TRANSISTORS APPLIED

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PREFACE

The transistor is being used nowadays as a technical amplifying element in almost every field of technology. In consequence, the valve is more and more superseded by the transistor. To the same extent as the transistor is replacing the valve, those who up to now have only worked with valves must now also become familiar with transistors. Experience has shown that the amplifying element “valve” is theoretically relatively easily mastered by students, apprentices, amateur technicians and so on. Why is it then that those very circles who successfully apply the theoretical knowledge concerning the operation of the valve in the circuit show an aversion to assimilating the theoretical fundamentals of the transistor? Is the operation of a transistor as an amplifying element really so different in principle compared with the valve? Is it necessary to replace the simple formulae of the valve by obscure four-pole equations in the case of the transistor? The answer to that is an emphatic “No!”. The transistor is just as easy to understand as an amplifying element in the circuit as the valve. Granted, the internal physics of the transistor present more difficulty than with the valve. This, however, is by no means simple in the valve and what “expert” in the use of the valve has hitherto bothered himself about the internal more profound physical processes of the valve? It is important for the user of valves and transistors to know what this type of amplifier can do. Here the greatest interest lies in the characteristic values and curves. This does not mean that one should know nothing at all about the internal physical processes in a transistor. It ought to be said, however, that over-emphasis on the physical processes in the transistor has “soured” its theoretical presentation to a large extent.

This text-book contains a short essential treatise on the physical facts necessary to explain certain specific transistor properties. Its chief aim, however, is the presentation of the principles of the transistor as an amplifying element in combination with the essential circuit elements. Here we are not so much concerned with reproducing the greatest possible number of circuits built up as with arousing a basic knowledge of which suitable chosen circuits to understand and eventually to develop oneself. Pure algebra is the only mathematical science required to study this book. In order that the less experienced may be able to concentrate on transistor problems, the

most important properties of the transistor compared with those of the valve have been set out in the form of an introduction. This summary may serve the more skilled reader as a quick survey. The detailed explanations mainly cover the so-called small signal amplification at low and high frequencies. The derivations are included in such a way that even those who dislike the formulae will be able to follow them without difficulty. Numerical examples given after each problem should consolidate the material and give the feeling for magnitude and dimensions.

The presentation of the transistor has been carried out in exactly the same way as that which has already become classical for the valve. It is therefore to be hoped that as a result of the uniformity of the presentation a better and clearer connection will be shown between the two amplifying elements and with it a basis for easier comprehension of the transistor.

January 1965

THE AUTHOR

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