

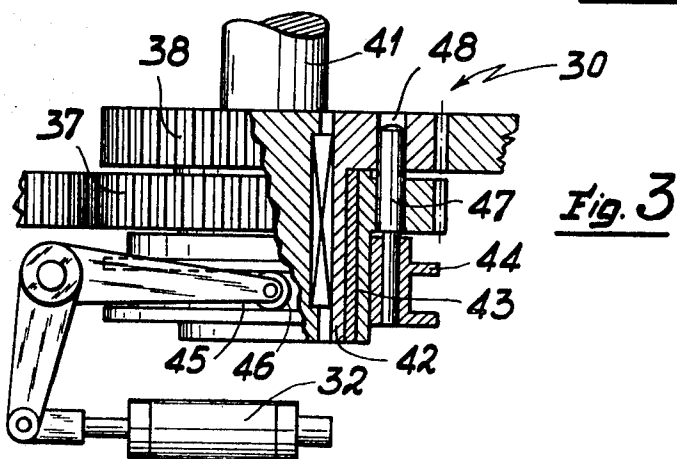
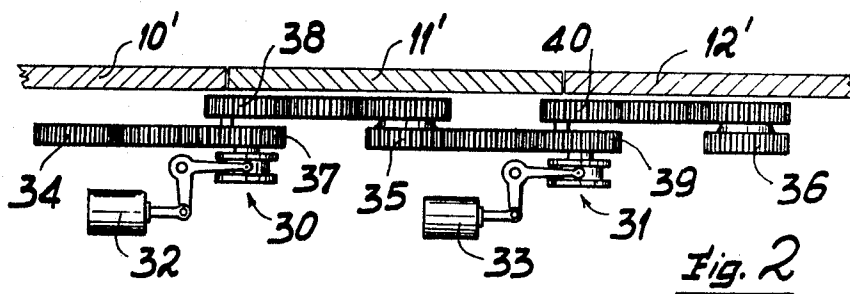
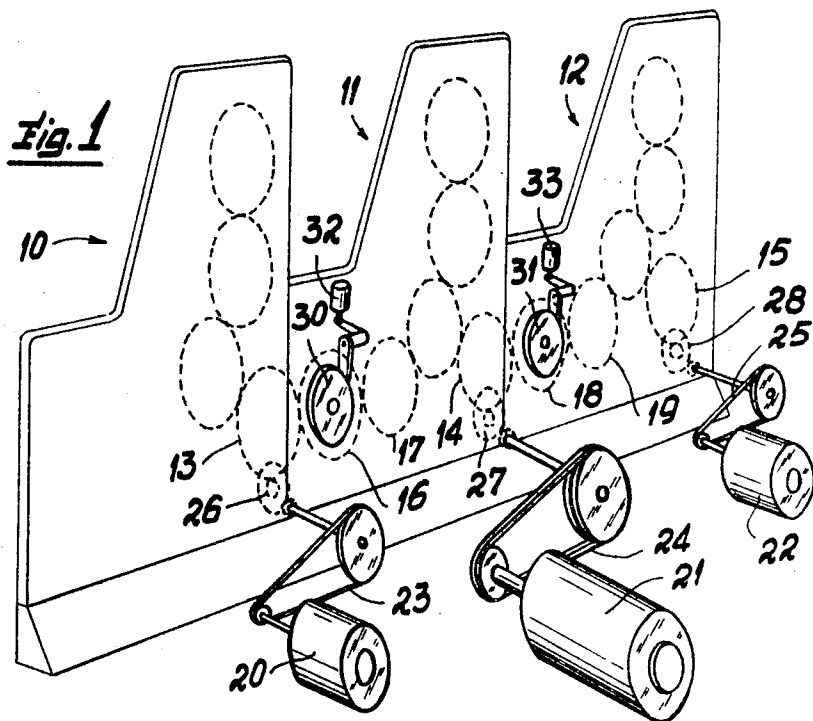
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P. GIUIUZZA

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MULTICOLOR SHEET PRINTING MACHINE DRIVE

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INVENTOR:

BY *P. Giuiuzza*
Attorney

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MULTICOLOR SHEET PRINTING MACHINE DRIVE

Pietro Gluizza, 55 Via Plinio, Milan, Italy

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ABSTRACT OF THE DISCLOSURE

A multicolor printing machine composed of several printing units rigidly coupled to each other for phasedly driving thereof and each adapted for individual actuation in view of independent setting, the coupling of adjacent units being provided by gear means associated to disengageable coupling means, said gear means being positioned between and in meshing relationship with the gears coaxial to and connected with the take-off cylinder and respectively the feed cylinder of the adjacent units.

