

## SECTION FOUR

### DUPLICATORS AND PLAIN PAPER COPIERS

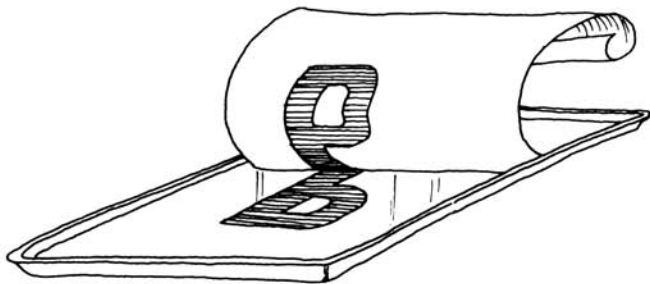
#### DUPLICATORS

The term "duplicator" covers a wide range of machines, from the jelly in a tray of the hectograph to small offset duplicators.

#### Hectograph duplicating

This is the simplest method of duplicating. The capital outlay for a complete kit is about the same as for a golfball typing head. The equipment consists of a light plastic tray containing a special jelly, carbon papers, special pens and pencils in four colours, and a sponge.

Master copies can be made by writing or drawing with pens or pencils or by typing on one of the carbons which transfers the image to a sheet of paper below. Any illustrations required can be added to the master with the hectograph pens and pencils.



*Diagram 10: A hectograph duplicator*

When the master is complete, it is laid face down on the jelly compound, smoothed down and left for 30 - 40 seconds. This allows the image to be transferred from the master to the jelly. Duplicating paper is then laid on the jelly, pressed against it with a roller, left for about a second and peeled off. All the colours are printed in this one operation.

A carbon image on the jelly will last for a maximum of 100 copies. It gets gradually paler as the run continues, and finally disappears altogether. Pen and pencil images fade more quickly

The operation is manual and, apart from a light application of water to freshen the jelly compound, no liquids are needed. It will print on most surfaces, even material, but will give the best results and the longest runs on smooth, non-absorbent papers.

### **Spirit duplicators**

These will reproduce typing, handwriting or drawing in up to seven colours: purple, blue, black, red, green, yellow and brown. A master copy is needed before printing can begin. Purple is usually used for typing, being the colour which lasts longest and produces the clearest image.

The master copy is prepared on a sheet of art paper (i.e. paper with a very shiny and smooth surface). A special carbon paper is placed in contact with the art paper. This can now be typed or drawn on (or both) with the art paper uppermost. A ballpoint pen or a pencil is all that is necessary for drawing. The pressure of the typing or drawing will transfer some of the coating from the carbon paper to the back of the art paper. This image when looked at will be in reverse - a mirror image of the words and illustrations on the other side of the art paper. This mirror image is the master.

If different colours are needed, it is quite simple to change the carbon paper. As some colours work better than others, some experience is needed before good results are

obtained every time. This is the only office-type duplicator that will reproduce more than one colour in one run through the machine.

The master copy is fixed around the cylinder of the machine, with the mirror image outwards. Paper is fed into the duplicator and passes under a pad which dampens it with spirit (methyl alcohol). The paper then passes between an impression cylinder and the master copy. The spirit in the paper dissolves a small proportion of the carbon image on the master copy. This is transferred to the paper by the pressure of the impression cylinder. As printing continues, the image is gradually dissolved away. Shiny art paper produces the maximum number of copies; duplicating paper absorbs very much more of the image each time and consequently the image dissolves more quickly, giving a short run.

The spirit dries almost immediately and there is little chance of the copies smudging as they leave the machine. Minor alterations can be made to the master copy during the run. A master can also be stored for future use if the image is not too exhausted.

The most popular and therefore the cheapest machines are A4 in size. Their cost is a little more than half that of an electric golfball typewriter. Other sizes are available but they are disproportionately expensive. The machines can be manually or power operated. It is seldom worth while to have a power-driven machine when the maximum number of copies from one master is only 250.

#### Advantages of Spirit Duplicating

1. The machine is robust.
2. Operating costs are lower than for most other methods.
3. Masters are simple to produce. They can be made on any shiny-surfaced paper, e.g. art paper.
4. Pure methylated spirit can be used. It is usually more easily available and much cheaper than the trade fluid.
5. Carbons can sometimes be re-used.

### Disadvantages of Spirit Duplicating

1. Colour will fade badly in strong light.
2. Only short runs are possible.
3. Damaged felts cause poor reproduction; spare felts must always be readily available. (A worn felt can be reconditioned by running an A4 sheet of fine sandpaper through the machine several times.)
4. The clarity of the print can be good but it is not to be compared with stencil duplicating or offset printing.

### **Stencil Duplicating**

Stencil duplicators will reproduce typewriting, handwriting or drawing. They work on the principle of ink being pushed through a stencil onto absorbent paper.

All stencil duplicators must have a good-quality stencil to produce a good-quality print. The best stencils are cut on electric typewriters rather than manual ones.

