ENGLISH IN FOCUS

Series Editors: J. P. B. ALLEN and H. G. WIDDOWSON

Mechanical Engineering Eric H. Glendinning*
Basic Medical Science Joan Maclean*
Education Elizabeth Laird
Agriculture Alan Mountford
Social Studies J. P. B. Allen and H. G. Widdowson
Electrical Engineering and Electronics Eric H. Glendinning

*Advisory Editor: Ronald Mackin

ENGLISH IN FOCUS

English in Electrical Engineering and Electronics

ERIC H. GLENDINNING

TEACHER'S EDITION

OXFORD UNIVERSITY PRESS

Oxford University Press, Walton Street, Oxford OX2 6DP

OXFORD NEW YORK TORONTO
PETALING JAYA SINGAPORE HONG KONG TOKYO
DELHI BOMBAY CALCUTTA MADRAS KARACHI
NAIROBI DAR ES SALAAM CAPE TOWN
MELBOURNE AUCKLAND

and associated companies in
BEIRUT BERLIN IBADAN NICOSIA

OXFORD is a trademark of Oxford University Press

ISBN 0 19 437517 X (Student's Book)
ISBN 0 19 437508 0 (Teacher's Edition)

First published 1980
Third (revised) impression 1984
Fourth impression 1987

PRINTED IN HONG KONG

Contents

Unit 2

Unit 3

Unit 4

Unit 5

5. What methods of MHD generation are in use?
6. How do the two methods differ?
7. How does the efficiency of this process compare with conventional systems?

STAGE 2 *Summarizing*

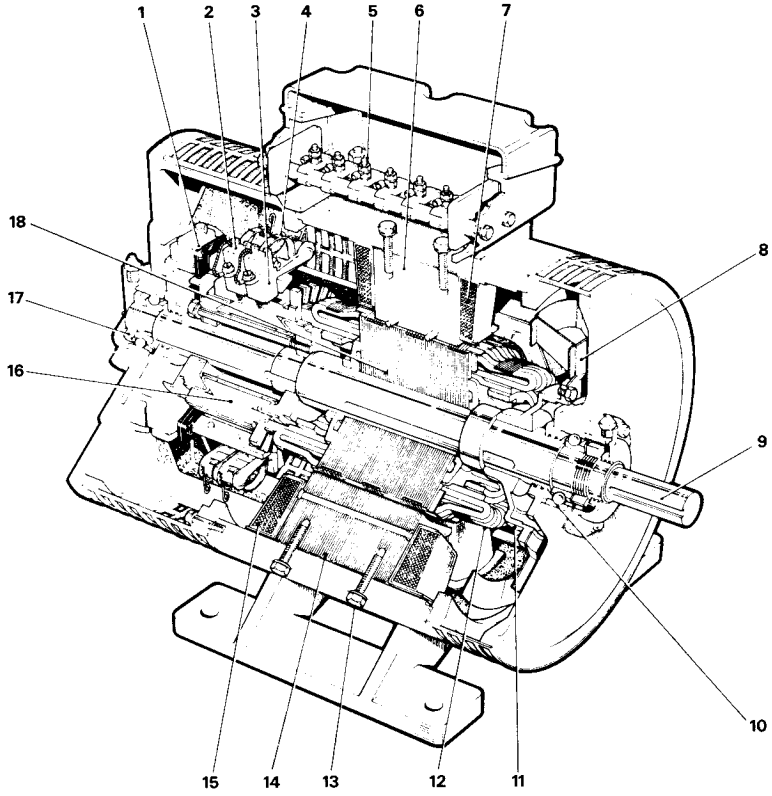
Complete this summary of the passage using your answers to Stage 1:

Unlike conventional power generation, the MHD process does not require . . . . . .
It operates on the principle that . . . . . .
The conductor is an ionized gas seeded with . . . . . .
It is pumped at a high temperature and pressure . . . . . .
Two methods can be used: . . . . . .
In the open-cycle method gas from oil or coal is passed through a magnetic field and then used to drive a turbine before . . . . . ., whereas in the closed-cycle method . . . . . .
The MHD process has an efficiency rate of . . . . . compared with . . . . . for conventional stations.

