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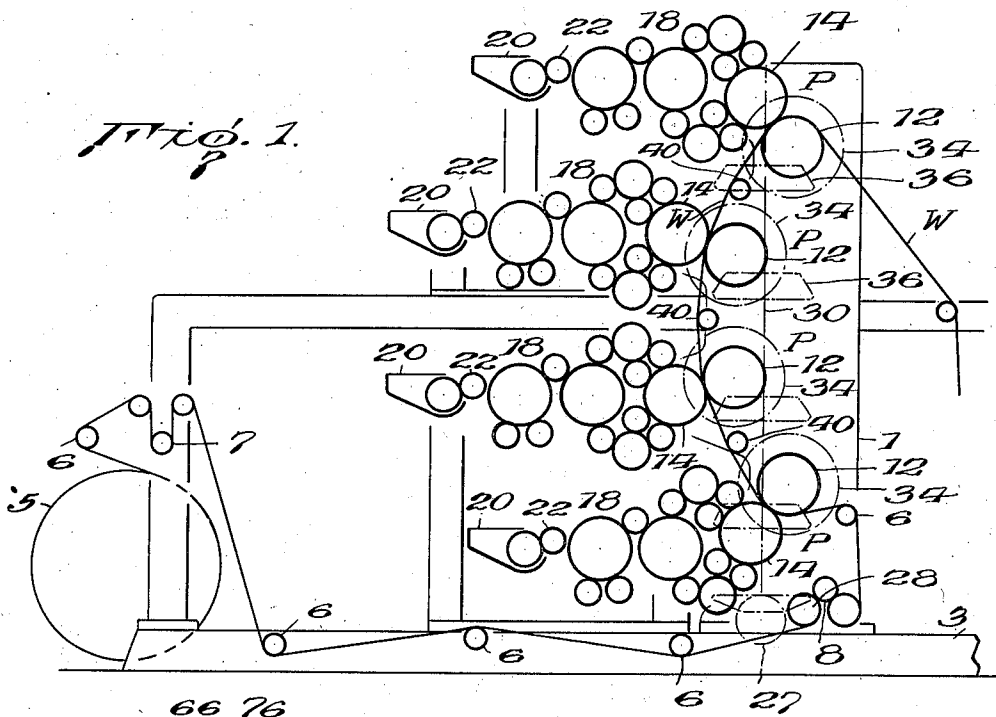
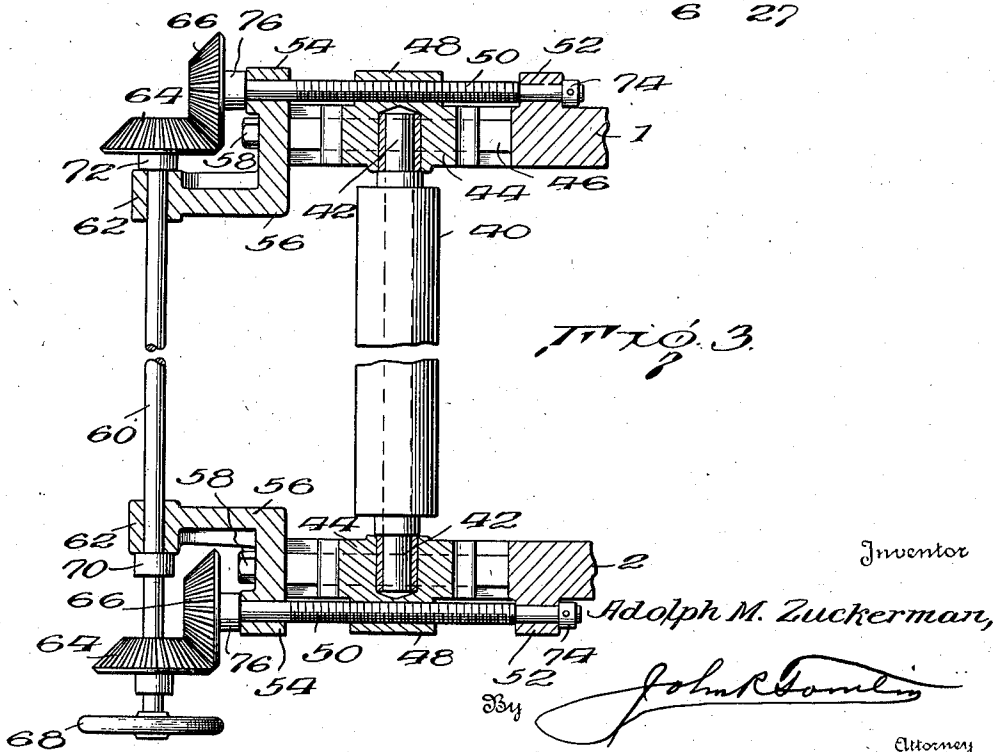
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2,104,065

