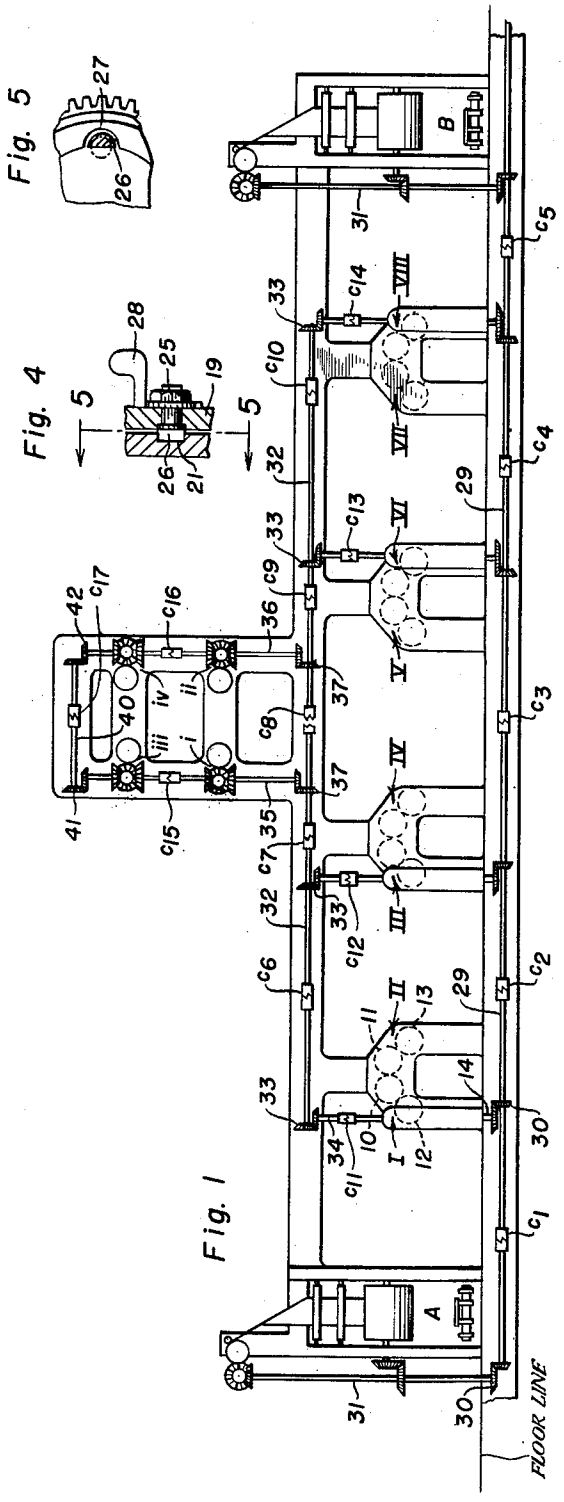
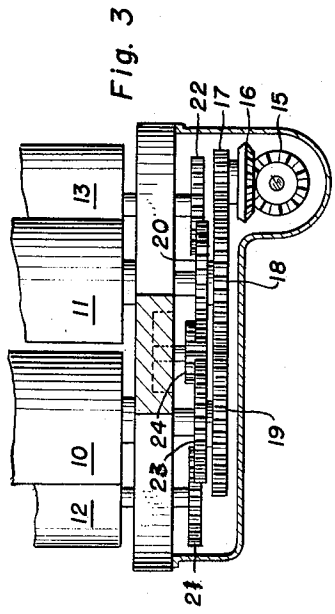
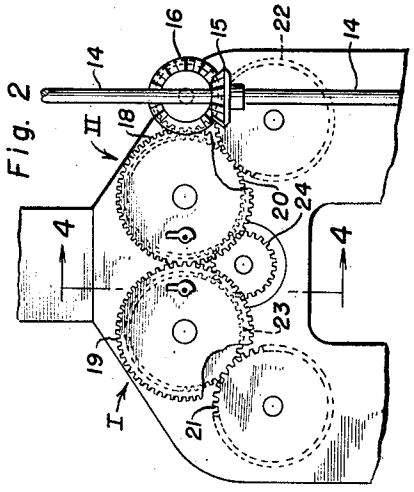
Nov. 19, 1957 A. DRESSEL ET AL 2,813,713

PRINTING PRESSES WITH ADDED COLOR COUPLES

Filed Oct. 27, 1953 8 Sheets-Sheet 1







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PRINTING PRESSES WITH ADDED COLOR COUPLES

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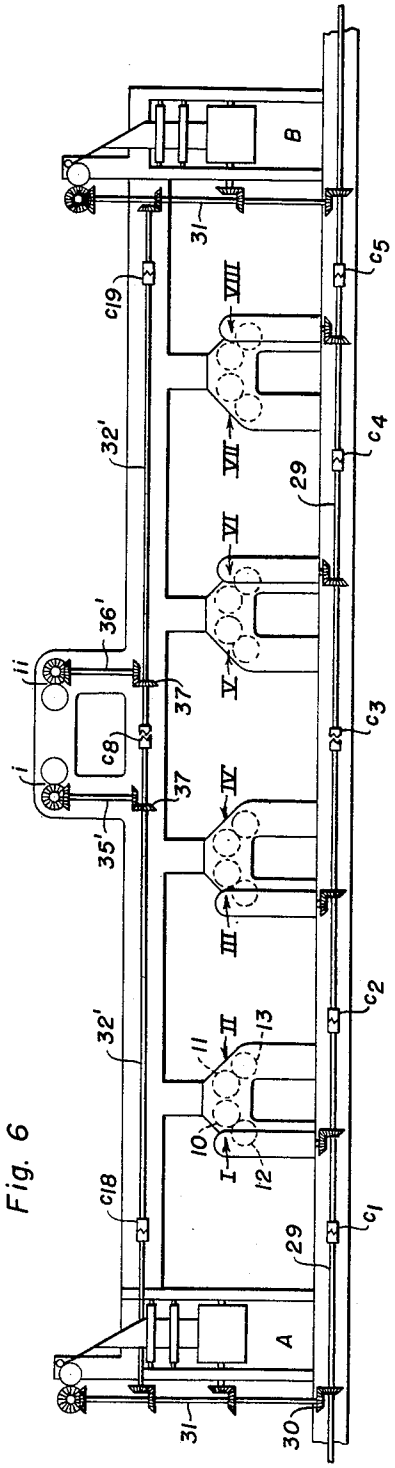