Unit 3

I READING AND COMPREHENSION

THE DC MOTOR



1 brush bar
2 brushes
3 brush holder
4 brush pressure spring
5 terminals (main)
6 interpole
7 interpole coil winding
8 fan
9 driving shaft
10 driving end bearing
11 fan hub
12 armature coils (commutator winding)
13 main pole bolt
14 main pole
15 main pole coil winding
16 commutator segments
17 commutator end bearing
18 armature core

FIGURE 1 A typical dc machine with a section removed

An electric motor is a machine for converting electrical energy into mechanical energy. Motors can be designed to run on direct (dc) or alternating current (ac). The motor shown in Figure 1 is a dc motor. Its most important parts are the rotor, the stator and the brushgear.

The rotor is the moving part. It contains an armature, which is a set of wire loops wound on a steel core. When current is fed to the armature, these windings produce a magnetic field. The armature and core are mounted on a shaft which runs on bearings. It provides a means of transmitting power from the motor.

The rotor also contains a commutator. This consists of a number of copper segments insulated from one another. The armature windings are connected to these segments. Carbon brushes are held in contact with the commutator by springs. These brushes allow current to pass to the armature windings. As the rotor turns, the commutator acts as a switch making the current in the armature alternate.

The stator does not move. It consists of magnetic and electrical conductors. The magnetic circuit is made up of the frame and the poles. Wound round the poles are the field coils. These form the stator's electrical circuit. When current is fed to them, a magnetic field is set up in the stator.

The motor operates on the principle that when a current-carrying conductor is placed in a magnetic field, a force is produced on the conductor. The interaction of the forces produced by the magnetic field of the rotor and the stator makes the rotor spin.

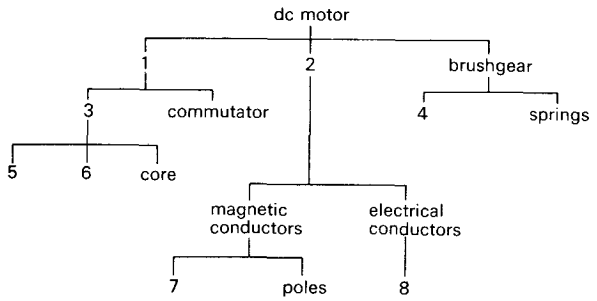
EXERCISE A *Meaning from context*

Select the word from the three alternatives given which is most similar in meaning to the word in italics as it is used in the passage:

1. *provides* (line 8)
   (a) produces
   (b) supplies
   (c) allows
2. *segments* (line 11)
   (a) sections
   (b) pieces
   (c) wires
3. *alternate* (line 15)
   (a) reverse
   (b) change
   (c) flow in one direction then in another
4. *interaction* (line 22)
   (a) acting together
   (b) operation
   (c) result

EXERCISE B *Completing a diagram*

Complete the following diagram of the components of a dc motor using the information in the passage and Figure 1.



EXERCISE C *Describing position*

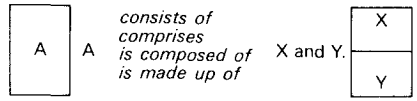
Describe where the following components are located using the information in the passage and Figure 1.

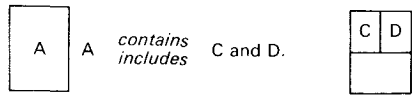
1. the armature windings
2. the core
3. the fan
4. the field coils
5. the poles

II USE OF LANGUAGE

EXERCISE D *Describing component parts 1*

The following verbs can be used to break down a piece of equipment into its component parts. Note how they are used.

