

Nov. 4, 1924.

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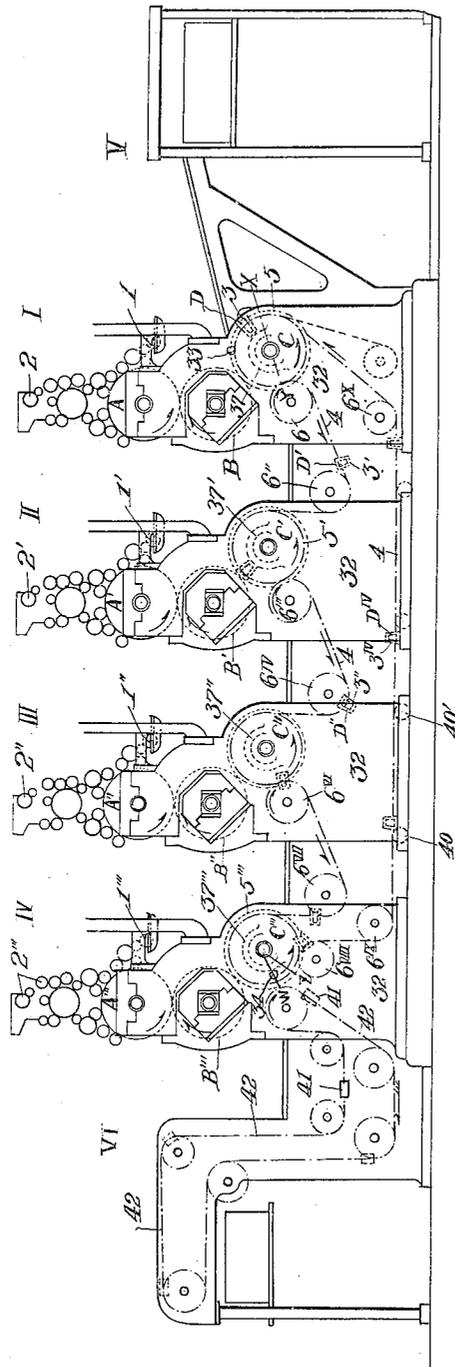
K. ICHIDA

ROTARY MULTICOLOR PRINTING PRESS

Filed Dec. 27, 1922

5 Sheets-Sheet 1

Fig. 1.



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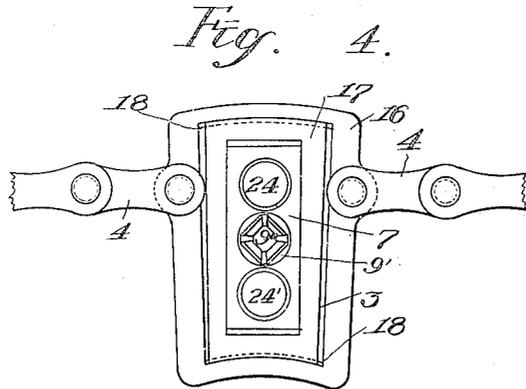
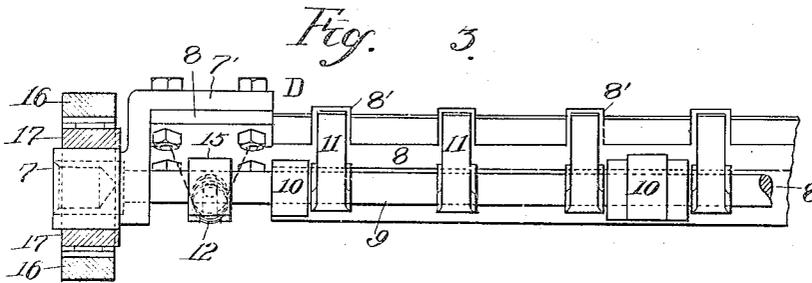
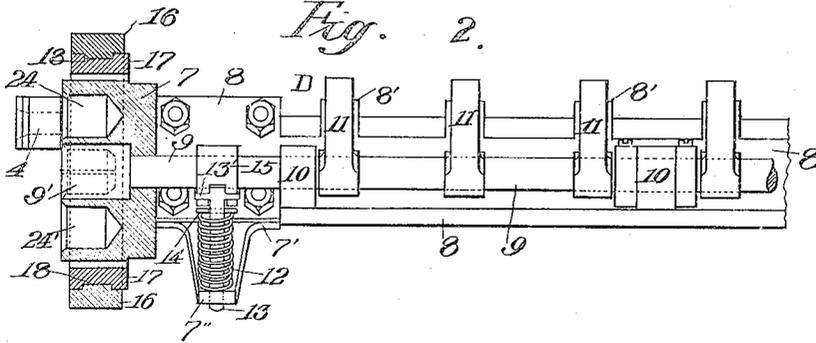
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ROTARY MULTICOLOR PRINTING PRESS