Fig. 6

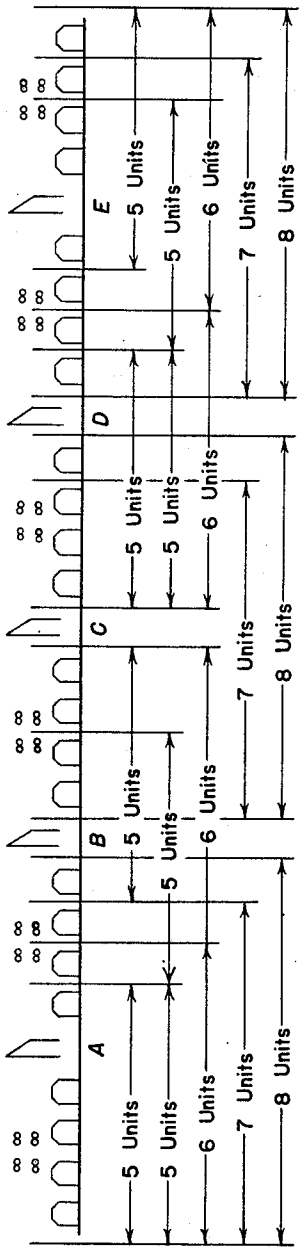


Fig. 7

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PRINTING PRESSES WITH ADDED COLOR COUPLES

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Fig. 8

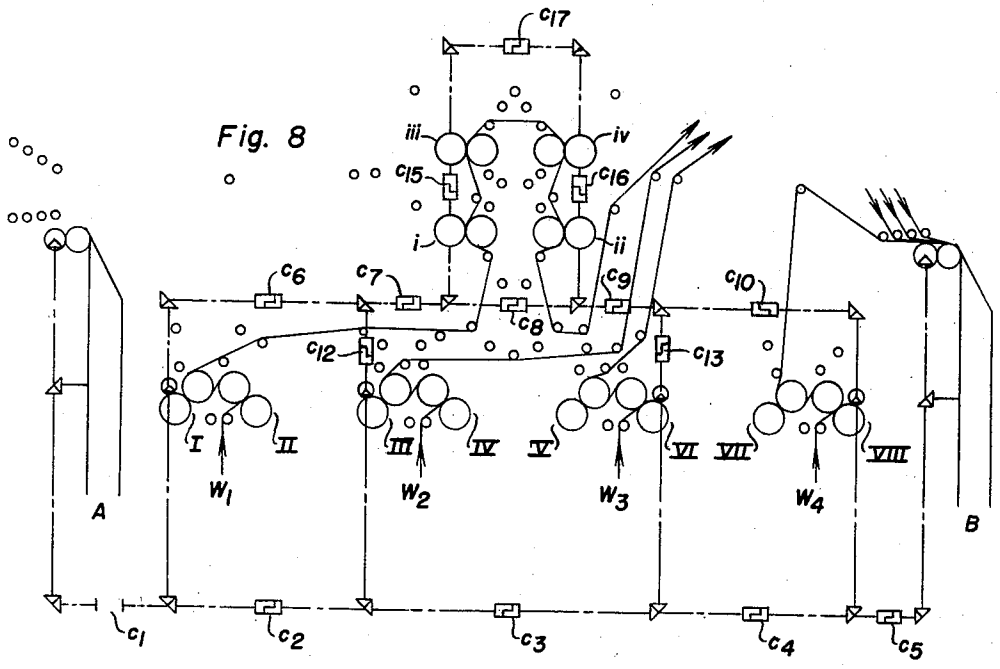
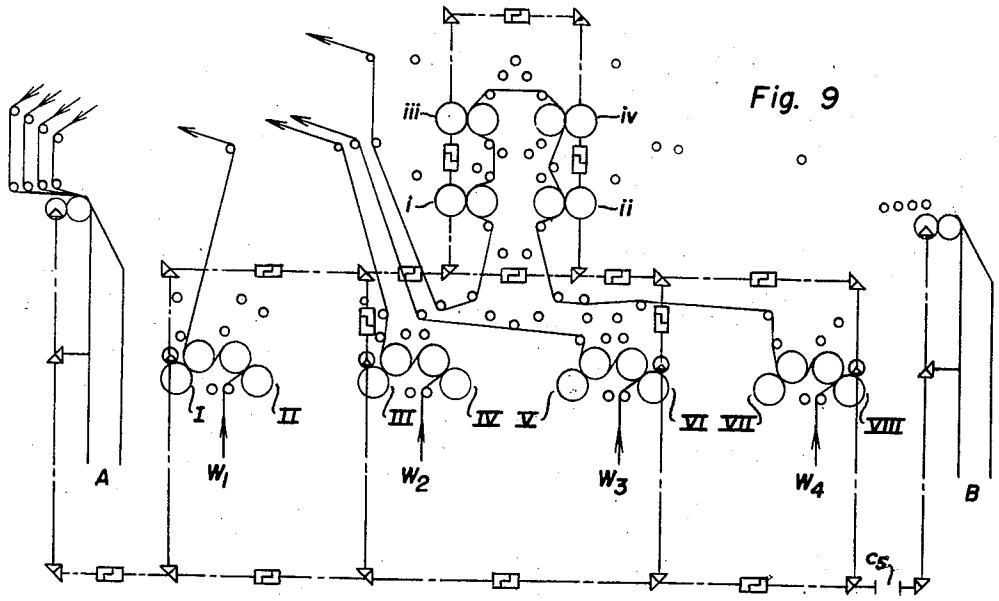