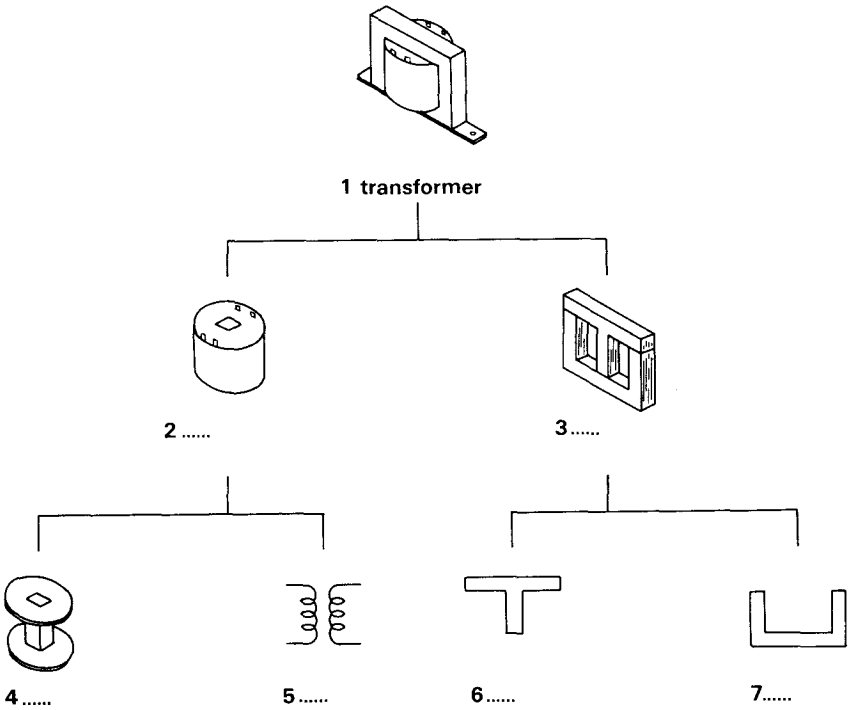




Study this description of a simple transformer:

A simple transformer consists of two coils, a primary and a secondary, wound on a former which is mounted on a soft-iron core. The coils are made up of a number of turns of insulated wire. The core is composed of thin laminations. Either E- and I- or U- and T-shaped laminations are used. The former is mounted on the centre limb of the E or T.

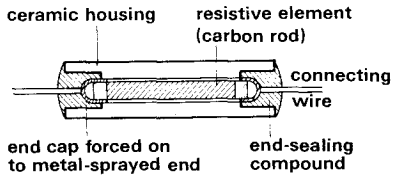
Complete this diagram of the components of the transformer.



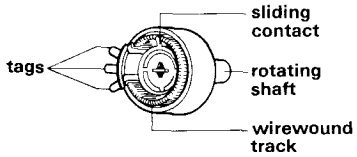
Now write your own description of a transformer using the diagram.

EXERCISE E *Describing component parts 2*

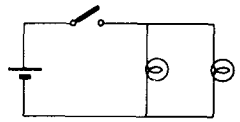
Break down each of these items into its components using the verbs you have learned. Where possible, draw a diagram to illustrate the breakdown.



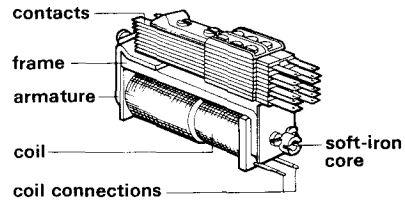
1. a carbon resistor



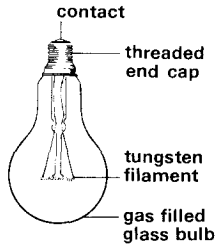
2. a variable wirewound resistor



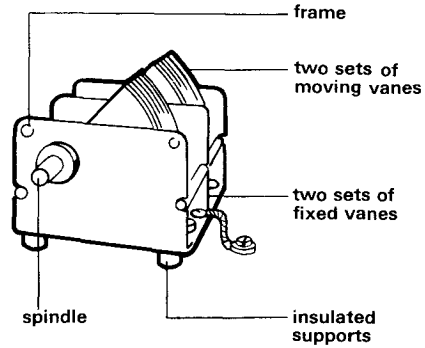
3. a lamp circuit



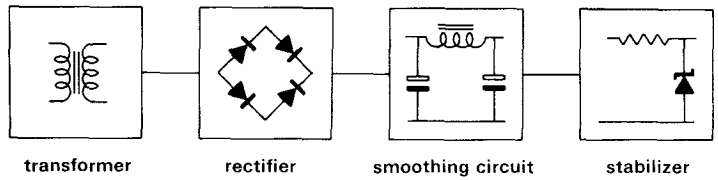
4. a relay



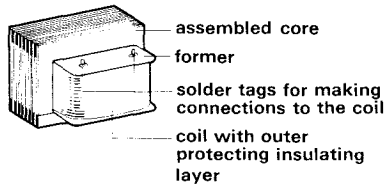
5. a filament bulb



6. a variable capacitor



7. a power supply



8. a choke

EXERCISE F *Writing impersonal instructions*

Study these instructions:

1. Use a high-resistance voltmeter.
2. Do not insert a fuse in an earth conductor.

In writing, instructions are often made impersonal using *should*.