Filed Dec. 27, 1922

5 Sheets-Sheet 2



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ROTARY MULTICOLOR PRINTING PRESS

Filed Dec. 27, 1922

5 Sheets-Sheet 3

Fig. 5.

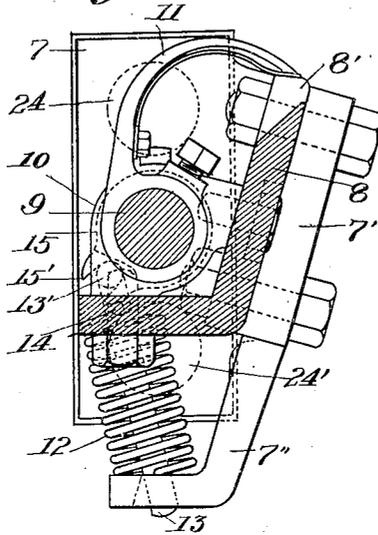
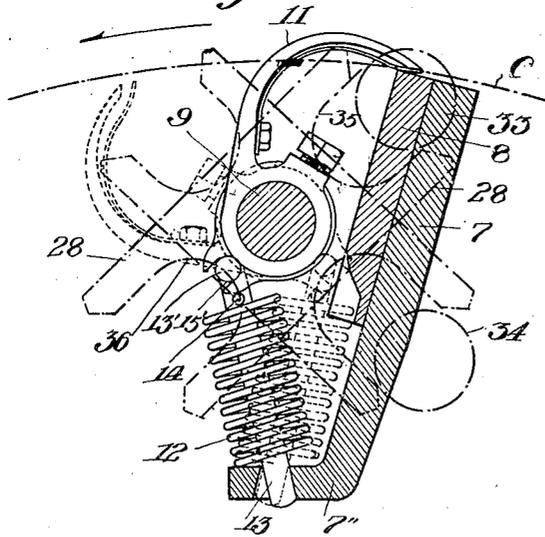


Fig. 6.