Fig. 9



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PRINTING PRESSES WITH ADDED COLOR COUPLES

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Fig. 10

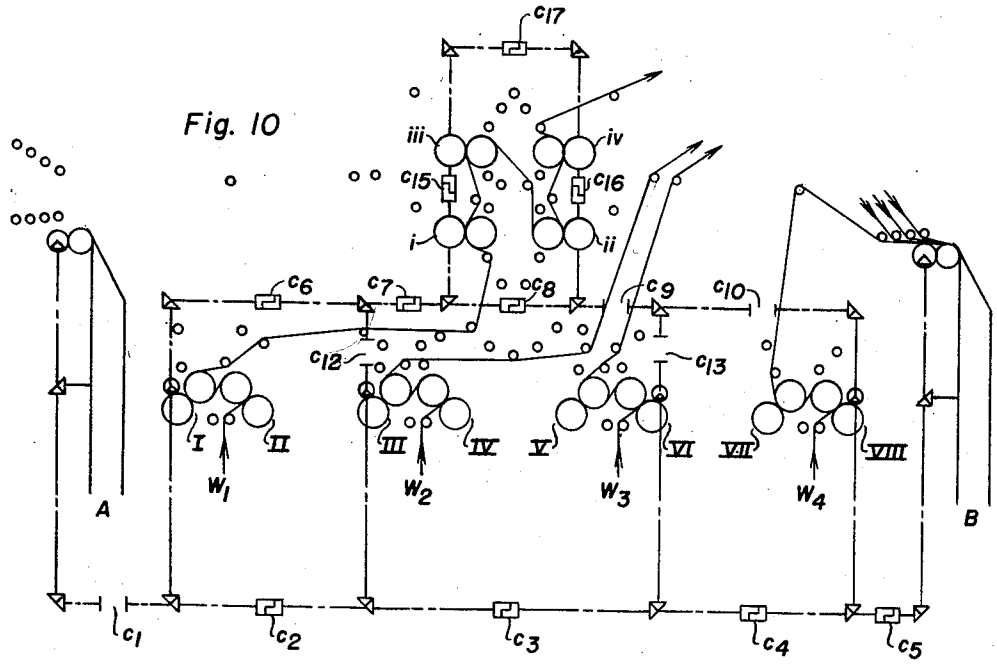
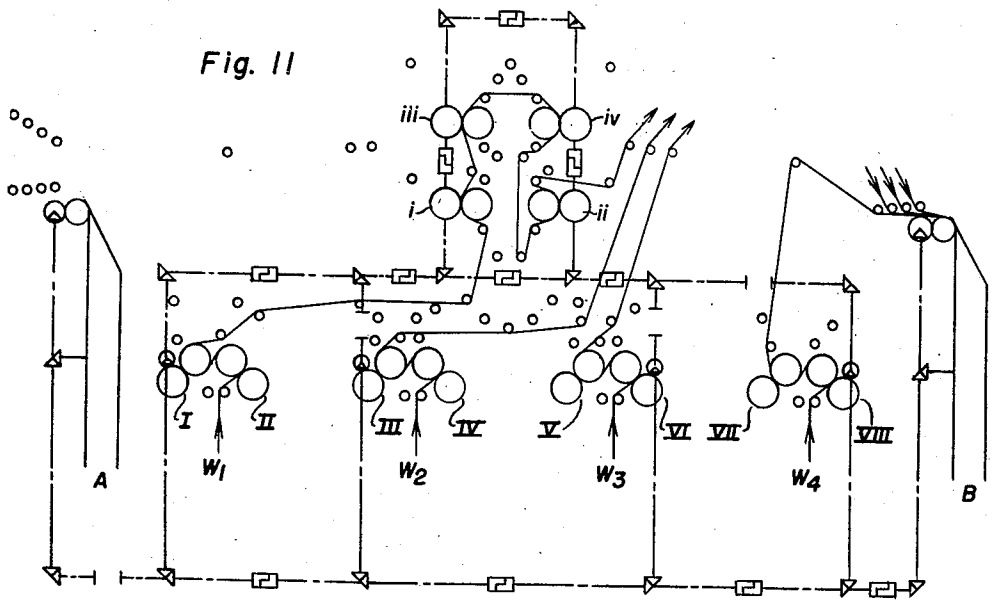


Fig. 11



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PRINTING PRESSES WITH ADDED COLOR COUPLES

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Fig. 12

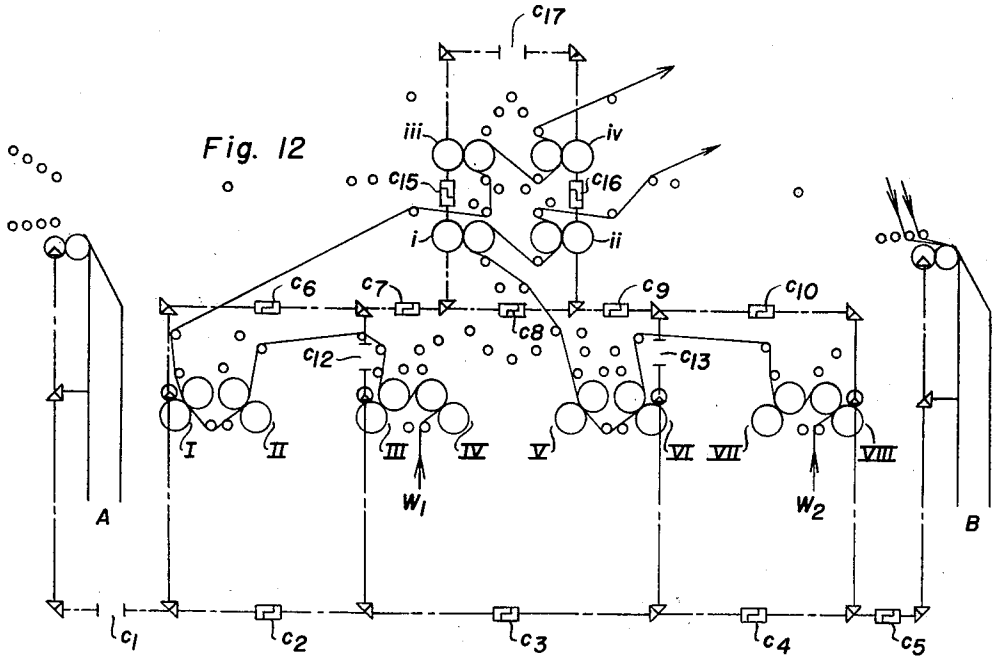
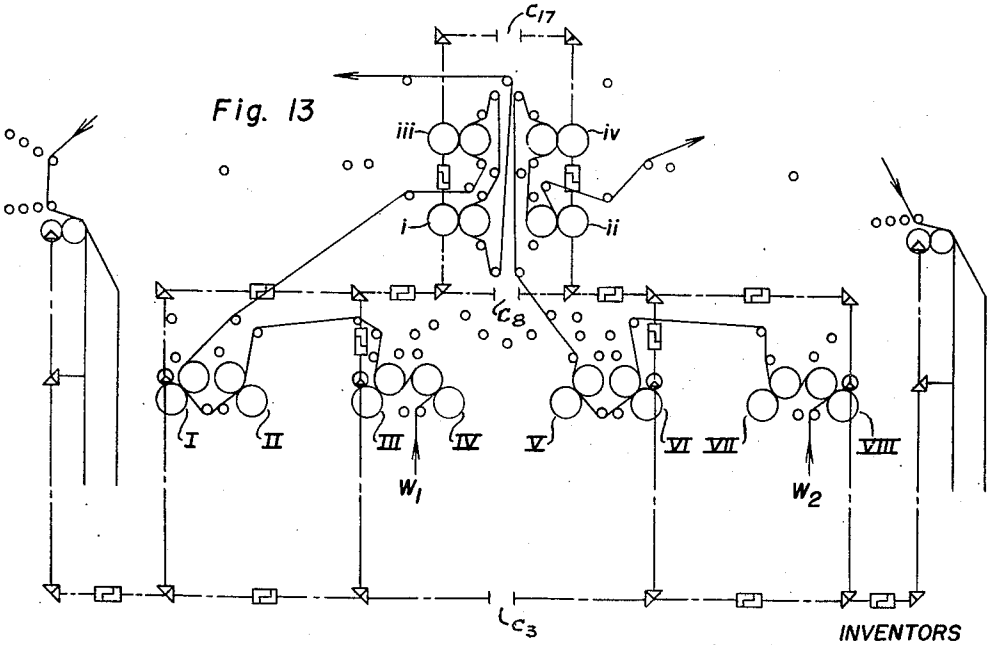