BACKGROUND OF THE INVENTION

The present invention relates to multicolor printing presses, and more particularly to an improved multicolor sheet printing rotary machine of the type composed of a plurality of printing units disposed one after another and rigidly coupled to each for ensuring common drive thereof in view of motion of all units is extremely precise phase-relationship. Still more specifically, the improved multi-unit machine of the invention comprises coupling means associated to the drive means and adapted for disengagement of individual units and motor means driving y connected to each individual unit for enabling each printing unit to be independently operated and set.

A variety of multiunits of the type referred above has been proposed and currently manufactured and in service. In particular, in the United States Pat. No. 3,221,651 of Ercole Tagliasacchi there is described a multiunit printing machine provided with a common main drive consisting of a drive shaft located sidewardly and longitudinally of the row or line of the units. Such shaft is subdivided into a plurality of shaft sections, one for each rotary printing unit, gear means being provided for connecting said shaft sections to said rotary units with an angular speed lesser than that of said shaft sections, each of said gear means providing the same ratio transmission between the respective shaft section and rotary unit. Said drive means comprises also coupling means cooperating with said shaft sections and being movable between a disconnected position in which said shaft sections and therefore the respective rotary units are free to rotate relative to each other and a connected position in which said coupling means fixedly connect said shaft sections in a given angular relationship for rotation with each other.

In said known machines, individual motors are connected to each shaft section for individually driving the respective unit, upon disconnection of said coupling means, and said motors are so adjustably supplied with electric energy and adapted for driving the said units, obviously when said coupling means are in said disconnected position, with slightly different speeds. Actuator means are operatively connected to said coupling means and adapted for exerting, when actuated, pressure on said coupling means tending to move the latter means to said connected position when said shaft section are in said given angular relationship.

Provided that said transmission ratio causes the said shaft section to rotate at speed higher than the speed of the respectively rotary unit driven thereby, said ratio

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being in general from $\frac{1}{8}$ to $\frac{1}{20}$ in the actually manufactured machines in service, the said angular relationship between adjacent shaft sections actually occurs many times during one revolution of the units, whilst for setting the multiunit machine for concurrent operation of two or more of the units thereof a given angular relationship between units and not only between shaft sections must be evidently provided. Therefore, the known machine referred to above is further provided with sensing means cooperating with said rotary units for sensing the angular relationship of said units and operatively connected to said actuator means for actuating the latter means slightly before said rotary units reach said preselected angular position so that said coupling means will couple said shaft sections when the latter reach said given angular position to connect thereby said units in their proper relationship for multicolor printing service of the multiunit machine.

However, the above described and other known multiunit sheet-fed rotary multiunit printing machines are subject to certain objections and suffer from certain disadvantages. For example, the provision and the arrangement of a sidewardly and longitudinally located main drive shaft leads to a rather bulky construction of the machine and involves a rather complicated and expensive structure, as the main drive means are external to the units frame components. The uncontrollable variations of the torque transmitted through the shaft sections lead to variations of angular position as the long shaft is unavoidably subject to torsional deformations proportional to the torque. The said ratio transmission between the shaft sections and the respective rotary units is therefore intended for proportionally lowering the torque and decreasing the torsional deformation, but said ratio leads in turn to the provision of said sensing means and to a rather sophisticated circuitry and control means for causing the actuator means to be actuated in abeyance of given conditions only. A missing function of the controls may lead to damage of the machine, in addition to an out-of-phase coupling, at certain rotary components, such as an interference between take-off or feed cylinders and sheet-transfer or transport cylinders or means can occur. Other objections and disadvantages are known to those skilled in the art.