EXAMPLES

1. A high-resistance voltmeter SHOULD be used.
2. A fuse SHOULD NOT be inserted in an earth conductor.

We can emphasize an instruction by using *must*.

EXAMPLES

1. A high-resistance voltmeter MUST be used.
2. A fuse MUST NOT be inserted in an earth conductor.

Here are some points to remember when using transistors. Study them:

1. Use heat shunts when soldering.
2. Do not connect or disconnect transistors with the power on.
3. Do not use an ohmmeter for checking transistors unless a safe voltage or current range is used.
4. Keep sharp bends in the leads at least 1·5 mm away from the transistor body.
5. Do not exceed the reverse breakdown voltage.

Rewrite each instruction to make it impersonal. Then emphasize each instruction using *must*.

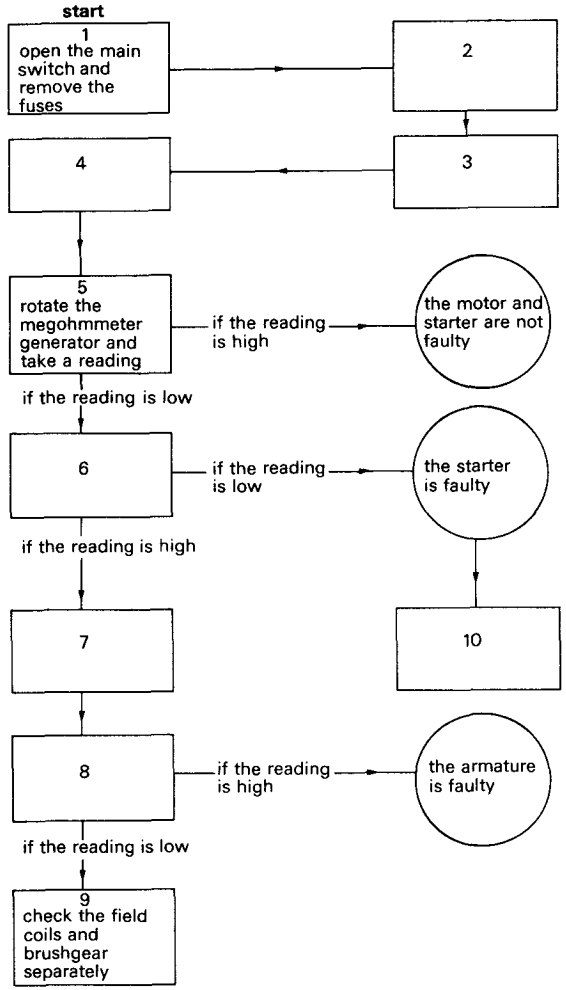
EXERCISE G *Writing instructions for testing a dc motor*

Study this description of how dc motors are tested with a megohmmeter:

The supply should be disconnected by opening the main switch and removing the fuses. Both starter input terminals are joined together and connected to one terminal of the megohmmeter. The other lead of the megohmmeter is connected to the motor frame. The megohmmeter generator should be rotated at about 160 rpm and a reading taken.

If the resistance is found to be low, then the starter should be isolated and the test repeated on the starter alone. If the resistance is still low, then the starter coils should be checked individually until the fault is located. If the resistance of the starter is high, then the fault must lie in the motor and not in the starter. The brushes should be lifted off the commutator and the field windings and brushgear tested. If the resistance is satisfactory, then the armature only should be tested. If the resistance is low, then the field windings and brushgear should be tested separately until the fault is located.

This flow chart provides instructions for how to test a dc motor. Fill in the missing instructions with the help of the preceeding description.



EXERCISE H *Relative clauses 4: clauses with prepositions*

Study these sentences:

1. The resistor has a value of 33 000 ohms.
2. The capacitor is connected across the resistor.

Note how they can be linked using a relative clause:

1+2. The resistor ACROSS WHICH THE CAPACITOR IS CONNECTED has a value of 33 000 ohms.