Fig. 13



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PRINTING PRESSES WITH ADDED COLOR COUPLES

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Fig. 14

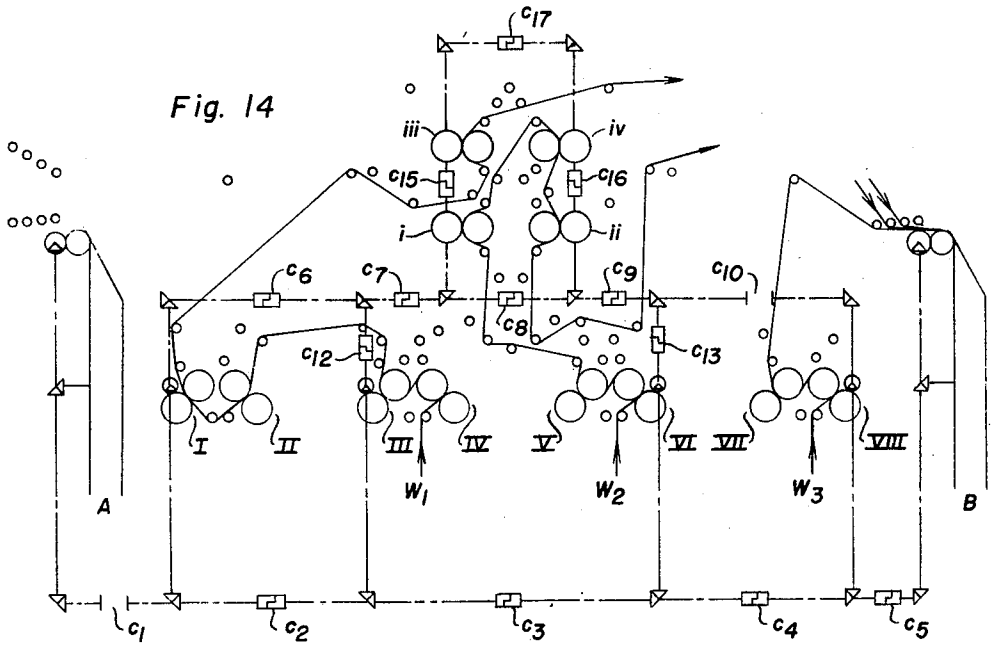
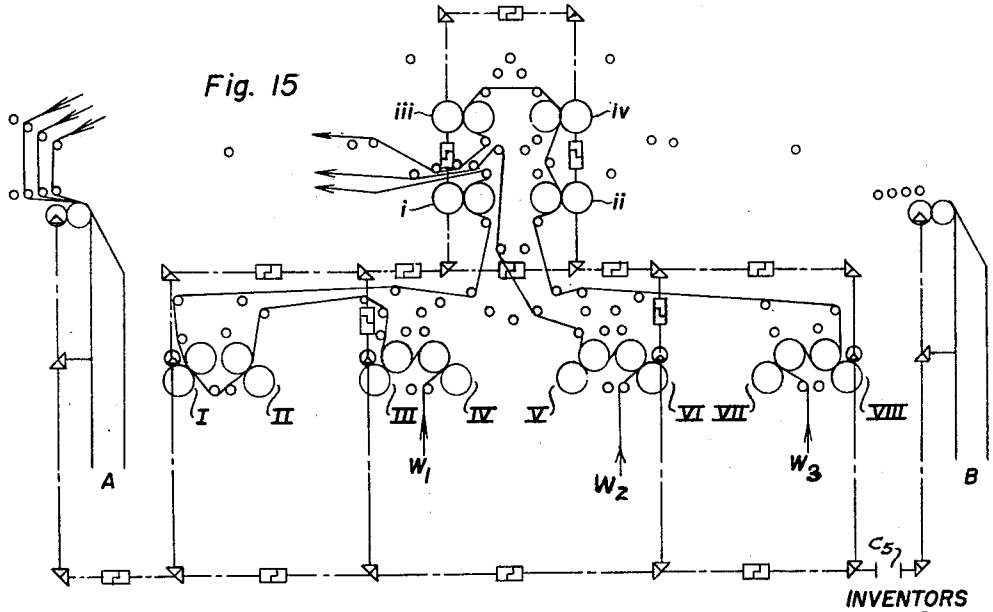