SUMMARY OF THE INVENTION

The present invention overcomes the disadvantages of the prior art. More particularly the present invention provides a new and improved multicolor rotary printing machine of the type referred to above, which is simpler and less expensive than the machines of prior art, highly efficient and reliable in service, and wherein the units can be readily independently set and then connected for concurrent use thereof for regular multicolor printing.

In accordance with one principal feature of the invention, the multiunit rotary printing machine, which comprises conventionally constructed units each including at least one receiving or take-off cylinder and a delivering or feed cylinders, in addition to impression cylinders (plate cylinder, transfer cylinder, rubber cylinder and so on, according to the type of printing method) and inking means, each cylinder being drivenly secured to a respective shaft and to a respective gear wheel so that the several cylinders are geared together by means of a train of gearing, comprises further gear means located between and in meshing relationship with the adjacent gear wheels appertaining to the said gearing trains of the adjacent units, said further gear means being associated to actuator controlled coupling means to controlledly connect and disconnect said adjacent units in and respectively from a given angular relationship of said units, whereby, when said coupling means are at their connected position, all cylinders and rotary components of the entire multiunit

machine are geared together by an actually unique gearing train. According to another feature of the invention, said further gear means comprise each a pair of coaxially and side-by-side located gear wheels which are supported for free rotation relatively to each other about their common axis, one of said gear wheels being in meshing relationship with one gear wheel appertaining to one adjacent unit and the other of said gear wheels being in meshing relationship with another gear wheel appertaining to the opposite adjacent unit, and the said coupling means are arranged for rotatively connect to each other said gear wheels of said pair in one given angular relationship.

According to a further feature of the invention, rotary transport means are provided between adjacent units for phasedly transferring sheet from one another of said adjacent units, the said rotary transport means being positioned coaxially to said further gear means and drivenly connected to one rotary component of said latter means, in particular to one gear wheel of said pair of gear wheels.

According to a still further feature of the invention, the multiunit machine is provided with one main motor adapted for driving all the units of the machine, upon phased coupling of the said units, for regular printing service of the machine, and permanently drivingly connected to one of said units, and with one or more auxiliary less powerful motor or motors, each drivingly and individually connected to each of the remaining unit or units of the machine, for independently driving the respective remaining unit, upon disconnection thereof from the adjacent unit or units, for independent setting of each unit and/or for maintenance or other purpose.

In particular, when the multiunit machine is composed of three or more printing units, the said main motor is drivingly connected to the unit located at the center or near the center of the row of units (according to the condition that said row includes an odd or respectively an even number of units), whereby the power transmitted to the said remaining units through the thus actuated unique train of gearing is nearly evenly distributed between the gear components of said train, located downstream and upstream of the unit to which said main motor is connected.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, together with additional objects, advantages and features thereof, will be best understood from the following description of a specific embodiment when read in connection with the accompanying drawing, forming an essential component of this disclosure.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective diagrammatical view of a three-unit printing machine improved according to the invention;

FIG. 2 is a view from above of the train of gearing by which all cylinders of the machine are geared together, and of the coupling means (diagrammatically shown) connecting the individual gearing trains of individual units; and

FIG. 3 is partly a horizontal sectional view and partly a view from above of one said coupling means.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Discussing now the drawing in detail, and firstly FIG. 1, it will be seen therein a three-unit printing machine composed of three conventionally constructed rotary units generally designated with reference numerals 10 and respectively 11 and 12, each including a take-off cylinder, a feed cylinder, an impression cylinder and any further rotary and not rotary components as required, according to current art, for proper operation of the printing unit. Such cylinders and components are not shown and will not be described in detail, as they are well known in the art and do not form part of this invention.