MULTICOLOR PRESS ARRANGEMENT

Filed July 16, 1934

2 Sheets-Sheet 1



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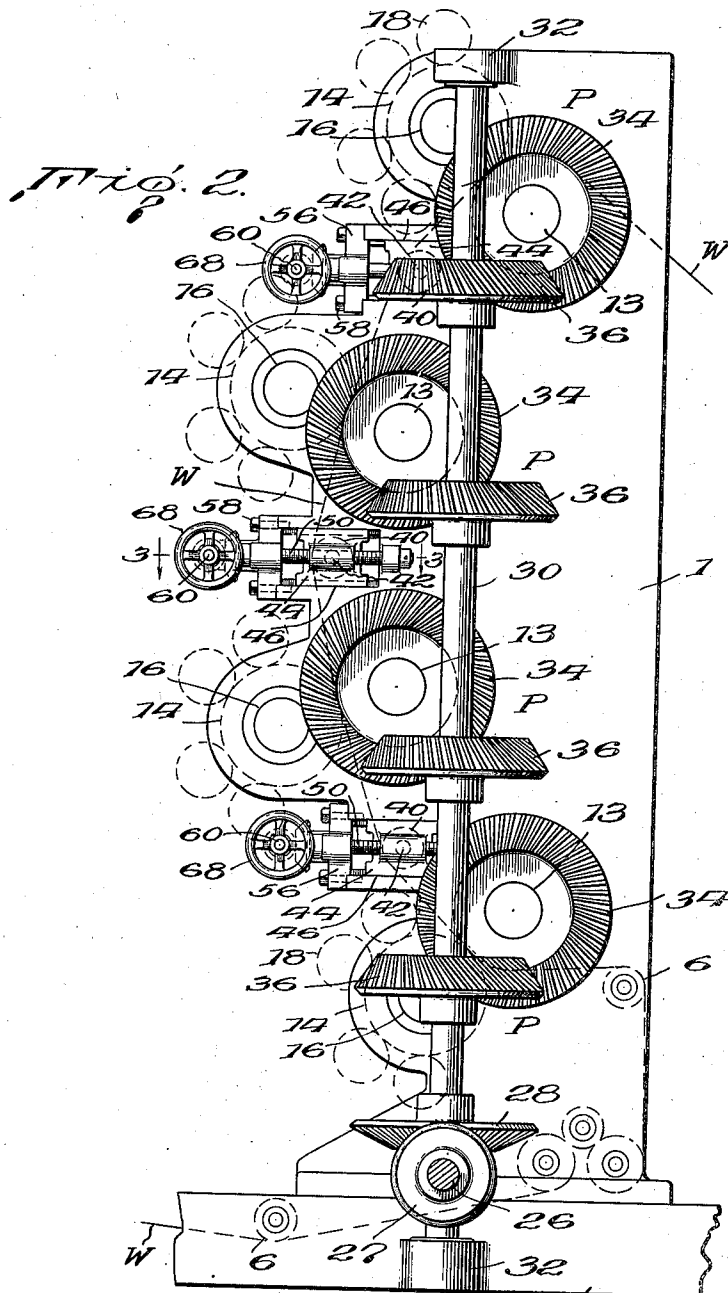
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MULTICOLOR PRESS ARRANGEMENT

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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MULTICOLOR PRESS ARRANGEMENT

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15 Claims. (Cl. 101—181)

This invention relates to printing machines and more particularly to novel means for driving multiple printing couples in a multi-color press, and to means for guiding or directing the web through the couples so that the printing couples will print successively on the same side of the web, and the guiding and compensating instrumentalities positioned, constructed and arranged to engage the unprinted side of the web.

