Dec. 12, 1961 W. KOCH 3,012,500

SHEET PRINTING MACHINE FOR OBVERSE AND REVERSE PRINTING

Filed March 31, 1959 2 Sheets-Sheet 1

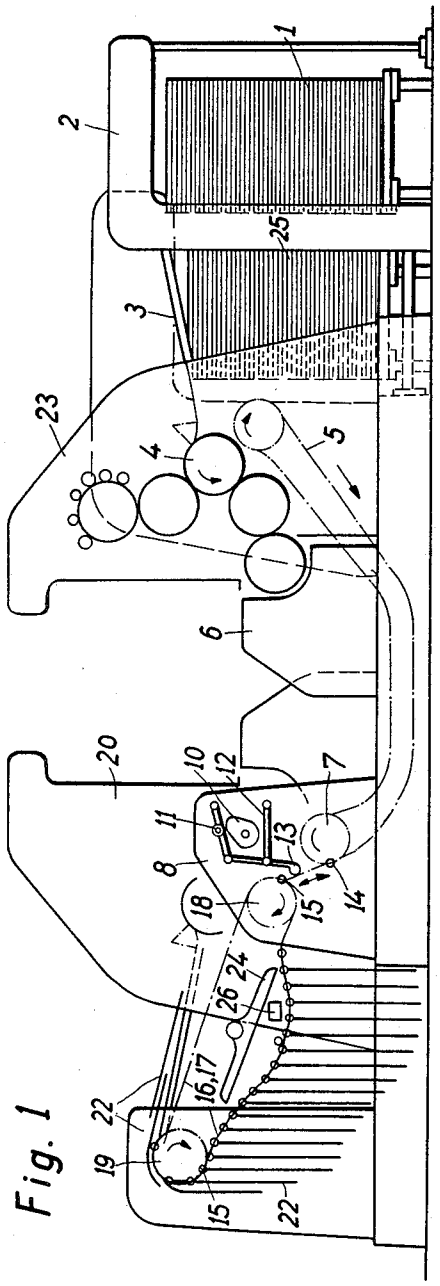


Fig. 1

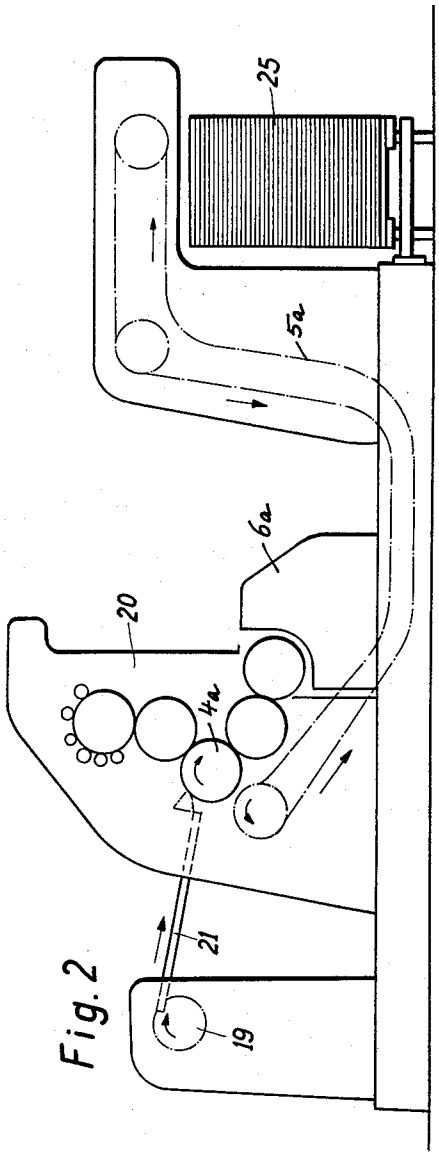


Fig. 2

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Filed March 31, 1959 2 Sheets-Sheet 2