The said cylinders in each unit are geared together by means of a train of gearing consisting, according to prior art, of gear wheels coaxial and rotatably connected to a respective cylinder. Such trains can include, in each unit 10, 11 and 12, a gear wheel 13 and respectively 14 and 15, connected to the feed or delivery cylinder of the respective unit, and a gear wheel 17 and 19 connected to the take-off or receiving cylinder of the same respective unit, said gear wheels forming the end gears of the respective train of gearing, the downstream end gear wheel of each unit, such as gears 17 and 19, being spaced from the upstream end gears, such as gears 13 and 14, of the next adjacent unit, the said spacing being made use of for locating and rotatably supporting further gear means, such as those generally indicated by numerals 16 and respectively 18, between said gear wheels 13 and 17 and respectively 14 and 19. Said further gear means comprise each a first and a second gear component in meshing relationship with the respective downstream adjacent gear, such as gear 17 or 19, and respectively with the relatively upstream adjacent gear, such as gear 13 and 14. Said further gear means 16 and 18 are associated to coupling means generally indicated at 30 and respectively at 31, actuated by actuators 32 and respectively 33, between a disconnected position in which said first and second components are free to rotate relative to each other and a connected position in which said components are fixedly connected to each other in one given angular position, whereby said rotary units are also connected in a given phased relationship.

Motor means are individually and drivingly connected to each unit. Such motor means are generally designated by reference numerals 20 and respectively 21 and 22. The motor 21, connected to the center unit 11, is the main motor and consists of a conventional drive motor for driving a printing press of the character considered. It is of power enough for driving the entire multiunit printing machine when regularly operated for multicolor printing purpose, and it is supplied and controlled according to current knowledge. Such motor and the supply thereof will therefore not be further discussed.

Other motors, such as motors 20 and 22, are auxiliary motors, conventionally constructed, supplied and controlled, and of power enough for individually driving the respectively connected unit, such as units 10 and 12, at a speed slightly different from that of center unit 11, when the motor 21 of said latter unit is adjusted for low-speed drive of the unit. Said auxiliary motors, therefore, are relatively inexpensive and do not require sophisticated supply and control means, variable speed adjustment between ample limits and so on.

As shown in FIG. 2, wherein reference numerals 10', 11' and 12' indicate the upright side components or shoulders of the frame of units 10 and respectively 11 and 12, the entire train of gearing arrangement comprises, at the further gear means associated to coupling means 30 and 31, pairs of coaxial gear wheels each including a first gear wheel 37 and respectively 39 and a second gear wheel 38 and respectively 40, the first gear wheel meshing with the gear connected to the feed cylinder (not shown) of the adjacent upstream unit and the second gear wheel meshing with the gear connected to the take-off cylinder (not shown) of the adjacent downstream unit. Upon fixed connection between said paired gear wheels 37, 38 and respectively 39, 40, an unique train of gearing is therefore actuated for gearingly interconnecting all rotary components of the multiunit machine, that is from the most upstream cylinder (take-off cylinder of first unit 10, not shown) which is assumed to be connected with and driven by a gear (not shown in FIG. 1) to the most downstream cylinder (the delivery cylinder of last unit 12, not shown). In FIG. 2 paired gears 35 and 36 are indicated too, said gears corresponding to the drive of impression cylinders (not shown) of units 11 and respectively 12, whilst gear 34 corresponds to the drive of impression cylinder (not shown) of unit 10.

Referring back to FIG. 1, there it is shown that each motor 20, 21 and 22 is individually connected to the rotary components of units 10 and respectively 11 and 12, by conventionally constructed and arranged transmission means, such as comprising transmission belts 23 and respectively 24 and 25 and transmission gears 26 and respectively 27 and 28, meshingly connected for driving gear wheels 13 and respectively 15 and 16 of the respective unit, for example.

Now, as the said main motor 21 is drivingly connected to the center unit 10, during regular service of the machine when the units are coupled to each other for concurrent and phased rotation of their rotary components, the power furnished by said motor and applied to gear 14, is nearly evenly divided, minus the amount required for driving the center unit, towards the upstream and respectively the downstream unit 10 and respectively 12 (or units, if the machine is composed of more than three units). Therefore, the gear components and the coupling means are not heavily loaded; no appreciable elastic or anelastic deformation occurs in the gearing train component. In addition, it may be observed that the gear wheel 14 is in mesh with two driven gears which at their turn are driving the upstream and respectively downstream rotary components and, therefore, the teeth of gear, in mesh with gear 27, are loaded by the full power of main motor 21 only.