It is the present practice to arrange multiple printing couples in a multi-color printing press in superposed relation, and to provide guiding and compensator rollers so arranged as to cause the web to wrap about a portion of the periphery of each impression cylinder, and each compensator roller engaging the printed face or side of the web. This arrangement is objectionable inasmuch as the compensator rollers engage the freshly printed inked face or surface of the web, thereby smearing the ink and producing "smuts." It is also a practice to provide in multi-color printing presses, a large impression cylinder common to a plurality of small plate cylinders, and the plate cylinders are driven from a large gear carried by or rotatable with the common impression cylinder and meshing with gears carried by or rotatable with the plate cylinders. In arrangements where an impression cylinder is provided for each plate cylinder the cylinders may be driven through a plurality of drive shafts. The employment of a number of separate shafts for driving the plate or form cylinders is objectionable, because the back lash in the gearing and the torsion "set-up" in the separate shafts permits sufficient play in the drive components to thereby effect the proper registration of the web in passing through the multiple printing couples.

An object of my present invention is to provide a multi-color printing press in which a plurality of printing couples are driven from a common drive shaft, the drive being transmitted to each printing couple through components having similar functions, so that if the drive stresses or power is imparted to a printing couple through its impression cylinder, each of the remaining printing couples would also be driven through its impression cylinder.

Another object of this invention is to provide a multi-color printing press in which a plurality of printing couples are employed, the printing couples being arranged above each other and a common vertically disposed drive shaft arranged to drive a cylinder of each couple.

A further object of my present invention is to provide a multi-color printing press having a

plurality of printing couples arranged to print successively on the same side of a web, and compensator rollers interposed between adjacent couples and constructed and arranged to engage the unprinted side of the web.

An additional object of my present invention is to provide a multi-color printing press having a plurality of printing couples arranged above each other and driven from a common instrumentality, and arranged to print successively on the same side of a web, and compensator rollers interposed between adjacent couples and constructed and arranged to engage the unprinted side of the web.

It is also an object of this invention to provide a multi-color printing press having a plurality of printing couples driven by a common drive shaft, and the printing couples arranged so that certain of them will be operably positioned at one side of the drive shaft and others operably positioned at the opposed side, and similar drive components imparting the drive from the drive shaft to the driven component of each printing couple.

Another object of this invention is to provide a multi-color printing machine having a plurality of printing couples, and each couple comprising a plate cylinder and an impression cylinder, the axes of these cylinders coinciding with, or approximately coinciding with, lines or planes radiating from a point located at one side of the machine, and a compensator roller interposed between adjacent printing couples and adapted to engage the unprinted side of the web.

A further object of this invention is to provide a multi-color printing machine having a plurality of printing couples arranged to print successively on the same side of a web, the printing couples being arranged above each other, and each couple including an impression cylinder and a plate cylinder, these cylinders being so disposed that their axes coincide with, or approximately coincide, with lines or planes radiating from a point at one side of the printing machine, the cylinders being driven from a common shaft, and a compensating roller adjustably positioned between adjacent printing couples to engage the unprinted side of the web and having an adjusting movement of sufficient amplitude to insure register without moving the web from the periphery of adjacent impression cylinders.

It is also an object of my present invention to provide a printing machine drive and web lead, guide and compensator components of generally improved construction and arrangement, where-

by the device will be simple, durable and inexpensive in construction, as well as convenient, practical, serviceable and efficient in its use.

With the foregoing and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts, and in the details of construction hereinafter described and claimed, it being understood that various changes in form, proportion, and minor details of construction may be made within the scope of the claims without departing from the spirit or sacrificing any advantages of the invention.

For a complete disclosure of the invention, a detail description of a printing machine embodying the invention in a preferred form will now be given in connection with the accompanying drawings forming a part of this specification, wherein:—

Figure 1 is a diagrammatic side elevational view of a multi-color printing press, depicting applicant's invention applied thereto;

Figure 2 is a fragmental elevational view showing the multiple printing couples, common drive instrumentalities, and novel web lead; and

Figure 3 is a fragmental horizontal sectional view taken on the line 3—3 of Fig. 2, depicting the means for simultaneously adjusting both terminals of a compensator roller.

