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PERFORMANCE OF THE TECHNOLOGICAL PROCESS OF PRINTING WITH PRINTING EQUIPMENT

M. GULIYEVA, M. NASIROV
Western Caspian University, Baku, Azerbaijan

The article discusses technological schemes of printing equipment, structure, principle of operation, design of the main units, classification of printing machines and their shortcomings that will be solved scientifically.

Introduction. The main purpose of the printing equipment is to carry out the printing process, that is, to repeatedly obtain identical prints by applying ink to the material. In addition to its main purpose, it is also used for embossing, die-cutting and perforating material. The block diagram of the printing machine is shown in Fig. 1 (its main units are represented in the rectangles, and those of them that may be absent in certain types of machines are outlined by the dashed line). The name of the device corresponds to the technological process it performs.

The classification of printing machines, reflecting only the main principles of their construction, is shown in Fig. 2. By the type of material being processed (tape unwound from a roll, or sheets fed from a stack), machines are called roll and sheet, respectively. The next feature of the classification is the shape of the actual printing surfaces. Machines in which the printing bodies are made in the form of cylinders are called rotary. Machines in which the working surface of the printing plate is located in plane, and the pressing surface is cylindrical, are called flat printing. Machines in which both working printing surfaces are flat are called crucible.

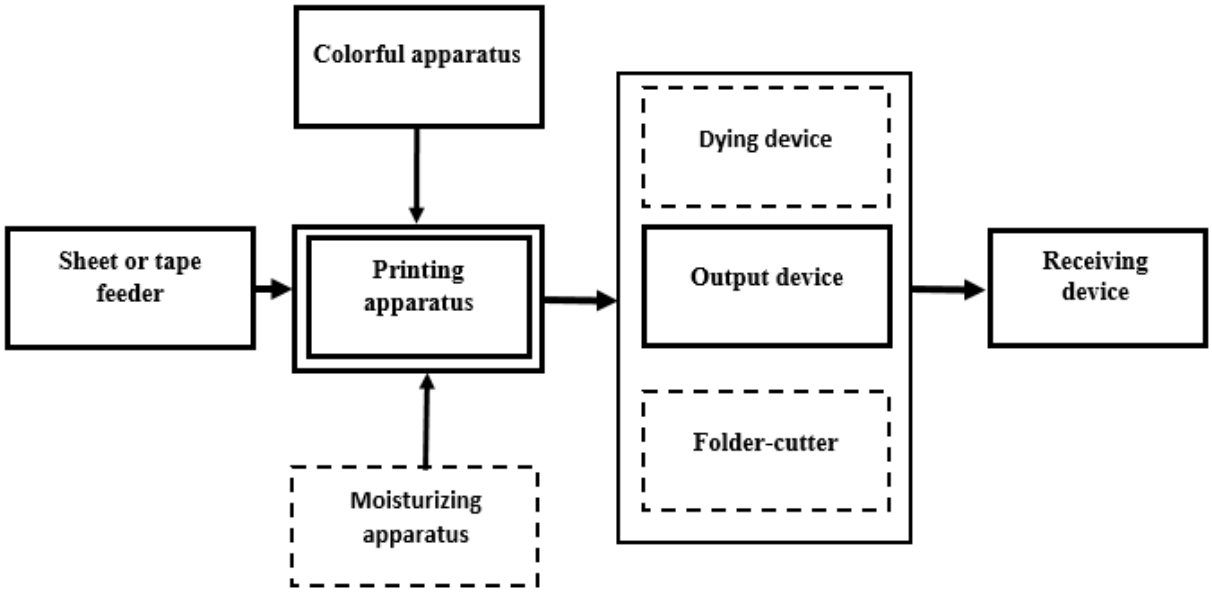

Fig.1. – Block diagram of the printing machine

Depending on the number of colors obtained on the print, the machine is called multi-color or single-color. Flat bed and crucible machines are currently produced, with rare exceptions, only in the form of single-color automatic machines or semi-automatic machines for processing sheet materials. Rotary presses are built exclusively in the form of automatic machines for printing on sheet or tape materials. At the same time, both single-color and multi-color machines are widely used. We have found double-sided rotary machines, in which the material is simultaneously or sequentially sealed from both sides. Multicolor machines which are made up of the same type of one-color printing units are called sectional, and multicolor machines containing one common impression cylinder around which other cylinders are installed (see Fig. 2) are called planetary. Flat bed and crucible presses are built for high printing method, and rotary - for high, offset and gravure printing methods [1].