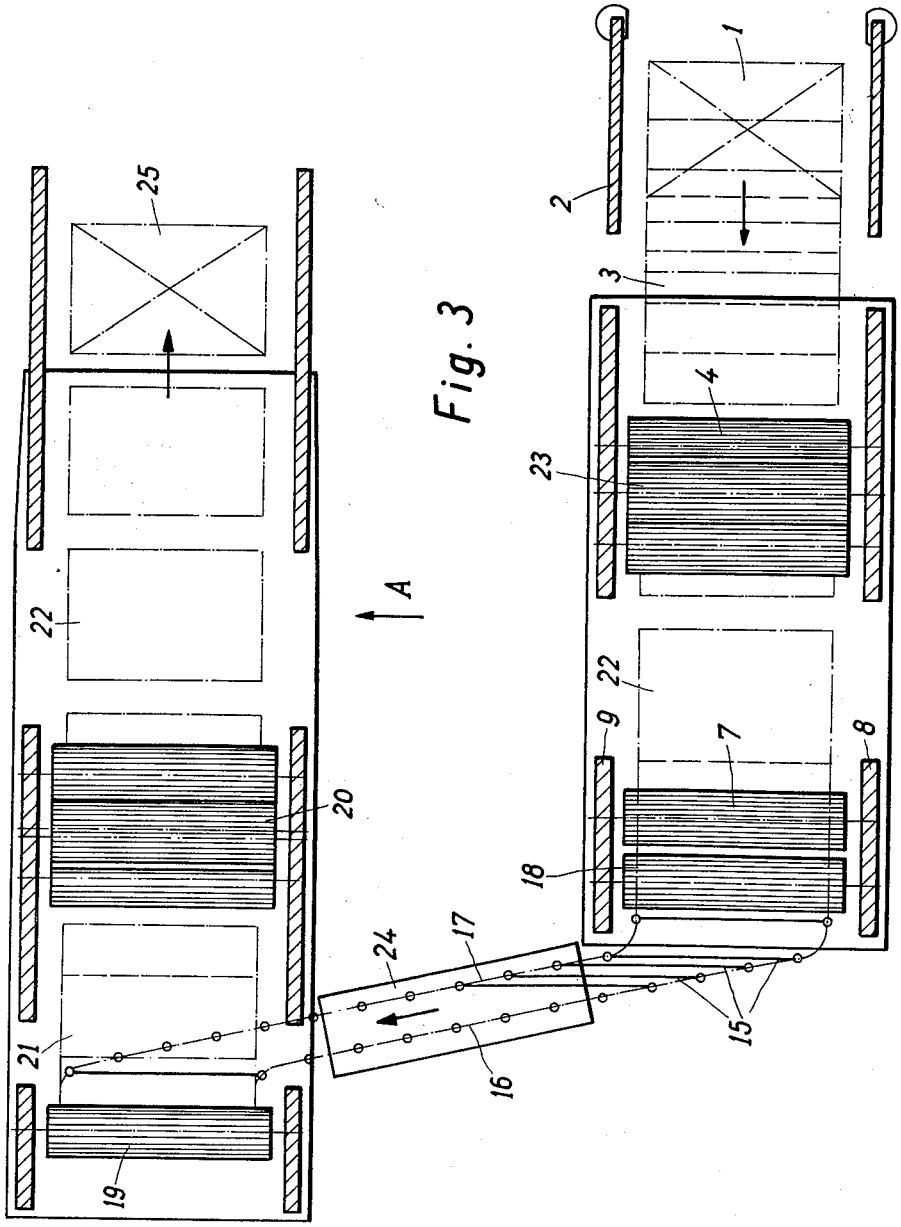


Fig. 3

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SHEET PRINTING MACHINE FOR OBVERSE AND REVERSE PRINTING

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3 Claims. (Cl. 101—230)

This invention relates to a sheet printing machine for the production, more particularly, of obverse and reverse printed sheets, and in which two or more printing units for printing each on one side of the sheets only are arranged in succession. In the known machines, or machine assemblies, of this kind the individual units are so arranged that, in the conventional way of feeding the sheets into the first unit, they must be moved out of the machine between two individual units toward the top thereof. The sheets, in this case, have to be lifted over the inking device of the last unit, which makes a special construction of the whole stacking device necessary, whereby the building height of the entire machine becomes considerably increased and the machine itself less accessible. If these disadvantages are to be avoided with a view of being able to employ a conventional stacking device, it would be necessary to feed the sheets to a place between two units. This would mean that the cited disadvantages have only been moved to another place, where they are even intensified, inasmuch as the sheets must now be fed into the machine over and above the inking device of the first unit.