Referring to the drawings, in which similar reference characters designate corresponding parts, 1 and 2 indicate the usual side frame members of a multi-color printing machine, and these members are supported by the usual base or bed plate 3. This bed plate 3, in conformity with the usual practice, may be extended at the right, as viewed in Figure 1, to accommodate a folder or a rewinding device, but, inasmuch as these members form no part of applicant's invention, they are not here illustrated. A feed roll 5 is operably mounted at the left end of the frame, as illustrated in Figure 1, and the web W from this roll is led around suitable guide rollers 6, through tension controlling device 7, feed rollers 8, and through a plurality of printing couples P.

Each printing couple includes an impression cylinder 12, having a shaft or trunnions 13 suitably journaled in the side frames 1 and 2 of the machine. A plate or form cylinder 14 has a similar shaft or trunnions 16 suitably journaled in the side frames 1 and 2, and the plate cylinder coacts with an impression cylinder 12 of each printing couple P. Each plate cylinder, in conformity with the usual practice, is arranged to operably support suitable printing plates, not shown, to which ink is supplied through the instrumentality of the usual inking mechanism, indicated generally at 18, which distributes the supply of ink from the conventional ink fountain 20 through the intermediation of the usual doctor roller 22. The impression cylinder 12 and plate cylinder 14 of each printing couple may be suitably geared together so that both cylinders operate with the same peripheral speed, but inasmuch as such gearing is in conformity with the usual practice and is well understood by those skilled in the art, it is not here illustrated.

The printing couples P are preferably positioned above each other, as shown in Figures 1 and 2, and arranged so that their axes actually or approximately coincide with lines or planes radiating from a point located at one side of the machine, for reasons to be hereinafter disclosed.

The machine may be driven from any suitable

source of power, usually an electric motor, not shown, which drives the horizontally disposed shaft 26 having a bevel gear 27, meshing with a similar gear 28, supported by a vertically disposed shaft 30, journaled in suitable bearings 32, carried by the side member 1 of the machine frame. The impression cylinder 12 of each printing couple P has a suitable gear 34 secured to rotate therewith, and this gear in the present instance is a spiral bevel gear meshing with a similar gear 36, the gears 34 and 36 forming the mating members of a hypoid gear couple.

The radial disposition of the axis of each impression cylinder 12 with relation to the axis of its coating plate cylinder 14 permits the printing couples P to be arranged so that the impression cylinders of certain of the couples are placed at one side of the vertical shaft 30, and the impression cylinders of other couples positioned at the opposed side of this shaft. In the present arrangement, the upper and lower printing couples P are disposed so that their impression cylinders 12 and driven gears 34 are positioned at the right of the shaft 30, as viewed in Figures 1 and 2, and the intermediate printing couples are disposed so that their impression cylinders 12 and driven gears 34 are positioned at the opposed, or left side, of the shaft 30, as viewed in Figures 1 and 2. By this arrangement, the hypoid gear couples drive the printing couples P in synchronism, and inasmuch as this arrangement permits the plate and impression cylinders of the printing couples to be arranged in radial relationship, an advantageous web lead is made possible. Although any preferred web lead may be employed in the arrangement illustrated, the feed rolls 8 and guide roll 6, positioned thereabove, lead the web W between the plate and impression cylinders of the lower printing couple, then through the intermediate couples and finally between the plate and impression cylinders of the upper printing couples. From this point, the web may be led to a folder, if the product is to be produced in final form, or, if desired, it may be rewound into a roll for subsequent use. Inasmuch as the disposition of the web after passing through the final printing couple of applicant's device is not a part of applicant's invention, the means for rewinding or folding the web has not been illustrated. Although the web W, in the present illustration, is depicted as being led from the supply roll 5, over guide roll 6, through tension controlling devices 7, to the feeding device 8, it is to be understood that this arrangement may be varied, and, if desired, the web may be led, first, to one or more printing couples to print on one side thereof and then led to the printing components of applicant's multi-color arrangement here disclosed.