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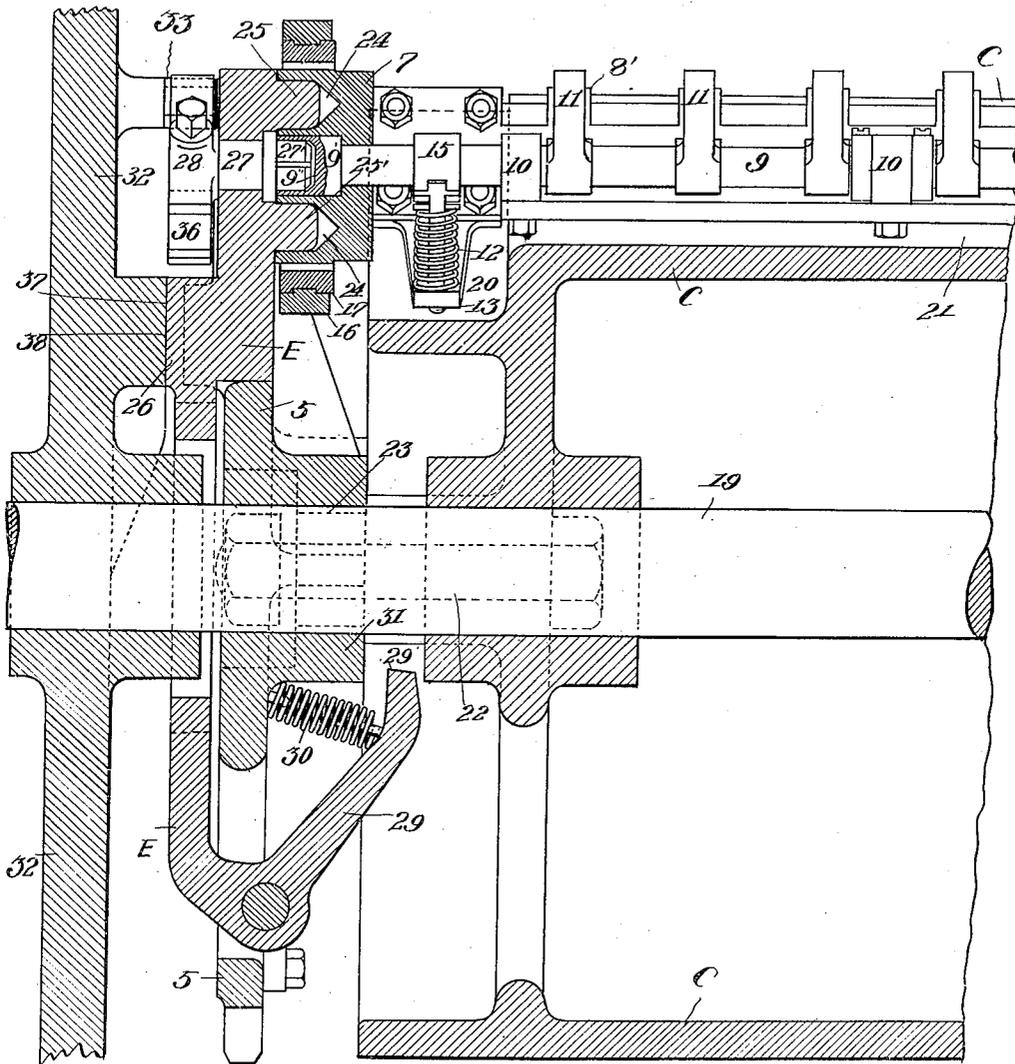
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ROTARY MULTICOLOR PRINTING PRESS

Filed Dec. 27, 1922

5 Sheets-Sheet 4

Fig. 7.



