needle absolutely stationary, but more "punch" is added to the carrier if the p.a. needle just flickers.

If the p.a. current will not go to a low value, try altering the resistor R_4 , or if it will not rise to a maximum c.w. level, with the clamp tube in, check drive voltage. This should be more than enough to bias the clamp tube to cut-off.

A variation, shown in the circuit of Fig. 1, can be used if it is desired to increase the modulation even deeper. R_5 is arrived at experimentally and then the screen supply to the driver is also controlled by the clamp tube. When correctly set up, the drive to the p.a. will vary proportionately to the p.a. input and 100% modulation can almost be achieved without fear of breaking up the carrier through overmodulation.

The audio amplifier shown in Fig. 2 can be used, and with a deaf aid crystal microphone unit will fully modulate a