In order to insure that the impression on the web in passing through each successive printing couple P will register with the previous impression or impressions, a compensator roller 40 is positioned between adjacent printing couples P, as shown in Figures 1 and 2, and inasmuch as four printing couples are here illustrated, three compensator rollers are consequently shown. It is to be understood, of course, that any preferred number of printing couples may be employed in conformity with applicant's arrangement, and, in each instance, one or more compensator rollers are operably positioned intermediate adjacent printing couples, and in the relationship herein disclosed. Each compensator roller is provided with a suitable shaft or trunnions 42, jour-

nalled in bearing blocks 44, slidably mounted in guideways 46, provided in the side members 1 and 2 of the machine frame. Each bearing block 44 is provided with a lateral boss or lug 48, for the threaded reception of a threaded shaft 50. Each shaft 50 is journaled in bearings 52, formed in the side frames 1 and 2 and in bearings 54, formed in bracket members 56. The brackets 56 are secured to the side members 1 and 2 of the machine frame by suitable bolts or securing devices 58. A cross shaft 60 is mounted in bearings 62 formed in the brackets 56, and this shaft has beveled gears 64 secured to or adjacent the opposed ends thereof. Each gear 64 meshes with a mating gear 66, carried by the threaded shafts 50, and a suitable hand wheel or manipulable member 68 is secured to one terminal of a shaft 60, and this shaft 60 is held against longitudinal movement relative to its bearing 62 by means of a collar 70 and the hub 72 of one of the gears 64. The threaded shafts 50 are held against longitudinal motion relative to their bearings 52 and 54 by means of a collar 74, secured at one terminal of each shaft 50, and the hub 76 of a bevel gear 66.

As clearly shown in Figure 2, the compensator rolls 40 are so positioned and arranged that they have a sliding motion of given amplitude, but throughout the extent of this sliding motion the web engaging portion of each compensating roller is always maintained to the inside of tangential lines passing through the nipping points of adjacent printing couples, and to the outside of a line which is tangential to the peripheries of adjacent impression cylinders 14. By this arrangement, each compensator roller 40 may be adjusted to vary the length of the web W between adjacent printing couples P sufficiently to insure proper registration without moving or pressing the web W from engagement with the periphery of the impression cylinder 12 of adjacent printing couples P.

In defining the location of the compensator rollers relative to adjacent printing couples, the web engaging portion of each roller is defined as being located to one side or outside of a line which is tangential to the peripheries of adjacent impression cylinders, and it is to be understood that the term outside is to be construed as the side of the web which is disposed towards the plate cylinders of the printing couples.

By this arrangement, printing couples P are provided for printing successively on the same side of the web W, and compensating rollers 40 are positioned intermediate adjacent printing couples and in engagement with the unprinted side of the web, thereby insuring perfect printing free of smearing and smutting. This arrangement also permits the driven component of each printing couple to operably engage a component of a common drive member, thereby providing an exceedingly simple and efficient drive for a plurality of printing couples.

As hereinbefore disclosed, the web W may be led through a printing unit or a number of units to print on one side thereof before the web is led through the printing couple P disclosed in this application. In this event, there would be no unprinted side of the web, and consequently, the compensator rollers 40 will engage the previously printed side of the web, but not the freshly printed surface thereof. Thus it is to be understood that when the unprinted side of the web is referred to in this application, it is to mean the side which is not printed in the arrangement forming the

subject matter of this application. The side of the web engaged by the compensator rollers 40, in the event the web is printed before it reaches the disclosed printing couples P, will be dry or nearly so before the web is engaged by the compensators, thus avoiding smuts.

Inasmuch as hypoid gears have the peculiar characteristic of permitting intermeshing of gears positioned in offset relationship, this form of gear is preferably employed in the present arrangement, thereby permitting certain of the driven gears to be positioned at one side of a common shaft on which drive gears are arranged, and other meshing gears to be positioned at the opposed side of the same shaft. Furthermore, the spiral disposition of the teeth of the meshed bevel gears 34 and 36, distribute the drive or power impulses so that the cylinders of the printing couples are driven with uniform peripheral velocity, thereby insuring uniform printing and obviating "gear-streaks" which manifests themselves in the printing in the form of alternate bands of light and dark impressions.

Although gears of the hypoid type are preferably employed to drive the printing cylinders, it is to be understood that other forms may be advantageously employed, such as worms and worm gears, or any other types of efficient gearing which lend themselves to driving printing cylinders positioned at opposed sides of a common shaft and driven from the shaft.

Having thus described my invention, what I claim as new and useful in the art, is:—

1. In a printing machine, a plurality of printing couples constructed and arranged to print successively on the same side of a web, a drive shaft common to the printing couples, a driven gear operably secured to a similar component of each printing couple, and aligned drive gears carried by the drive shaft and each drive gear meshing with the driven gear of each printing couple, the driven gears being positioned at opposed sides of the drive shaft and the drive gears positioned axially beyond the driven gears and disposed perpendicularly thereto.