Other machines are known in which two different units are connected to each other by a chain conveyer and in which a sheet turning device is provided to adapt the assembly for obverse and reverse printing. These machines are costly to produce and to fit; they are difficult of access and the turning devices, when in use, change the position of the alignment edges so that the leading edge becomes the rear edge, and vice versa, whereby the sheets lose their register. This type of machine has been found practically unusable for obverse and reverse printing.

It is, therefore, the main object of the invention to provide a printing press, or an assembly of printing units of the aforesaid type, in which the aforesaid disadvantages are absent and in which normal feeding and stacking devices can be employed.

Another object is the provision of a machine of the aforesaid type which can be more easily attended to by the operator, and which can be worked at greater speed and, consequently, with higher efficiency

A further object of the invention is the provision of a machine in which the feeding or working speed can be so regulated that always a predetermined number of sheets will pass through the machine in unit time.

A still further object of the invention is the provision of a printing machine of the aforesaid kind in which between each two printing units a chain conveyer is provided, in which the sag in the lower strand of the chain is variable, but is automatically controlled so as to avoid disturbances.

With these and other objects in view the invention, in a preferred embodiment thereof, consists in a printing machine or, a perfecting press as it is called in the trade, having a plurality, usually two or three units, in which each two successive units are arranged in mutually parallel relation, and in which the direction of travel of the sheets is such, that the stacking or delivery end of the first unit comes substantially adjacent and opposite the feeding end of the next following unit, with means between them for transmitting the sheets at approximately right angles from one unit to the other in the so-called work and turn manner. In this way it is possible to build up the machine of normal or conventional printing machine units with likewise conventional feeding and stacking devices. Another considerable advantage is that units may be chosen of any known type of sheet printing machines, as for instance two four-color offset printing machines, so that the sheets leave the machines printed in four colors on both sides.

The invention preferably provides means for controlling the speed of the machine so that the rate of feeding the sheets between two units is smaller than the rate at which the sheets are printed in the units. This makes it possible to pass the sheets from the stacking or delivery end of one unit to the feeding device of the next following unit in underlapped condition and that, on account of their correspondingly lower rate of feed, they are able to hang down freely for at least part of their passage between two successive units, so that they can easily be passed through a drying chamber or tunnel when moving from one unit to the other.

For the object of passing always the correct number of sheets in unit time through the various units, means are provided to regulate the printing speed of each individual unit separately and independently of the other or others. Under normal working conditions the successive working units operate all at the same speed. However, if a stop occurs, or if owing to the removal of a test sheet from the first unit, less sheets are passed to the transfer conveyer, the speed of the first unit can be increased or that of the second unit decreased, until the correct number of sheets passes again through the various units.

For the transfer of the sheets from one unit to the next a chain conveyer is used in accordance with the invention, of which the sag in the lower strand of the chain is variable. The amount of the sag depends on the difference in the speeds of each two adjacent units, and in accordance with a special feature of the invention, the lower strand of the chain is connected to a tracing or feeling device, which automatically controls the speed differences so that the sag in the chain remains approximately constant at a given amount.

A further feature of a machine in accordance with the invention rests in that the intermediate feeding device continues to move in the sequence of sheet feeding, so that it is possible to operate the feeding device at the place of introduction of the sheets in conformity with the working cycle of the preceding unit, and at the stacking position in conformity with the working cycle of the succeeding unit. So it is not necessary that both units must operate in synchronism.

The accompanying drawings diagrammatically illustrate a perfecting machine consisting of two juxtaposed two-color offset printing machines in accordance with the invention by way of example. To avoid crowding of the drawings, such parts of the machines as are known to those skilled in the art of printing or printing machines, for instance the various cylinders and their bearings, the inking mechanism, the grippers, and others, are merely indicated and their locations shown at their correct places, it being understood that their design and appearance is of no importance to the invention and that their shape and arrangement may be chosen in consistnecy with the particular type of machines employed, or to suit convenience or requirement, as the case may be.

In the said drawings,

FIG. 1 is a side view of an offset printing machine for two-color obverse and reverse printing,

FIG. 2 is a side view of the second unit as seen in the direction of the arrow A in FIG. 3,

FIG. 3 represents a plan view of the machine.