Fig. 15



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PRINTING PRESSES WITH ADDED COLOR COUPLES

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Fig. 16

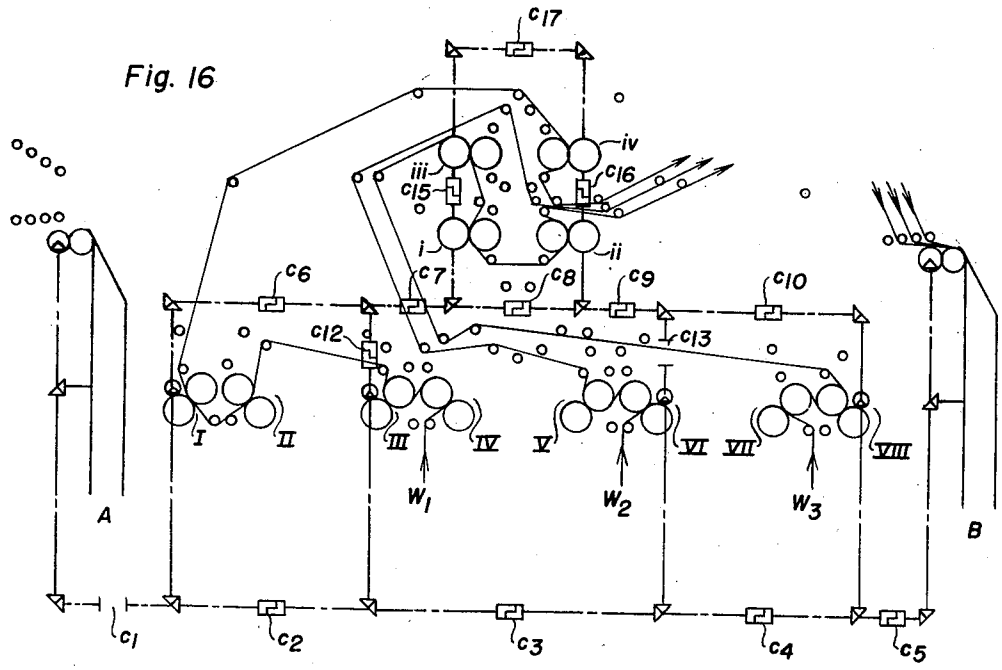
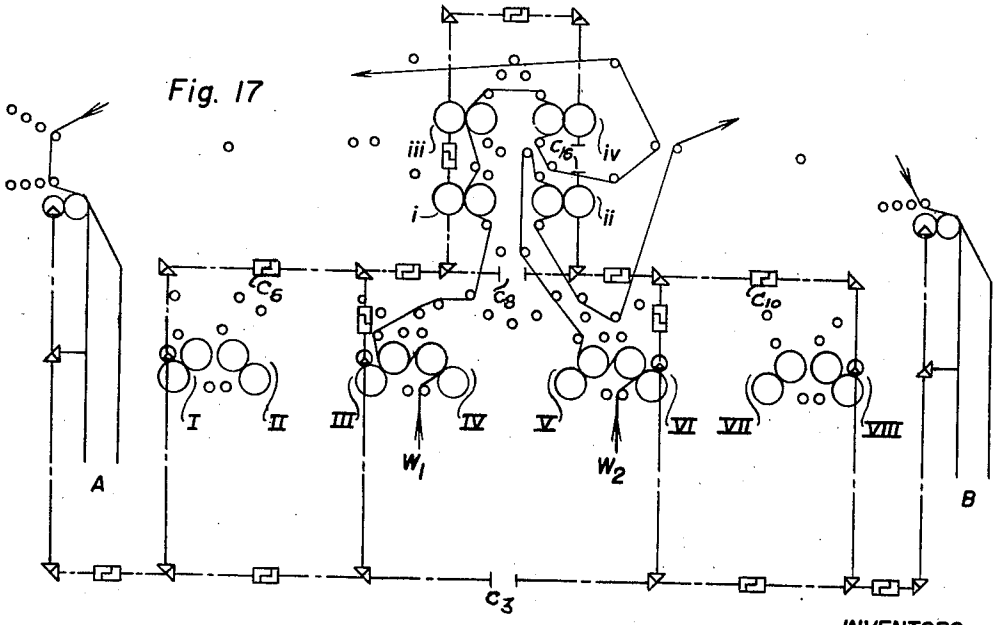


Fig. 17



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Fig. 18

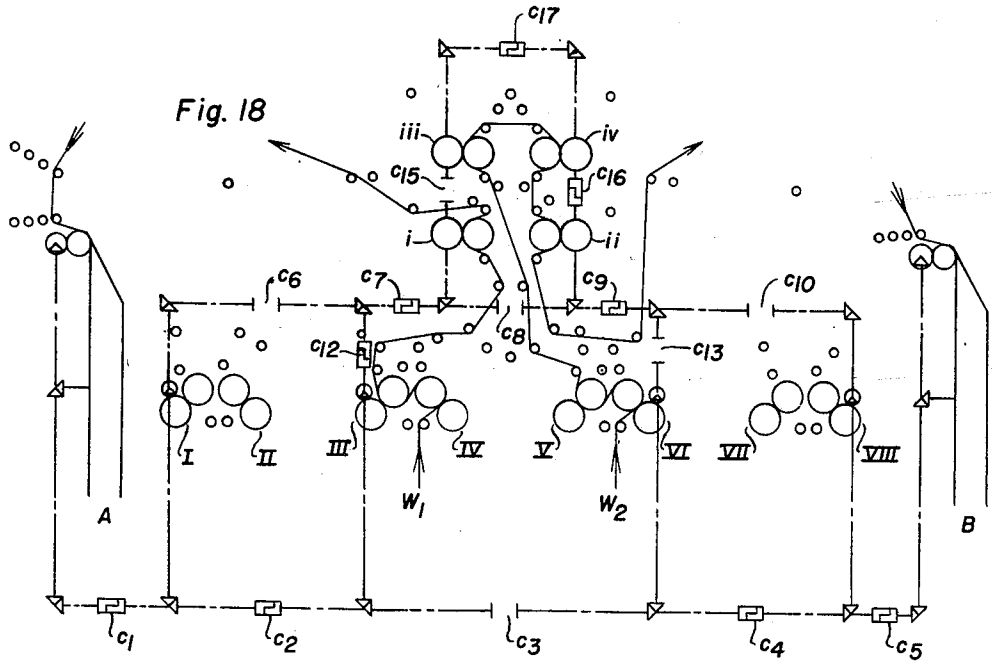
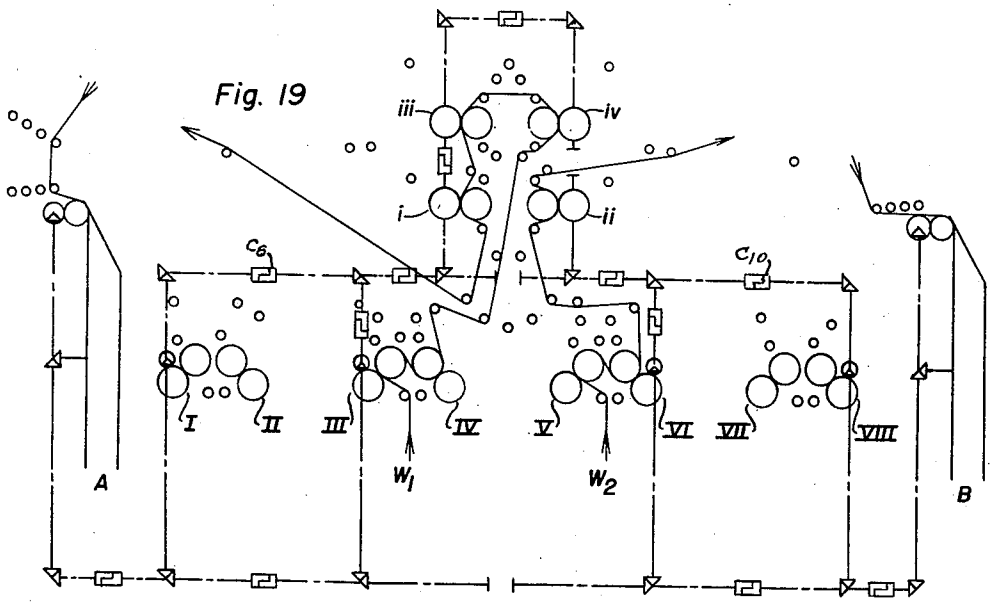


Fig. 19



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2,813,713

PRINTING PRESSES WITH ADDED COLOR COUPLES

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Application October 27, 1953, Serial No. 388,542

7 Claims. (Cl. 270—5)

This invention relates to printing machines having a number of main printing units, together with added color couples.