2. In a printing machine, a plurality of printing couples constructed and arranged to print successively on the same side of a web, each printing couple including a plate cylinder and an impression cylinder, all the impression cylinders being disposed at the same side of the plate cylinders, a drive shaft common to the printing couples, a driven gear operably secured to a corresponding cylinder of each printing couple, and aligned drive gears carried by the drive shaft and each drive gear meshing with the driven gear of each printing couple, the driven gears being positioned at opposed sides of the drive shaft and disposed perpendicularly to the drive gears.

3. In a printing machine, a plurality of printing couples constructed and arranged to print successively on the same side of a web, each printing couple including a plate cylinder and an impression cylinder, a drive shaft common to the printing couples, a driven gear operably secured to the impression cylinder of each printing couple, and aligned drive gears carried by the drive shaft, and each drive gear meshing with a driven gear of each printing couple, the driven gears being positioned at opposed sides of the drive shaft axially beyond the driven gears and disposed perpendicularly thereto.

4. In a printing machine, a plurality of printing couples constructed and arranged to print successively on a web, a drive shaft common to

the printing couples, a hypoid gear operably secured to a similar component of each printing couple, and aligned hypoid drive gears carried by the drive shaft and each drive gear meshing with the driven gear of each printing couple, the driven gears being positioned at opposed sides of the drive shaft.

5. In a printing machine, a plurality of printing couples, constructed and arranged to print successively on a web, each printing couple including a plate cylinder and an impression cylinder, a drive shaft common to the printing couples, a driven hypoid gear operably secured to a corresponding cylinder of each printing couple, and aligned hypoid drive gears carried by the drive shaft and each drive gear meshing with the driven gear of each printing couple, the driven gears being positioned at opposed sides of the drive shaft.

6. In a printing machine, a plurality of printing couples positioned above each other and constructed and arranged to print successively on the same side of a web, a compensator roller operably interposed between adjacent printing couples and arranged to engage the unprinted side of the web, a drive shaft common to all the printing couples, a driven gear operably secured to a corresponding component of each printing couple, and aligned drive gears carried by the drive shaft, and each drive gear meshing with the driven gear of each printing couple, the driven gears being positioned on opposed sides of the drive shaft.

7. In a printing machine, a plurality of printing couples positioned above each other and constructed and arranged to print successively on the same side of a web, each printing couple including a plate cylinder and an impression cylinder, a compensator roller operably interposed between adjacent printing couples and arranged to engage the unprinted side of the web, a drive shaft common to the printing couples, a driven gear operably secured to a corresponding cylinder of each printing couple, and aligned drive gears carried by the drive shaft and each drive gear meshing with a driven gear, the driven gears being positioned at opposed sides of the drive shaft.

8. In a printing machine, a plurality of printing couples positioned above each other and constructed and arranged to print successively on the same side of a web, each printing couple including a plate cylinder and an impression cylinder, a compensator roller operably interposed between adjacent printing couples and arranged to engage the unprinted side of the web, a drive shaft common to the printing couples, a driven gear operably secured to the impression cylinder of each printing couple, and aligned drive gears carried by the drive shaft and each drive gear meshing with the driven gear of each impression cylinder, the driven gears and impression cylinders being positioned on opposed sides of the drive shaft.

9. In a printing machine, a plurality of printing couples positioned above each other and constructed and arranged to print successively on the same side of a web, each printing couple including a plate cylinder and an impression cylinder having their axes positioned to substantially coincide with lines or planes radiating from a point located at one side of the machine, a compensator roller operably interposed between adjacent printing couples and adapted to engage the unprinted side of a web, a drive shaft common to the printing couples, a driven gear oper-

ably secured to a corresponding cylinder of each printing couple, and aligned drive gears carried by the drive shaft and each drive gear meshing with a driven gear of each printing couple, the driven gears being positioned on opposed sides of the drive shaft.

10. In a printing machine, a plurality of separate printing couples all positioned in superposed relation and constructed and arranged to print successively on the same side of a web, each couple including a plate cylinder and a separate impression cylinder, means for synchronizing the rotation of the plate and impression cylinders in each printing couple, a compensator roller operably interposed between adjacent printing couples and adapted to guide the web and engage only the unprinted side thereof, a common drive shaft extending in the general direction of the superposed couples, and a plurality of gears operably supported by the drive shaft, each gear arranged to drive a separate printing couple to thereby drive all the printing couples in synchronism.