The repeated noun in sentence 2, *resistor*, has a preposition, *across*, before it. This preposition must be included in the relative clause. It is placed before the relative word, *which*.

Now link these sentences. Make the second sentence in each pair a relative clause. State whether the clauses are defining or non-defining. (See Unit 2, Exercise H.) Explain any difference in meaning which may occur.

1. The range is 0–1000 volts.
   The meter can operate over the range.
2. A battery is a device.
   The device changes chemical energy into electrical energy.
3. Power supplies are used to drive dc motors.
   The power supplies use thyristor rectifiers.
4. The capacitor has a value of 27pF.
   The signal is passed through the capacitor.
5. The telephone is a device.
   The device uses the magnetic effect of a current.
6. The receiver can only be used with headphones.
   The headphones have a high impedance.
7. The plates are known as X and Y plates.
   The beam passes between the plates.
8. The rotor contains a commutator.
   The commutator acts as a switch.

EXERCISE I *Reason and result connectives 2*

In Unit 1, page 8 you learned that *because* links a statement and a reason and that *therefore* links a statement and a result. The following connectives can also be used:

statement + reason

since
as
for the reason that

statement + result

hence
consequently
for this reason

If the connective has more than one syllable, use a comma before it.

EXAMPLE

Dc motors are used for cranes, for the reason that their speed can be finely controlled.

Although connectives link ideas, these ideas need not be put into one sentence.

EXAMPLE

The current rose above the maximum. Consequently the circuit-breaker opened.

These ideas are linked by *consequently* but each is in a separate sentence.

Reason connectives, however, are almost always used to link ideas into one sentence.

EXAMPLE

Copper is often used for cables since it is a good conductor.

Now link these ideas with either reason, result, or qualification connectives. (See Unit 1, Exercise K and Unit 2, Exercise K.)

1. Conventional current flow is from positive to negative.
   In fact electrons flow from negative to positive.
2. Alternators are preferred to dynamos for cars.
   Alternators give higher outputs at low speeds.
3. Dirt and dust reduce effective light.
   Lamps must be kept clean.
4. Squirrel-cage motors are simple, cheap and strong.
   Squirrel-cage motors are used for many general duties.
5. It is convenient to describe magnetic lines of force.
   In reality magnetic lines of force do not exist.
6. Transistorized equipment is easily portable.
   Transistors can operate from battery voltages.
7. Ultrasonic welding is better than heat welding.
   The materials are not distorted.
8. Watchmakers work with very small parts.
   Watchmakers require a lot of light.

III INFORMATION TRANSFER

EXERCISE J *Reading motor rating plates*

Study these rating plates from two electric motors:

Motor A is an induction motor of the squirrel-cage type.

HP $\frac{1}{6}$	VOLTS 240	PH 1 HZ 50
RPM 2850	AMPS 0·5	RATING Continuous
INS CLASS E		

Motor B is a dc motor which is compound-wound.

HP 15	VOLTS 240	CYCLE dc
RPM 1400	AMPS 12	RATING Continuous
INS CLASS E		

Fill in the spaces in this table using the information given on the two motors. In the third column indicate if the features listed are the same or different. Numbers 2 and 8 have been done for you.

	Feature	Motor A	Motor B	Same or different
1.	type			
2.	horsepower	$\frac{1}{6}$	15	different
3.	volts			
4.	cycle			
5.	amps			
6.	rating			
7.	rpm			
8.	insulation class	E	E	same

EXERCISE K *Making comparisons and contrasts 1*

We can compare two similar features using *both*.

EXAMPLE

Both motors are insulation class E.

We can contrast features which are different using *whereas*.

EXAMPLE

Motor A has a horse power of $\frac{1}{6}$, *whereas* motor B has a horse power of 15.

Other words we can use for contrast are: *while, but, in contrast*. Often we can use a comparative form of an adjective to describe a difference.

EXAMPLES

Motor A rotates FASTER THAN motor B.
Motor B is MORE POWERFUL THAN motor A.

Now write sentences like the examples to compare and contrast the motors.

EXERCISE L *Making comparisons and contrasts 2*

Compare and contrast the following:

1. valves and transistors
2. alternating and direct current
3. transmitters and receivers
4. filament lamps and fluorescent tubes
5. ideal and practical transformers (See Unit 8, page 108)

IV GUIDED WRITING

STAGE 1 *Sentence building*

Join the following groups of sentences to make ten longer sentences. You may add or omit words and make whatever changes you think are necessary in the word order and punctuation of the sentences.

