thyristor by avalanche action, even with the gate open circuited, if a high enough anode voltage is applied. In fact, some devices are manufactured to work in a controlled avalanche mode; the voltage regulator diode is a well-known example of an avalanche device. The "bidirectional diode thyristor," or DIAC, is also an avalanche device. As the symbol suggests, it will conduct in either direction when the breakdown voltage is applied across T1 and T2.

The bidirectional triode thyristor or TRIAC is a versatile device. It will conduct in either direction (T1 to T2, or T2 to T1) when the gate is either sufficiently negative or sufficiently positive with respect to T1. It can perform the same tasks as a pair of thyristors connected in inverse parallel. It can be seen to have many useful applications.

CLOTH EARS

THE PSYCHOLOGY OF CW RECEPTION

Revd. G. DOBBS (G3RJV)

SHORTLY after the G.P.O. let me loose on the amateur bands, a well seasoned operator, catching sight of my battered old receiver, said, "You'll be struggling with *that* on today's bands, matey!" I suppose he was right. What can be done with an ancient receiver, selectivity as wide as a barn door, on crowded amateur bands? Perhaps it seems, not much. But how much depends upon the sophistication of the receiver and how much upon what rests between the phones? In the field of behavioural psychology, recent experimental work on human attention brings good news to those of us whose receivers seem to pick up half a band at any one time.

For many years work has been done on, what might be called, the "focus of attention." That is, the ability of humans to use a sense organ in a discriminatory manner. Our eyes don't usually view a whole scene at once, but choose certain focal points of interest. In a jazz concert, discerning fans may be able to follow the music of one instrument, admidst a welter of sounds. The ability, and limitations, of our control of attention is of great interest to psychologists, partly arising out of the increase in automation. In future the role of man, in relation to automated control systems, will rest upon his ability to receive and react upon information.

Some experimental work as been done on what is called "The Cocktail Party Problem." The brain is set a difficult task at a Cocktail Party. We usually only listen to one person at once, yet our ears are receiving an extremely complex series of sound waves in which all the conversations within earshot are jumbled. From this confusion of sounds our brains extract one voice, while the rest are checked for relevance and rejected. "I know the problem," sighs the amateur, but we might call it the "40-metre band problem!" How is this relevant to Amateur Radio?

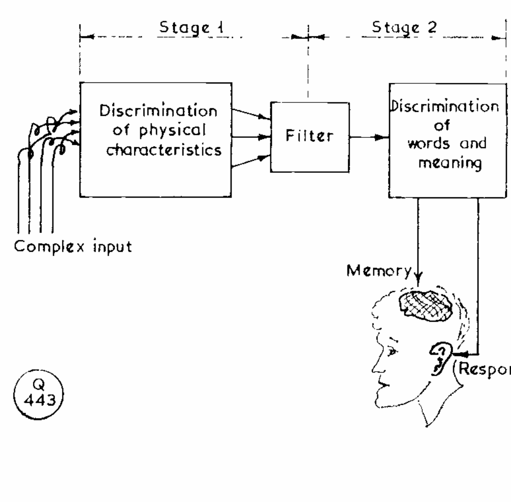
Well, a researcher called Cherry did some practical experiments in 1953, which have led to further research and comment. He played two passages of prose separately into two headphones worn by the same subject. Then whilst listening to both passages the subject was asked to repeat one of the passages as he heard it. Then he was asked what he knew about the other passage, and the answer was usually very little. Most subjects could tell the sex of the voice, but some did not even notice when the passage was interpersed with gibberish or another language. This experiment suggests that we discriminate in two stages (at least) when faced with a complex sound input—first, general features then specific information. Broadbent in 1958 suggested a model in diagram form, to explain how this works. The drawing here looks strangely analogous to a radio receiver block diagram.

It suggests that the brain acts as a filter selecting between the various input channels. The sense organs are fed with the complex stimuli, and the first discrimination is mainly on the basis of physical characteristics. In terms of the spoken voice, things like: Is the voice male or female, loud or soft, intoned high or low, and so on. The next stage is concerned with discrimination on the basis of words and meaning, dealing only with one or perhaps two signals allowed to pass the first stage. The interesting fact which emerges from this model is that the human brain finds it difficult to discriminate between messages or signals on the basis of their meaning if they do not differ in physical characteristics.

Radio Analogy

This is good news for the CW operator with a wonky note—his signal stands more chance of being picked out when the rest of the band is full of T9 notes! This means that the characteristics of a CW note are important for its discrimination. The remedy can be within the receiver. A deliberately foul BFO beat can nicely mess up the signals produced by the most perfect transmitter, so perhaps make them easier to sort out. But the age-old remedy is the T5'er, an audio filter designed to *spoil* the quality of CW notes to make discrimination easier.