The sheets are fed singly into the first printing unit by any known or convenient means from the pile **1** of the sheet feeding device **2** over the feeding table **3** into the five-cylinder two-color offset printing machine **23**. From the printing cylinder **4** of the printing mechanism they are passed to the chain conveyer **5** which carries them out of the machine underneath the inking device **6** of the lower printing mechanism. So far the arrangement is generally known.

Now, in lieu of the stacking device which normally is arranged at this end of the machine, the invention provides an intermediate feeding or transferring device, which includes a control cam **10**, a cam follower **11**, and a pivotally suspended oscillating feeder **12** having a sheet gripper **13**. On the operation of this intermediate feeding device the chain conveyor **5** passes over the chain wheels **7**, which are journaled in the side wings **8** and **9** of the machine. The sheets are taken from the grippers **14** of the chain conveyer **5** by the sheet grippers **13** of the oscillating feeder **12** and transferred to the grippers **15** which are fitted between two endless conveyor chains **16** and **17**. The latter travel over chain wheels **18** which are arranged to form a self-contained conveyor mechanism together with the chain wheels **7** and the oscillating feeder **12** and which, at its other end, is passed over the chain wheels **19**, which form part of the feeding device of the second offset printing machine **20** and are journaled under the feeding table **21** at the entrance end thereof.

In accordance with the invention, the circumferential speed of the chain wheels **18, 19** is less than that of the printing cylinder, so that the sheets **22** are carried to the feeding table **21** in partly underlapped condition. While traveling from the stacking end of the first machine **23** and the feeding device of the second machine **20** the sheets are allowed to be freely suspended and to travel past a drying installation or through a drying chamber or tunnel **24**.

The lower strand **16** of the chain **16, 17** is guided with a variable sag, so that certain differences in the traveling speed of the two units are possible. A tracer or feeler **26** is arranged to be in connection with the strand **16** of the chain **16, 17** and to regulate the differences in the speeds of the two units so that the sag will remain at a certain predetermined amount. The sheets travel through the two printing units **23** and **20** in mutually opposed direction as indicated by the arrows in FIG. 3, so that they are passed to the second unit **20** in what is called "work and turn" condition. FIG. 2 shows that the second printing machine unit, like the first unit, is also a printing machine of entirely normal or conventional construction from its feeding table **21** to the stacking pile **25**. The sheets travel in the reversed work and turn direction over the printing

cylinders **4***a*, from which they are taken up by the chain conveyer **5***a*, in order eventually to be deposited on the stack **25** after having been guided underneath the inking device **6***a*.

What I claim is:

1. In a sheet printing machine of the perfecting press type for obverse and reverse printing having a plurality of successively arranged printing units each for printing the said sheets on one side only and having a feeding and a stacking end, the arrangement of the said units one beside the other and mutually opposing traveling direction of the sheets, a chain conveyer in each unit for carrying the sheets printed in said unit to the stacking end thereof, another chain conveyer at right angles to and between each two successive units for carrying said sheets from the stacking end of one unit to the feeding end of the next following unit, sheet grippers on both of the said chain conveyers, an oscillating gripper arrangement between the said conveyers for receiving the sheets from the grippers of the first of said conveyers and transmitting them in freely suspended condition with always the same edge leading to the grippers of the following chain conveyer to be transferred by the same to the feeding end of the next following printing unit, a cam and follower device for operating said oscillating gripper arrangement in conformity with the working cycles of the said units, said second conveyor chain being so arranged as to present the transmitted sheets to the feeding end of the next following unit in a work and turn reversed condition so as to be printed on their other sides by the printing mechanism of the said unit.

2. A sheet printing machine as set forth in claim 1, in which the amount of sag in the lower strand of said second chain conveyer between each two printing units is variable.

3. In a sheet printing machine as set forth in claim 1, a tracing device in cooperation with the lower strand of said second chain conveyer, a feeler in said tracing device to feel the amount of sag in said lower strand, and automatic contact means in connection with said feeler for regulating differences of printing speed in successive printing units in dependence of the sag in the lower strand of the chain of said second chain conveyer.

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