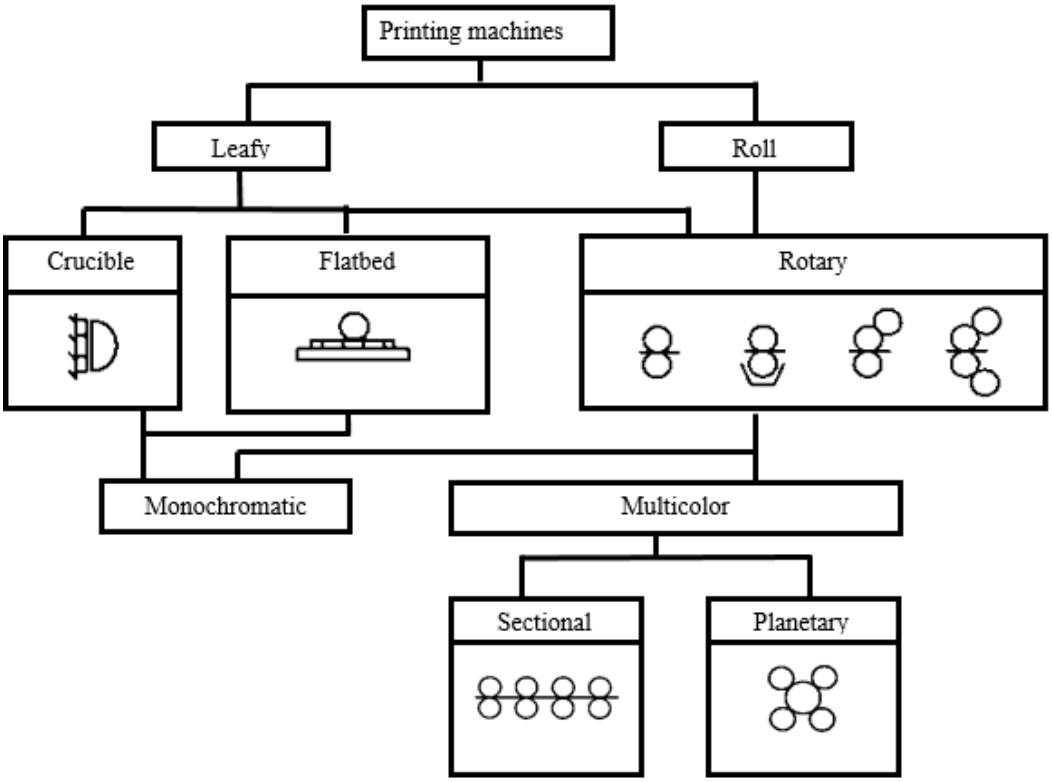

Fig.2. – Classification of printing machines

By the degree of automation, modern printing equipment is, as a rule, automatic machines, which are highly automated and high-speed high-precision mechanical systems with automatic feeding of the printed mathematic systems with automatic feeding of the printed material and acceptance of finished products. Thanks to electronics, they are able to control and maintain in automatic mode the main functional units, to diagnose and adjust them. The evolution of printing equipment led not only to the increase in the operating speed of machines, but also to a sharp increase in their productivity due to a high degree of automation.

However, there are still machines with manual feed of the printed material, which belong to the class of semiautomatic devices. They are characterized by a low level of automation and low productivity.

Sheet-fed presses have lower productivity compared to web-fed presses. The speed of their operation is limited by the capabilities of the leaf feeding system, which carries out piecewise (discrete) feeding of sheet material. For medium format machines the capacity is 18,000 sheets / h at a linear sheet speed of up to 4 m / s, and for large format machines - 9000-15,000 sheets / h. Modern printing machines have wide technological capabilities to reproduce at a high quality level almost any text and illustration images with simultaneous additional finishing operations. For this, in the course of work of the PM, perforation, varnishing, numbering, die-cutting, embossing and other additional work is carried out, which expands the technological capabilities of the machine and allows you to obtain printed products of increased cost.

Sheet-fed presses are capable of printing sheet material in a wide range of formats with a sheet weight of 1 m^2 from 30 to 800 g and a thickness of 0,03 to 1,2mm. Sheets of paper pass through the technological sections of the machine without tension and warping, which reduces, in comparison with roll-red machines, the likelihood of being pealed, allowing you to obtain high accuracy of color registration in one pass within $\pm$0,05mm.

When designing printing machines, the dimensions of the PA cylinders are selected taking into account the utilization rates of the working cycle $K_ц$ and the circumference of the printing or plate cylinders $К_ц = \frac{t_n}{Т}$; $К_n = \frac{l_p}{\pi D_n} \approx \frac{L_{max}}{\pi D_n}$/; where t_n- sheet sealing time; T – duration of the kinematic cycle; l_p – the length of the working part of the circumference of the impression cylinder; L_{max}–the largest size of the sheet in the direction of its feeding; D_n- diameter of the impression cylinder.

The value of these coefficients is less than one ($К_ц = К_n = 0{,}65 - 0{,}85$), since the cylinders of the printing CVL machines have non-working zones (recesses) for placing the actuators in them.

In roll-to-roll presses with a rotary press, the cycle time for printing and the surface of the plate cylinder are fully used, therefore $К_ц = К_n = 1{,}0$. These machines are the fastest of all types of printing equipment, which is achieved by the continuous supply of paper tape to the rotary press. The speed of its conduction is about 18 m / s at a rotation frequency of the cylinders of the printing pair 50,000 -100,000 rev / h. Roll-fed machines have wide technological capabilities of reproducing any graphic images on the printed material together with the operations of cutting, perforating, gluing, sewing and folding. The multi-operation nature of roll-fed machines makes it possible to receive printed products at the output in the form of notebooks, sheets, rolls and even in the form of finished brochures, books and magazines when the RPM is included in the printing and finishing line. [2]

Conclusion. The disadvantages of RPM in comparison with sheet PM include:

– limited format of printed products (except for gravure printing machines), since the format can only be changed according to the width of the roll;

– limited length of tape cutting (except for gravure printing machines) due to the rigid scheme of the folder;

– lower accuracy of color registration due to the unstable behavior of the paper tape;

– limited range in thickness and weight of the sealed material when PA cylinders are force-locked to slip rings (40-210 g/m^2).

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