Machines of this general type have been constructed in a variety of arrangements. In previous Dressel Patent No. 2,298,094, for example, there is shown a printing press arrangement including a number of arch type printing units together with added color cylinders and reversing arrangements providing great flexibility in operation. In that disclosure, each of the added color printing cylinders, which may be incorporated in the original units or added later, cooperates with an impression cylinder of one of the main units, and, hence, an added color cylinder can be used only with the couple with which it is associated. Provision for added color has also been made by adding one or more complete color printing couples, generally located above the line of main units, it being possible in such a case to lead a web to the added printing couple from more than one of the main printing units. Little or no added flexibility has, however, been obtained by such an arrangement.

The present invention has for its general object to provide, with a minimum number of main units and of added color units, for maximum flexibility in production of different desired products, permitting the placement of multicolor impressions in desired number upon selected webs and upon either side of a web, as desired, for locating the color printing in any of various page positions in a product or section, and also permitting a wide range of variation as to the distribution of color among sections and in the number of pages in each section.

In the arrangement of the invention, a line of printing units is arranged with a folder at each end, and with one or more added color printing couples above the units. Drive arrangements for driving the line of units with either folder or splitting the drive at any point along the line of units are provided, together with means for selectively driving added color units with either folder. The invention also contemplates an arrangement in which a large number of printing units are arranged in line with a number of folders interspersed at various points, provision for driving the units selectively with the various folders being made, so as to produce not only a large number of color arrangements within a section, but also a large variation in the number of pages within the sections.

A press embodying the invention in a preferred form will now be described with reference to the accompanying drawing and the features forming the invention will then be pointed out in the appended claims.

In the drawing:

Figure 1 is a schematic side elevation of part of a line of printing units and folders;

Figure 2 is an end elevation showing the drive gearing for one of the units of Figure 1;

Figure 3 is a plan view of the gearing of Figure 2;

Figure 4 is a detail section on the line 4—4 of Figure 2;

Figure 5 is a section on the line 5—5 of Figure 4;

Figure 6 is a schematic side elevation of part of a line of units utilizing a modified drive arrangement;

Figure 7 is a diagram, illustrating an arrangement embodying a number of sections such as shown in Figure 1 or Figure 6; and

Figures 8 to 19 are diagrams, illustrating various web leads.

In Figure 7 there is illustrated diagrammatically an arrangement utilizing a line of twenty-four arch type printing units consisting of six groups, each group containing four printing units, with five folders A to E, inclusive, interspersed between these groups of units, there being four units at each end of the line and four units between each adjacent pair of folders. There is indicated above each set of four printing units two superposed pairs of added color printing couples. In Figure 1 there is shown a typical group of units of the arrangement of Figure 7 in more detail.

In Figure 7, there are also indicated five different combinations of the units and folders for producing various products. The first such arrangement utilizes four groups of five units, each group feeding one of the folders. In this arrangement, the center two units of the second and fifth group of the printing units and the center folder are not utilized. It will be observed that each folder receives webs from a single unit on one side and from four units on the other. The various added color couples may print on the webs in cooperation with these various units in a variety of ways which will be indicated later.

The second arrangement shown in Figure 7 also utilizes four groups of five units, but in this case some groups include four units to one side of a folder and one on the other, while other groups include three units on one side and two on the other. The middle folder and two units to the left of this folder, as well as the two units on the extreme right hand end of the line, are not used.

The third arrangement uses four groups of six units each, the middle folder C not being used. In this case, each folder receives webs from four units to one side and two units to the other side of the folder.

There are further shown in Figure 7, arrangements utilizing three groups of seven units each and three groups of eight units each, in the one case each of the three folders receiving webs from four units to one side and three to the other, and, in the other, each of these three folders receiving webs from four units on each side of the folder. It will be apparent that by providing for the feeding of a web from the various units between folders to a folder located either to the right or to the left of the units, and by further providing for the added color couples being utilized with the webs in any of a variety of ways, practically any desired arrangement of sections and of color within sections can be obtained. The arrangement of Figure 1 makes provision for this.

Referring now to Figure 1, which shows a typical section of the line of units of Figure 7, the units shown are of the generally known arch type, each including two printing couples. The printing couples are identified by the numerals I to VIII. Each unit includes a pair of impression cylinders **10**, **11**, together with cooperating plate cylinders **12**, **13**, the plate cylinder **12** cooperating with impression cylinder **10** to form one printing couple and the plate cylinder **13** cooperating with impression cylinder **11** to form another.

Unit gear drive

The drive arrangement for each unit, which is shown in more detail in Harless application Serial No. 336,235, filed February 11, 1953, for Printing Unit Drives, includes a vertical shaft **14** (Figs. 2 and 3) carrying a bevel gear

15 which meshes with a bevel gear 16 and drives a pinion 17, which, in turn, drives a gear wheel 18 and gear wheel 19 in mesh with each other and rotating about the shafts of the impression cylinders 10, 11. Gears 20 and 23 fixed to the shafts of the impression cylinders 11 and 10 mesh with gears 22 and 21 fixed to the shafts of plate cylinders 12, 13 for driving the plate cylinders. An idle intermediate gear 24 is provided for forming a driving connection between the gears 20 and 23, together with arrangements for coupling and uncoupling the gear wheels 18 and 19 to and from the gears 20 and 23, as desired. Idle gear 24 is movable axially for coupling gears 20 and 23 together as shown in Figure 3, or for disconnecting these gears. With gear 24 slid back to the inactive position and gears 18 and 19 coupled to gears 20 and 23, and hence to the impression cylinder shafts, the unit will be driven in the forward direction, and impression cylinder 11 rotating counterclockwise and impression cylinder 10 rotating clockwise. By uncoupling gear 19 and sliding intermediate gear 24 into the active position, the direction of rotation of the couple 10, 12 may be reversed. By uncoupling gear 18, coupling gear 19 and utilizing gear 24, the couple 10, 12 may be driven in the forward direction and the couple 11, 13 in the reverse direction.

The arrangement for coupling and uncoupling the gears 18 and 19 is shown in Figures 4 and 5 with reference to gear 19, and comprises a member 25 rotatably carried in the gear 19 and terminating in an approximately semicircular end 26 which is received in a corresponding recess 27 in the gear 23 for coupling the two gears together. Turning the member 25 by means of handle 28 through 180°, rotates projection 26 out of the recess 27 and uncouples the two gears. The specific drive and reversing arrangements for the unit form no part of the present invention and reference may be made to the above mentioned application for further details thereof.

As is apparent, reversal of either couple of a unit does not involve reversal of the direction of rotation of the vertical unit drive shaft 14, simplifying the use of this shaft for transmitting the drive to upper color couples as described below.