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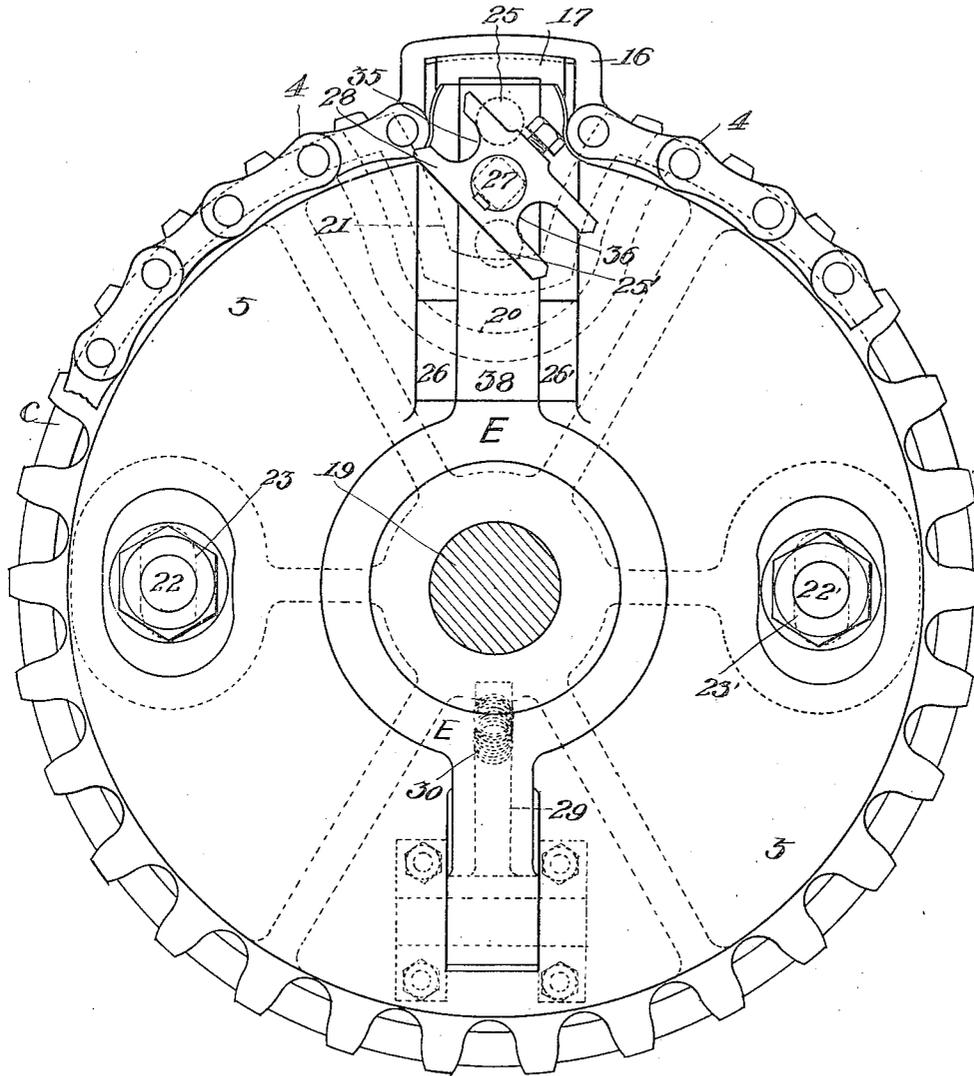
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ROTARY MULTICOLOR PRINTING PRESS

Fig. 8. Filed Dec. 27, 1922

5 Sheets—Sheet 5



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UNITED STATES PATENT OFFICE.

KOSHIRO ICHIDA, OF TOKYO, JAPAN.

ROTARY MULTICOLOR PRINTING PRESS.

Application filed December 27, 1922. Serial No. 609,325.

To all whom it may concern:

Be it known that I, KOSHIRO ICHIDA, a subject of the Emperor of Japan, and a resident of No. 108, Aoyama-Minami-cho, Akasaka-ku, Tokyo, Empire of Japan, have invented a new and useful Improvement in Rotary Multicolor Printing Presses, of which the following is a specification.

This invention relates to a rotary multi-color printing press, and more particularly to a compound printing press consisting of any desired number of any rotary printing units constructed materially alike.

One object of this invention is to provide a rotary multicolor printing press wherein there is no occasion for the colors to inter-mix during printing and wherein the ink deposited on the face of a sheet by a previous impression is allowed sufficient time to dry or set before the sheet receives the next color.

Another object of this invention is to provide a rotary multi-color printing press wherein a number of color impressions can be made successively in the printing units constituting the multicolor press without any transfer of a sheet from gripper to gripper during the travel of the sheet through the said printing units, by virtue of which a large portion of attachments, time and labour usually required for feeding, delivering, jogging or moving the sheets in case a number of independent one-color printing presses are employed for the same purpose is saved, and, what is more important, all chances for misregister arising from a sheet being gripped at wrong points during successive impressions are entirely eliminated.

A further object of this invention is to provide a rotary multicolor printing press wherein, even though any of the component printing units are to a certain extent thrown out of perfect alignment, which is almost unavoidable in practice where three, four or more printing units are arranged in a line, such deviation from perfect alignment cannot affect the perfect register of the several impressions or the smooth working of the machine in general.