11. In a printing machine, a plurality of separate printing couples all positioned in superposed relation and constructed and arranged to print successively on the same side of a web, each printing couple including a plate cylinder and a separate impression cylinder, means for synchronizing the rotation of the plate and impression cylinders in each couple, a compensator roller adjustably interposed between adjacent printing couples and positioned to guide the web and engage only the unprinted side thereof, means for movably adjusting each compensator roller, the adjusting movement of each compensator roller being of such amplitude as to vary the length of the web between adjacent printing couples sufficiently to insure registration without pressing the web from engagement with the adjacent printing cylinders, a common drive shaft extending in the general direction of the superposed couples, and a plurality of gears operably supported by the drive shaft, each gear arranged to drive a separate printing couple to thereby drive all the printing couples in synchronism.

12. In a printing machine, a plurality of separate printing couples positioned above each other in substantially vertical alignment and constructed and arranged to print successively on the same side of a web, each printing couple including a plate cylinder and a separate impression cylinder having their axes positioned to substantially coincide with lines or planes radiating from a point located at one side of all the cylinders, means for synchronizing the rotation of the plate and impression cylinders in each printing couple, a compensator roller operatively interposed between adjacent printing couples and adapted to engage only the unprinted side of the web, each compensator roller being positioned so that its web engaging portion is located outside of a line which is tangential to the peripheries of adjacent impression cylinders, a common vertically disposed drive shaft, and a plurality of gears operably supported by the drive shaft, each gear arranged to drive a separate printing couple to thereby drive all the printing couples in synchronism.

13. In a printing machine, a plurality of separate printing couples constructed and arranged to print successively on the same side of the web, each printing couple including an independent plate cylinder and independent impression

5 cylinder having their axes positioned to substantially coincide with lines or planes radiating from a point located at one side of all the cylinders, means for synchronizing the rotation of the plate and impression cylinders in each printing couple, a compensator roller operatively interposed between adjacent printing couples and adapted to engage only the unprinted side of the web, each compensator roller having an adjusting motion sufficient to insure registration and positioned so that throughout the extent of its adjusting movement its periphery engages the web at a point located outside a tangential line passing through the peripheries of adjacent printing cylinders, a common vertically disposed drive shaft, and a plurality of gears operably supported by the drive shaft, each gear arranged to drive a separate printing couple to thereby drive all the printing couples in synchronism.

10 14. In a printing machine, a plurality of printing couples arranged in substantially superposed relation, each printing couple including a plate cylinder and an independent impression cylinder, means for synchronizing the rotation of the plate and impression cylinders in each printing couple, a gear operably connected to one of the cylinders of each printing couple, the plate cylinders supporting suitable printing plates and adapted to print on one side only of a common web led through the printing couples, a vertically disposed drive shaft common to all the printing couples, a plurality of drive gears operably supported by the drive shaft, each drive gear arranged to mesh with the gear of each printing couple to thereby drive all the printing couples in synchronism, compensating rollers arranged so that at least one roller is operably inter-

posed between adjacent printing couples to engage the unprinted side of the web, and means for adjusting each compensating roller, the adjusting movement of each compensating roller being of sufficient amplitude to insure registration without pressing the web from engagement with the adjacent impression cylinders so that the web engages only the nipping portions of the plate cylinder.

15 15. In a printing machine, a plurality of separate printing couples disposed in substantially superposed relation and arranged to print successively on the same side of a web, each printing couple including a plate cylinder and a coacting impression cylinder which is independent of the cylinders of the other couples, the cylinders being arranged so that a plane which passes through the axes of the cylinders of a couple is disposed in angular relation to a similar plane which passes through the axes of the cylinders of any other couple, thus permitting the web to appreciably wrap around each impression cylinder when guided around the impression cylinders and around points located between couples and outside of planes which are tangential to the peripheral portion of adjacent impression cylinders, means for synchronizing the rotation of the plate and impression cylinders in each printing couple, a gear operably connected to one of the cylinders of each printing couple, a vertically disposed drive shaft common to all the printing couples, and a plurality of drive gears operably supported by the drive shaft, each drive gear arranged to mesh with the gear of each printing couple to thereby drive all the printing couples in synchronism.

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