FIG. 3 illustrates the subassembly including coupling means 30, said subassembly being similar to that including coupling means 31 and which is not therefore illustrated. The gear wheel 38 is keyed or otherwise connected for rotation with shaft 41 to which the rotary transport means (not shown) between units 10 and 11 is drivenly connected. Said transport means may comprise a conventional transport roller provided with grippers for phasedly transferring sheets from delivery cylinder of upstream unit to the receiving or take-off cylinder of downstream unit.

Said gear wheel 38 is fixedly secured to or integrally formed with an elongated hub portion 42 provided with a bearing sleeve 43, made of antifriction metal (or with ball or roller or needle bearing means), about which an elongated hub, fixedly secured to or integrally formed with gear wheel 37, is supported for free rotation relative to said wheel gear 38. Said gear wheel 37 is transversally bored for having a coupling pin 47 slidably fitted into, said pin being adapted for fitting also in a bore 48 provided through gear wheel 38, when the bores provided in both said gear wheels are aligned at the said given angular relationship of said gear components and therefore of the adjacent units drivingly and drivenly connected thereto.

Said coupling pin 47 is secured to a grooved ring 44 supported for axial reciprocation about the elongated hub of gear wheel 37, and a fork-shaped shifter 45 having rollers 46 is engaged in the groove of said ring 44, for actuating the pin 47 between its positions of engagement and respectively of not engagement with gear wheel 38. Said shifter 45 is at its turn actuated by actuator 32.

The said coupling device and the actuation thereof will not be further described in detail or discussed as the structural features and the mode of actuating same, for the purpose of connecting and disconnecting adjacent printing units, are known and as described in the said prior U.S. Pat. No. 3,221,651. It is however to be taken into consideration that, as all the gear components of the gearing train rotate at same angular speed, provision of sensing

means and of controls and functions related to and controlled by said latter means are unnecessary and omitted in a multi-unit printing machine improved according to the present invention. It is further to be taken into consideration that other and differently constructed rather inexpensive coupling means, adapted for coupling to each other coaxial rotary components rotating at slightly different speeds, in one given angular relationship, may be readily adapted by those skilled in the art for providing said coupling means as generally designated by reference numerals 30 and 31 in FIG. 1; further, other and different actuator means could be provided therefor.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

1. In a multicolor printing machine comprised of a plurality of printing units disposed one after another and coupled to each other by means of a gear train for assuring common drive in a given phase relationship of rotary components in all units, said gear train comprising individual minor trains in each unit comprising upstream and downstream gears, the improvement comprising further gear means arranged between adjacent units for drivingly connecting the same in phase relationship, each further gear means comprising a first gear in mesh with the downstream gear of the minor gear train of one unit and a second gear in mesh with the upstream gear of the minor gear train of the unit located downstream of said one unit, a common shaft supporting said first and second gear for rotation relative to each other, and coupling means movable between a disconnected position in which said first and said second gear are free to rotate relative to each other and a connected position in which said coupling means fixedly connects said first to said second gear in one given angular relationship for rotation with each other; a main motor capable of driving the entire machine under regular service conditions drivingly connected to one of the plurality of units; and a plurality of auxiliary motors, each capable of running a single unit at setting and maintenance speed and each individually connected to a respective one of said plurality of units with the exception of said one unit for individually driving the respective unit.

2. A multicolor printing machine as defined in claim 1, wherein said main motor and said plurality of auxiliary motors are respectively drivingly connected to one gear comprised in the respective minor gear train of the respective unit.

3. A multicolor printing machine as defined in claim 1, which is composed of at least three printing units, and wherein said main motor is connected to a unit located in the region of the center of the plurality of units.

References Cited

UNITED STATES PATENTS

246,710	9/1881	Bean	74—333
532,026	1/1895	Chamberlain.	
2,484,905	10/1949	Peyrebrune	101—183
2,705,918	4/1955	Koch	101—183
2,707,914	5/1955	Harrold	101—183
3,221,651	12/1965	Tagliasacchi	101—183

ROBERT E. PULFREY, Primary Examiner

J. R. FISHER, Assistant Examiner