A still further object of this invention is to provide a rotary multicolor printing press wherein rotary printing units adapted for different printing methods, such as relief and planographic printing methods, can be made to form the multicolor printing system.

The novel features of this invention will be pointed out with greater particularity in the appended claims and described in detail in the following description taken in connection with the accompanying drawings.

In the accompanying drawings, which show an embodiment of this invention in the shape of a four-color offset printing press comprising four offset printing units:

Fig. 1 is a side elevation of a four-color offset printing press, showing the arrangement and interconnection of its four component units and also of the said printing units and the feeding and the delivery units preferably used in connection with this invention.

Fig. 2 is a front elevation of one end of the gripper bar encased in the gripper bar frame.

Fig. 3 is a plan view of the parts shown in Fig. 2.

Fig. 4 is a side elevation of the parts shown in Fig. 2 taken from the left-hand side thereof.

Fig. 5 is a side elevation of that portion of a gripper bar shown in Fig. 2, taken from the right-hand side thereof.

Fig. 6 shows the relation of clamps, H-block and actuating rollers.

Fig. 7 is a sectional view of that portion of one end of a printing unit which has reference to this invention, showing one of the gripper bars in its operative position and also showing the H-block, etc., peculiar to the first and last units only.

Fig. 8 is a side elevation, minus the side-frame of the printing unit, taken from the left-hand side of Fig. 7, showing the H-block, etc., peculiar to the first and last units only.

The rotary multicolor printing press of my invention includes rotary multicolor printing presses for printing any number of colors by any printing method, namely planographic, relief or intaglio method, or by a combination of any said methods, as far as such a multicolor printing press can be had by combining the printing units under the principles disclosed in the following description of a four-color offset printing press and set forth in the appended claims.

Like letters and numerals of reference refer to like parts in the several figures of the drawings.

Referring now to the drawings, the four-

color rotary offset printing press shown in Fig. 1 principally consists of four printing units I, II, III and IV placed one behind the other on a base or bases or on a system of rails and turntables with a suitable feeding unit V at one end of the row and a suitable delivery unit VI at the other. In these printing units, I, II, III and IV, which are similarly constructed and which may be practically the same as any existing one-color offset presses except those features described below, A, A', A'' and A''' represent plate cylinders, 1, 1', 1'' and 1''' water rollers, 2, 2', 2'' and 2''' inking rollers, B, B', B'' and B''' blanket cylinders and C, C', C'' and C''' impression or paper cylinders. Of the above-mentioned, it is with the last item alone that a departure has been made from the ordinary. A detailed description of the impression cylinder will be given later.

These four printing units are preferably connected one another in the following manner: gripper bars D, D', D'' and D''', in Figs. 1-4, are attached at both ends to two parallel endless chains 4 disposed on both sides of the row, preferably by the medium of gripper bar frames 3, 3', 3'' and 3''' at intervals equal to the circumference of the paper cylinders. These endless chains 4 are arranged to be driven by engaging the teeth of the sprocket wheels 5, 5', 5'' and 5''' and guided by engaging those of auxiliary gears 6, 6', 6''-6''', the said sprocket wheels being fixed to both ends of the paper cylinders.

As shown in Figs. 2-5, the gripper bar D, which extends the entire length of the paper cylinder C, preferably consists of two register blocks 7, a beam 8 connecting the said blocks and a shaft 9 extending between the said blocks, the said several parts being constructed as follows:—The beam 8, resembling a regular angle bar in appearance, is fixed at either end to an extension 7' of a register block 7 and is provided, at suitable intervals along its length, with a number of flat members 8' intended for forming clamps with the arched members mentioned below. The shaft 9 is journaled at either end in a register block 7 and turns in bearings 10 provided on the beam 8. The flanged end 9' of the shaft 9 located inside the register block 7 is provided with a square slot 9'' facing outward. A number of arched clamping members 11 are arranged along the shaft 9 at locations corresponding to those of the flat members 8' of the beam 8 for clamping sheets between the arched members 11 and flat members 8'. As shown in Figs. 2-3 and 5-7, a T-rod 13 with its stem located inside a spring 12, which spring has its lower end supported on a bracket 7'' extending from a register block 7 and its other end held from extension by a pin thrust across the stem of