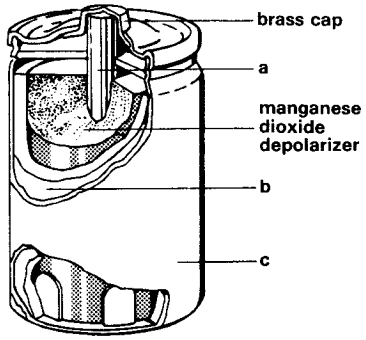
1. A zinc case is used as a container for the cell.
   The zinc case is used as the negative electrode.
2. A carbon rod forms the positive electrode.
   The carbon rod is in the centre of the cell.
3. The space between the zinc case and the carbon rod is filled with a paste of ammonium chloride.
   The paste is used as an electrolyte.
4. The electrolyte is a paste and not a liquid.
   This type of cell is called a dry cell.
5. The paste also contains manganese dioxide.
   The manganese dioxide prevents gas being formed.
6. The cell is sealed with a cap.
   The cap is made of metal or plastic.
   The cap is to prevent the paste coming out.
7. A small space is left below the cap.
   Gas formed by the cell can collect in the space.
8. Dry cells are usually enclosed in a cardboard case.
   An additional metal jacket may be added.
   The jacket makes the cell leakproof.
9. Leakproof cells are often preferred.
   The electrolyte cannot leak out.
   The cell ages.

10. Leaking electrolyte may damage the equipment.
    The cells are installed in the equipment.

STAGE 2 *Diagram labelling*

Label this diagram to illustrate the passage you have made with these items:

1. electrolyte
2. carbon rod
3. negative electrode
4. zinc case
5. positive electrode



STAGE 3 *Using the diagram to illustrate the passage*

Add a reference to the diagram in your passage. Give the completed passage a suitable title.

V READING AND NOTE-TAKING

STAGE 1 *Previewing*

Read the title and the first sentence of each paragraph. Then write down what you think the passage is about.

THE EFFECTS OF AN ELECTRIC CURRENT

The effects of an electric current are thermal, luminous, chemical and magnetic. When a current flows through a conductor it may heat the conductor. This heat is sometimes undesirable and has to be reduced. For this reason many electric motors and generators contain a fan. However, domestic appliances, such as electric cookers, and many industrial processes depend on the heating effect of an electric current.

The passage of a current may produce light. This can happen in a number of ways. The heat generated by the current may be so great that the conductor becomes incandescent. For example, the filament of a light bulb emits intense white light when heated by a current. Light is also produced when a current ionizes a gas. The colour of the light will vary according to the gas used. Mercury vapour lamps give a greenish-blue light.

An electric current can separate a chemical compound into its components. This is called electrolysis. Chlorine is generated by the electrolysis of salt water. Electrolysis can also be used to break down water into hydrogen and oxygen. Because pure water does not conduct well, sulphuric acid has to be added before the electrolysis takes place.

A current flowing through a conductor creates a magnetic field around it. This field has three applications. It can magnetize magnetic materials and attract them to the conductor. The electric relay works on this principle. If the magnetic field is cut by another conductor, an electromotive force will be induced in that conductor. For instance, the change in current flowing through the primary of a transformer will induce a current in the secondary. This principle is also used in generators. Thirdly, if a current-carrying conductor is placed in the magnetic field, a force will be exerted on it. This effect is utilized in the electric motor.

STAGE 2 *Note-taking*

Now study the passage carefully and complete this framework of notes:

Effects of an electric current:

1. thermal
2. . . . . .
3. . . . . .
4. magnetic

1. heat can be
   (a) undesirable e.g. motor
   (b) . . . . . e.g. cooker
2. light
   (a) from incandescent conductor e.g. . . . . .
   (b) from . . . . . e.g. vapour lamp
3. . . . . = breakdown of chemical compound e.g. salt water into chlorine
4. current flowing in conductor → . . . . . round it. Magnetic field has 3 applications:
   (a) . . . . . e.g. relay
   (b) induce emf in another conductor e.g. . . . . .
   (c) . . . . . e.g. motor