### Preparation of masters

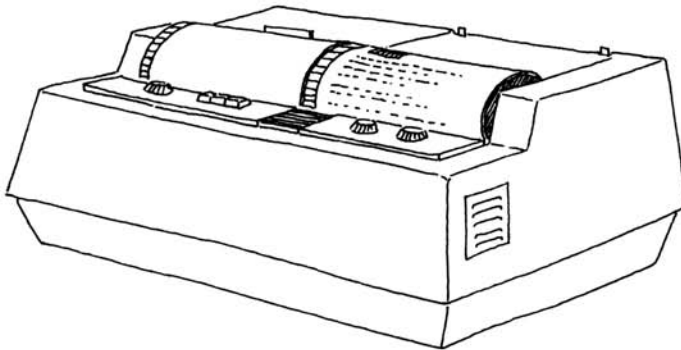
Special stencils must be used. The complete stencil consists of three layers: a top sheet, a carbon and a backing sheet. The top sheet has a wax coating to prevent ink from penetrating. This coating must be cut through in the areas which have to print. This can be done with a typewriter with the ribbon out of action (machines have a special adjustment for this); it can also be done by writing or drawing with a ball-point pen or a special instrument called a stylus.

To get a good result a hard surface, e.g. glass, plastic, formica, must be used when drawing or writing.

### **Electronic Stencils**

These are different from ordinary duplicating stencils.

They are always black. The stencils are cut by a machine called a scanner which uses a photo-electric cell requiring a reliable electricity supply.



*Diagram 11: An electronic scanner*

The scanner can copy any black and white line images - newspaper headlines, rub-down letters, drawings, typing. Photographs are less successful and some scanners will not copy them properly at all.

A page of the material to be scanned and one of the electronic stencils are clipped side by side on a revolving drum. When the power is switched on, the drum spins rapidly and the image is gradually transferred to the stencil. Ordinary correcting fluid can be used to obliterate any pinholes or similar errors in the stencil before it is rolled, but if anything has to be altered a new stencil must be scanned. It can be sent from a central production agency (e.g. a Ministry of Education) to any place (e.g. a school) where copies can be rolled on an electrical or hand-operated duplicating machine. An electronic stencil should produce at least 1,000 copies.

A big advantage of a scanner is that it can be kept with a duplicating machine in an office, thus enabling illustrated leaflets and booklets to be produced on the spot. A machine capable of scanning an A4 sheet will cost about twice the price of a golfball typewriter. Any of the office staff will be able to operate it after five or ten minutes' instruction.

## **Duplicating Machines**

Most machines are of the rotary type. The stencil is fitted around a drum containing the ink. As the drum revolves, the paper is fed into the machine and ink is forced through the stencil onto the paper.

These machines can be operated manually or by power. The manual model will cost about the same as the spirit duplicator, and the electric model about half as much again.

Because the ink is slow-drying it is best to use an absorbent paper. This will avoid smudging. Up to 4,000 copies can be obtained and, when necessary, stencils can be stored and re-used. If they are to give good results at the second printing, they must be handled carefully and protected during storage.

Only one colour can be printed at a time, but this does not prevent other colours from being used. The drum-type duplicator is best for multi-colour duplicating. Changing colours on tube-feed type machines is messy and complicated. For every different colour a new stencil must be cut. Each copy must pass through the machine for each different colour.

## **COPIERS**

The extent to which a printing unit should be involved with plain paper copiers will entirely depend on individual circumstances. The range of equipment available enables many options in terms of size, speed and simplicity to be considered.

There are two main types of copier: chemical transfer and electrostatic.

### **Chemical Transfer System**

This requires two special papers, their chemistry being closely allied to conventional photography. Negative paper is placed in contact with the original and subjected

to light. It is then contacted with a positive paper and fed through a bath of chemicals. When the papers are pulled apart the image has been transferred to the positive paper. Its quality is sufficiently good to be suitable for art work.

The system can also produce paper or foil litho plates. It is slower than electrostatic copying and depends to some degree on the skill of the operator.

A machine capable of producing A4 sheets will cost about the same as a basic golfball typewriter.

### **Electrostatic Copier**

Electrostatic copying is fast and simple and this explains its rise to become the most widely used method. Techniques of the various copiers differ slightly but are basically similar. An electrostatic image of the original is created. This attracts molecules of carbon compound, which are fused to create a permanent copy.

### **Considerations**

Copiers must be chosen to suit the needs of the unit. Certain factors must be taken into consideration:

#### Speed

This must be looked at in two ways: (a) the speed with which the first copy is taken from the machine; (b) the speed with which subsequent copies are produced. If the demand for copies is low then the first factor is important. If the machine is to be used as a duplicator producing multiple copies, then the second factor is most important.

#### Capacity

This is the ability of the copier to handle more than flat, flexible sheets. Some copiers have a roller carrier method which would prevent the user from taking copies from pages of books.

### Accessibility

Is the copier to be available to all staff, or is it to be operated as a service by the printing unit? If it is available to all, time will be saved but the machine will be open to excessive use and abuse. Control by printing staff is recommended for an expensive machine.

### Additional refinements

These will depend on the user's needs. They include the ability to reduce the size of the image by a pre-determined amount, normally by 30% or 50%. This enables economies in paper to be made whether the copier is used as a production machine or as a plate-maker. The basic models cost about the same as a golfball typewriter but become more expensive as their complexity increases.