Further research has been done to show ways in which the brain distinguishes between certain signals at the first stage. The pitch of sounds reaching the ear as well as their volume aids discrimination. Although volume is an important characteristic enabling clear



Q 443

discrimination, subjects under test were able to distinguish clearly soft signals which had definite physical characteristics in spite a much louder signals present. Experiments in 1957 with pulsating sounds (probably the nearest psychologists have come to using Morse) showed that both the pitch of the note and its pulse rate or modulation were recognisable characteristics. When two notes of differing frequency were subjected to the same rate of pulsation, the hearer could only tell one sound. This might suggest that the actual keying of a CW signal, both in speed and style, may help distinguish a signal, although the content of the information has little effect.

Conclusion

What does all this suggest to the Amateur Radio operator? Well, in the first place, our brains have quite good filters for incoming signals to our ears. If we could only realise it, we have crystal, rather than cloth, ears. So unless the mechanics or electronics of our receiver can select the signals we require, our brains must do the work. This research has given us a rough indication of how our brains do this. The first important fact is that information contained in the signal has practically no effect on our wilful discrimination of that signal. We distinguish between competing signals first and foremost by their *characteristics*, what the signal sounds like rather than what it is saying. So on a crowded band we naturally choose odd sounding, or very loud, or very fast or slow signals. Receiver-wise we can help ourselves by introducing physical characteristics to certain signals. This can be done expensively with crystal or mechanical filters, which improve not only the selectivity of the receiver but the quality of the signal note. But we could just as well employ a device which makes certain signals distinguishable because of the poor quality of the note, such as the inexpensive " T5'er." Thankfully, our own ears are quite sophisticated equipment when fed into a brain.

Editorial Note: Competent and experienced CW operators will readily confirm the ideas outlined in this interesting article. Years ago, when Rx selectivity was much worse than it would be even with G3RJV's " old banger " of today, it was common practice for wily DX operators to impress a " muscial buzz," or slight tone modulation, on their note, usually by running the PA with virtually unsmoothed DC/HT. This signal could then be picked out comfortably against the T9x competition! Similarly, a competent operator will read the signal he wants by slight pitch variation, and will even ask for QRQ (" please send faster ") in the face of heavy QRM, simply to make the wanted signal sound different. Subconsciously, the Rx is always adjusted, in one way or another, to obtain this " difference " characteristic. But you've got to be able really to read Morse to succeed at this sort of thing!

TRANSISTOR POWER SUPPLY UNIT

WITH OVERLOAD PROTECTION— VALUES FOR TWO OUTPUT RATINGS

A. CHORAFFA (G3PKW)

A SIMPLE, low-cost and reliable transistor power supply was required at the writer's QTH, because of increased experimentation with semiconductors. The unit described here gives a variable output of 6 to 18 volts DC with a 2% regulation from zero to full load. The arrangement provides for current overload and short circuit protection.

Circuit is as in Fig. 1. A transformer and bridge rectifier produce about 25 volts of unsmoothed DC. This is smoothed by C1 and fed to the collector of Tr1, the base of which is forward biased by R1. Tr1, known as the pass-transistor, acts as a series-regulating device and must be capable of withstanding the full load current. Tr1 functions as an emitter follower, the base of which is held at the correct voltage by Tr2, known as the voltage reference amplifier. It obtains forward base bias *via* ZD1, VR1 and R2, R3 and CR1 being supplementary to give current control.

Operation

The circuit operation is as follows: Fig. 2 shows simplified circuit with the assumption that VR1 is at the top end of its travel. When the supply is turned on Tr1 starts to conduct due to the forward base bias provided by R1. When Tr1 emitter reaches just over 6 volts (zener turn-on voltage), forward base bias is applied to Tr2 causing it to conduct, which starts to degrade the forward bias applied to Tr1 by R1, causing Tr1 to conduct less. This action continues until equilibrium is reached, at which point stabilisation occurs. In Fig. 1 VR1 provides, at the slider arm, a variable proportion of the total output voltage. The voltage at the slider always being the 6 volt reference. (For VR1 read RV1 in circuit.)

Current Control

Fig. 3 shows the current control elements. It must be stated here that all semiconductor diodes exhibit a forward volt drop (VF) when conducting. This is about 0·2 volts for germanium devices and about 0·5 volts for silicon. We will assume CR1 is a silicon device with a VF of 0·5v. As current is drawn from the emitter of Tr1 a volt drop occurs across R3. Tr1 requires a forward base/emitter junction voltage of 0·2 volts, therefore if the current through R3 exceeds 0·3 amps (a volt drop of 0·3v.) the base/emitter junction voltage of Tr1 will be limited. This action begins to cut off Tr1. If the output load tries to draw more current Tr1 is cut off completely and output voltage becomes zero. It must be emphasised that an overload should not be left connected for any length of time, as the possibility of thermal effects could allow current to flow. As the PSU was not intended to