the said rod 13, is connected to the shaft 9 by a set of claws 15', which extends from a sleeve 15 fixed to the said shaft 9, intended for movably encasing the head 13' of the said T-rod 13. This rod serves, in co-operation with the said spring 12, to keep the arched clamping members 11 in either of the positions shown by the continuous and the dotted lines in Fig. 6, to which the said members may happen to be thrown as described later. The gripper bar frame 3, in Figs. 2, 3 and 4, connecting the register block 7 to the chain 4 preferably consists of an outer frame 16 and an inner frame 17. The former frame is linked to the chain and the latter one is made to slide inside the former with its arched top and bottom grooves bridging over the corresponding top and bottom guides 18 of the outer frame 16 and into the opening of the said inner frame 17 is inserted the register block 7 in such a manner that the said block may slide either vertically within top and bottom clearance or horizontally in the direction of the length of the shaft 9. By this arrangement, the gripper bar D is permitted a limited free motion in the gripper bar frame 3. The paper cylinder C is preferably constructed in the following way:—The body of the cylinder is fixed on the shaft 19 journaled in the side frames 32 of a printing unit and driven by a suitable means, and is provided with a recess 20-21 running lengthwise of the same, the said recess being so formed as to lodge a gripper bar bodily; a sprocket wheel 5 is journaled on the shaft 19 and screwed down to the body of the paper cylinder by screws 22 22', the holes 23 23' cut in the sprocket wheel being preferably made in such a shape as to permit the said wheel being set at a coplanar angular position in its relation to the paper cylinder by rotating the former for adjustments, as shown in Figs. 7 and 8. The fixing device E for fixing the register block 7 of a gripper bar D in position on the paper cylinder C is preferably constructed as follows:—The bottom of the device is hinged on the sprocket wheel 5 and its top, having a pair of studs 25 and 25' made to fit into the corresponding holes 24 and 24' of the register block 7, is made capable of freely sliding perpendicularly to the face of the wheel 5 between the confronting sides of the guides 26 and 26' which are situated on the outer face of the wheel 5 at the location where the wheel is cut open for admitting the top of the fixing device; in the first and the last of the printing units, which in the case of the four color printing press mean I and IV in Fig. 1, an extra attachment is provided in the shape of an H-block 28, in Figs. 6-8, fixed to the outer end of a short shaft 27 the inner end 27' of which is squared so as to fit into the

aforsaid square hole 9" cut in the flanged end 9' of the shaft 9; of the function of the said H-block more will be said later. The arm 29 of the fixing device E, whose bottom is, as described, hinged on the wheel 5, is arranged to be continually drawn toward the hub 31 of the wheel 5 by means of a tension spring 30, in consequence of which the fixing device E will, as far as there is no interference of force, remain with the end 29' of its arm 29 in contact with the said hub 31 of the wheel 5 and its top inclined to the left clear of the register block 7, as shown in Fig. 7.

In Fig. 7, the side frame 32 of each printing unit is furnished with a suitable cam 37 for pressing the outer face 38 of the top of the fixing device E resisting the compression of the spring 30. In the first and the last of the units, which have the aforesaid H-blocks 28, the side frames 32 are equipped with two actuating rollers, 33 for the first unit and 34 for the last unit, each arranged to actuate one of the H-blocks concerned by catching one of its fork ends 35 and 36.

The above-mentioned parts, namely the register blocks 7, the gripper bar frames 3, the endless chain 4, the sprocket wheels 5, the auxiliary wheels 6, the fixing devices E, the actuating rollers 33, 34, and cam 27, etc., are to be disposed symmetrically on both sides of the machine. The chains 4 are to be geared on the sprocket wheels in such a manner that the gripper bar D and the recess 20—21 of the paper cylinder C as well as the register block 7 of the gripper bar D and the top of the fixing device E will keep a given relation respectively.