Arrangement of a typical section of the line of units

The four reversible printing units of Figure 1 are combined with four reversible added color couples *i* to *iv*, by means of shafting and clutches permitting practically any conceivable web lead.

A lower line shaft 29 is provided and consists of a number of sections coupled together by clutches c_1 to c_5, inclusive. This shaft may be driven by one or more motors for each folder or may be a synchronizing shaft utilized with separate motors for the various units and folders. Bevel gearing 30, as indicated, connects each vertical shaft 14 to a section of the shaft 29 and also the vertical shafts 31 for driving the folders A and B. An upper line shaft 32, also composed of a number of sections, coupled together by clutches c_6 to c_{10}, inclusive, is driven by bevel gearing 33 from vertical shaft sections 34 continuing the unit vertical shafts 14 and coupled thereto by clutches c_{11} to c_{14}, inclusive. Vertical shafting 35 and 36 is provided for the color units *i, ii, iii, iv* these shafts being driven by bevel gear couples 37 off sections of the shaft 32 and being, in turn, broken into upper and lower sections by clutches c_{15} and c_{16} located between the color couples *i, iii* and *ii, iv*, respectively.

A cross shaft 40 and gearing 41, 42 connect the vertical shafts 35, 36 at their upper ends. Shaft 40 comprises two sections connected by a clutch c_{17} to permit disconnecting the drive at this point.

By disengaging one of the clutches c_1 to c_5 the four main units may be driven with either folder A or folder B, or the group of four units may be divided at any desired point, so that one, two or three of them are driven with folder A and the remainder with folder B.

Similarly, by disengaging a clutch c_6 to c_{10} the upper line shaft 32 may be divided into two sections, one driven with folder A and the other with folder B.

In particular, clutches c_8 and c_{17} may be disengaged, driving added color couples *i* and *iii* with folder A and added color couples *ii* and *iv* with folder B. By engaging clutch c_{17} and disengaging clutches c_8 and c_{15} (or c_{16}) three of the added color couples may be driven with one folder and one with the other.

Clutches c_{11} to c_{14} are also shown as provided between vertical shafts 14 and 34 at each unit. Not all of these clutches will be required, but they may be provided if it is preferred to standardize the units. In some cases clutches in the vertical shafting and upper horizontal shafting are alternative. For example, either clutch c_6 or c_{11} may be omitted in the construction shown.

When utilizing the full printing capacity of the group of Figure 1, two, three or four webs may be printed by the main units and the units may be combined in various ways. The added color couples *i* to *iv* may be used with one of these webs as a group, printing partly on one side and partly on the other, or printing entirely on one side. Alternatively, one or two of the couples *i* to *iv* may print on one web and the remainder on another. Here again, the added color couples printing on a given web may also print on one or both sides of the web. Since webs may be divided in various ways between folders A and B, and there combined with webs from groups of units to the left and right, respectively, of these folders, it will be apparent that the number of web leads and products produceable is so great that only selected leads can be shown. A variety of leads illustrating various important features will now be described, referring to the schematic Figures 8 to 19, inclusive.

Illustrative web leads

In Figure 8 there is shown an arrangement in which four webs W_1 to W_4 are printed, all webs going to folder B. In this case, clutch c_1 is disengaged and the remaining clutches are engaged. The uppermost web W_1 is led first through main unit couples I and II and then through added color couples *i, iii, iv* and *ii*, printing first one impression (couple II) on the bottom of the web and then five impressions on the upper side of the web.

Figure 9, shows a similar lead to that of Figure 8, feeding the four webs to folder A, and again printing five impressions on the upper side of the uppermost web, W_4, and monotone on its lower side. Clutch c_5 is disengaged and the remaining clutches are engaged. As will be apparent, the lead of web W_4 could be first through couple VII and then through couple VIII, instead of as shown, making a lead identical to that of Figure 8, except for one lead being right hand and the other left hand. Figures 8 and 9 illustrate the point that for every lead there exists also a companion lead which is its mirror image.

Figure 10 shows a lead similar to that of Figure 8, except that the direction of travel of web W_1 through couples *ii* and *iv* has been reversed, placing three impressions (II, *ii, iv*) on the underside of this web and three impressions (I, *i, iii*) on its top.

In Figure 11, the lead of Figure 8 is modified by reversing the direction of travel of web W_1 through couple *ii*, printing two impressions (II, *ii*) on its underside and four on its top.

Figure 12 illustrates the use of the added color couples, printing in two pairs on each of two webs. In this case, each of the two webs is printed four colors on its upper side and two on its lower side, as follows:

W_1:

III II I *iii*
IV *iv*

W_2:

VII VI V *i*
VIII *ii*

The foregoing figures illustrate the use of the added color couples printing four colors on one side of a web (Figures 8 and 9), two colors on one side and two on the other (Figure 10), three colors on one side and one on the other (Figure 11), and one color on each side of two webs (Figure 12).

In Figure 13, the group of units is split down the middle, half feeding folder A and half feeding folder B. Clutches c_3, c_8 and c_{17} are disengaged and the remainder are engaged. Each web is printed two colors on one side and four on the other, as follows:

W_1:

IV *i*
III II I *iii*

W_2:

VII VI V *iv*
VIII ii

As will be observed web W_1 has four colors on its upper side while web W_2 has four colors on its lower side. From the symmetry of the construction it will be apparent that the color distribution as between the upper and lower sides could be reversed by changing the lead through the right or left half of the group, respectively, to be symmetrical with the left or right half.

Figure 14 shows three webs going to folder B, clutch c_1 being disengaged and the remainder engaged. Web W_1 is printed four colors on the top and monotone on the bottom using couples IV, III, II, I and *iii*; web W_2 is also printed four colors on top and monotone on the bottom, using couples VI, V, *i*, *iv* and *ii*; and web W_3 is monotone perfected by couples VII and VIII.

Figure 15 shows three webs going to folder A, webs W_1 and W_3 being printed four colors on one side and monotone on the other, with the color being placed on the upper side of web W_3 and the lower side of web W_1. In this case the remaining web W_2 is monotone perfected and is the middle web of the three as they pass to the folder, instead of the lowermost web as in Figure 14. In the arrangement of Figure 15, clutch c_5 is disengaged and the remaining clutches are engaged.

In Figure 16 clutch c_1 is disengaged, the remaining clutches are engaged, and the upper and lower webs are printed four colors in monotone and the center web W_2 being monotone perfected as in Figure 15. The webs, however, are directed to folder B and the color is placed on the upper side of the upper web W_1 and the lower side of the lowermost web W_3.

In Figure 17, webs W_1 and W_2 are printed, the web W_1 going to folder A and the web W_2 to folder B, clutches c_3, c_8 and c_{16} being disengaged and the remaining clutches being engaged. The web W_1 is printed four colors on the lower side and monotone on the top, and web W_2 is printed monotone on the lower side and two colors on the upper side. As will be apparent, an additional web could be monotone perfected in the couples I and II of the unit adjacent folder A, the web being directed to this folder, and another web could be monotone perfected in the unit adjacent folder B and be directed to folder B. Also, if desired, web W_2 could be first printed upon by couples VII and VIII and then passed through couples VI and V (couple VI being reversed) for printing additional color on this web, if wanted.

Figure 18 shows an arrangement similar to that of Figure 17, clutches c_3, c_8 and c_{15} being disengaged and the remaining clutches being engaged. In this case, the web W_1 going to folder A is printed in two colors and monotone, while web W_2 going to folder B is printed in four colors and monotone. The direction of travel of the webs through the added color couples is also reversed, placing the color on the lower side of web W_1 and upper side of web W_2.

In Figure 19 the clutching is the same as in Figure 17, but the direction of leads with the added color couples is reversed, giving the same color on the two webs as in Figure 17, and applying it to opposite sides of the webs.

Modified arrangement

Figure 6 illustrates a modification of the construction of Figure 1, in which the vertical shaft **34** driving the upper line shaft is eliminated, this shaft **32'** being driven from gearing at its ends, off the vertical folder drive shafts **31** and being broken up by a central clutch c_8 located between the drive gears **37** for the vertical shafts **35'** and **36'** of the added color units *i* and *ii*. Clutches c_{18} and c_{19} are also provided, so that the shaft **32'** may be driven with either folder. By disengaging clutches c_3 and c_8 and engaging clutches c_{18} and c_{19}, vertical shaft **35'** driving added color couple *i* will be driven with folder A, and vertical shaft **36'** driving added color couple *ii* can be driven with folder B. Only two added color couples are provided but, as will be apparent, further color couples and upper shafting, such as the shaft **40** provided in Figure 1, can be added if desired. Also as will be apparent, by engaging and disengaging the clutches in suitable combinations, web leads similar to those discussed in connection with Figure 1 may be provided.

What is claimed is:

1. A printing machine comprising a line of web printing units, a folder at each end of the line for receiving webs therefrom, an added color couple positioned above the line of units and shafting and clutches operable to drive the said couple selectively with either folder, and independently operable to divide the printing unit drive at selected points along the line of units for driving the units to each side of the said selected point with the folder adjacent thereto, the said shafting and clutches comprising a line shaft, means for drivingly connecting the respective ends of the said line shaft to the said folders, gearing connecting the said line shaft to the said units and clutches in the said line shaft between units, whereby disengaging a selected one of said clutches and engaging the others divides the line of units into two groups, each connected to and driven with a said folder, a second line shaft, gearing connecting the second line shaft to the added color couple, a clutch in the said second line shaft at each side of the added color couple, and means at the ends of the said second line shaft drivingly connecting the same to the respective two folders, whereby disengaging one of the last said clutches and engaging the other, selectively connects the added color couple for driving with either of the said folders.

2. A printing machine comprising a line of web printing units, a folder at each end of the line for receiving webs therefrom, a plurality of added color printing couples positioned above the line of units and shafting and clutches for driving said couples selectively as a group with either folder and also partly with one folder and partly with the other, the said shafting and clutches comprising a line shaft, means for drivingly connecting the respective ends of the said line shaft to the said folders, gearing connecting the said line shaft to the said units and clutches in the said line shaft between units, whereby disengaging a selected one of said clutches and engaging the others divides the line of units into two groups, each connected to and driven with a said folder, a second line shaft, gearing connecting the second line shaft to the added color couples, a clutch in said second line shaft at each side of the added color couples and between the added color couples, and means at the ends of the said second line shaft drivingly connecting the same to the respective two folders, whereby disengaging one of the last said clutches and engaging the others, selectively connects the added color couples for driving both couples with either of the said folders and for driving a said couple with each said folder.

3. A printing machine comprising a line of web printing units, a folder at each end of the line for receiving webs therefrom, a line shaft, means for drivingly connecting the line shaft at its ends to the said folders, and at intermediate points to the said printing units, clutches in the said line

shaft between printing units, whereby disengaging a said clutch and engaging the remainder divides the units into two groups, respectively driven with the two said folders, a pair of added color printing couples positioned above the line of units, shafting for connecting the couples together and to the folders, and clutches in said shafting between the couples and between the couples and the folders for driving said couples selectively as a pair with either folder or one couple with each folder.

4. A printing machine according to claim 3, comprising also a second pair of added color printing couples positioned above the first said pair, a drive shaft connecting the couples of the second said pair and drive shafts connecting a couple of each said pair with a couple of the other said pair, and clutches in the last said shafts, whereby the said added color printing couples may be driven selectively with either folder as a group of four, or one, two or three of them may be driven with one folder and the remainder with the other.

5. A printing machine comprising a line of web printing units, a folder at each end of the line for receiving webs therefrom, and added color printing equipment positioned above the line of units, the added color printing equipment comprising four printing couples aligned vertically and horizontally in pairs, a horizontal shaft, a pair of spaced vertical shafts driven thereby and an upper horizontal shaft drivingly connecting the two said vertical shafts, clutches in the horizontal shafts located between the vertical shafts and clutches in the vertical shafts located between the horizontal shafts, gearing for driving the four said couples off the four vertical shaft sections above and below the clutches in the vertical shafts, and means for selectively connecting and disconnecting the first mentioned horizontal shaft sections to each side of the said vertical shafts to the respective folders for driving therewith.

6. A printing machine comprising a line of web printing units, a folder at each end of the line, a horizontal main drive shaft extending along the line, a plurality of clutches in the shaft for dividing the shaft at any of a

plurality of selected points along the line to drive units selectively with either folder, a vertical unit drive shaft geared to the main drive shaft for driving each unit, an upper shaft extending along the line of units, gearing coupling the vertical shafts to the upper shaft, clutches in the upper shaft for dividing the upper shaft at any of a plurality of points spaced along the line, an added color printing couple positioned above the line of units, and gearing connecting the said couple to the upper shaft between two of the last said clutches.

7. A printing machine comprising a line of web printing units, a folder at each end of the line, a horizontal main drive shaft extending along the line, a plurality of clutches in the shaft for dividing the shaft at any of a plurality of selected points along the line to drive units selectively with either folder, a vertical unit drive shaft geared to the main drive shaft for driving each unit, an upper shaft extending along the line of units, gearing coupling the vertical shafts to the upper shaft, clutches in the upper shaft for dividing the upper shaft at any of a plurality of points spaced along the line, a plurality of added color printing couples positioned above the line of units, and gearing connecting the said couples to the upper shaft at points on opposite sides of one of the last said clutches, whereby one of said couples may be driven with one folder and another with the other folder.

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