As the entire system is driven by a suitable means so as to cause the paper cylinders C, C', C'' and C''' to rotate all at the same speed in the direction indicated by arrows in Fig. 1 and, with the said cylinders, the endless chains 4 to run in the direction also indicated by arrows, the outer face 38 of the fixing device E of unit I begins to be pressed inwardly by the cam 37 on the side frame 32 of the said unit when the gripper bar D carried by the chains 4 reaches a point indicated by the letter X. Consequently, the studs 25 and 25' on the top of the fixing device E begins to slide into the holes 24 and 24' in the register block 7 of the gripper bar D and, with them, the square end 27' of the shaft 27 into the square hole 9" in the flanged end 9' of the shaft 9, until both the said studs 25 and 25' and the square end 27' of the shaft 27 are completely lodged in their respective holes when the highest ridge of the cam 37 is reached. The gripper bar then ceases to be influenced by the chains 4 which thus far served to carry it and, rigidly caught between a pair of fixing devices E, revolves

with the revolution of the paper cylinder C. It will be clear that, since the operative position taken by the fixing device E is always one and the same in its relation to the paper cylinder C, the gripper bar thus held between a pair of such fixing device cannot but always take exactly the same position in its relation to the paper cylinder C. This is also the fact with the position taken by the said gripper bar D under consideration in any of the remaining units, or by any of the remaining gripper bars D', D'', D''' etc. in any printing unit, since all the members concerned are coincidentally constructed and conditioned throughout.

When the gripper bar thus positioned moves a little farther until it reaches a point where a sheet fed from the feeding unit V is waiting for the bar with its gripper edge in position, one of the fork ends 35 of the H-block 28 strikes against the actuating roller 33, the shock of which causes the H-block to turn from a position shown in the broken line to another in the continuous line in Fig. 6. This, in turn, causes the shaft 9 connected with the said H-block by the square end 27' of the shaft 27 to rotate and throw the arched clamping members 11 down on the flat clamping members 8' on the beam 8, causing the sheet to be clamped at its gripper edge between the two members and kept in that state by the action of the spring 12. As the machine runs on, the sheet begins getting printed thereon by the blanket cylinder B and, when the point indicated by the letter Y, or more precisely the point where the actuating ridge of the cam 37 is exhausted, is reached, the spring 30 is put into operation and disengages the studs 25 and 25' of the fixing device E and the shaft 27 from the register block 7 of the gripper bar E, in consequence of which the gripper bar, thus disconnected from the fixing device, is left to be again conveyed by the chains. The gripper bar, still keeping the sheet in its hold, reaches the second unit II carried by the said chains, whose course is determined by the auxiliary gears 6 and 6', and, taking its position as in unit I between the pair of fixing devices provided on the sprocket wheel 5' of unit II, which pair of fixing devices are actuated by the cams 37', allows the sheet to get the second impression thereon after which the said gripper bar is disengaged from the fixing device and is again carried onward by the chain 4 to the unit III where the third impression is given to the sheet in the same manner as in the units I and II.

In the last printing unit IV, when the gripper bar lodged as before in the recess of the paper cylinder C''' reaches the point maked W, or more precisely, the point where the pair of endless chains 4 connecting the printing units I, II, III and IV and another

pair of endless chains 42 belonging to the delivery unit IV are nearest to each other, the fork end 26 of the H-block 28 attached to the fixing device E of the unit IV strikes against the actuating roller 34 and, reversing the process of gripping the sheet in the unit I, the sheet is released at length to be caught at the same moment by a gripper bar 41 belonging to the delivery unit VI. When the gripper bar, still driven on, reaches the point marked Z, or more precisely the point where the actuating ridge of the cam 37''' is exhausted, the connection between the said bar and the fixing device of the unit IV is cut off as in the case of the preceding units, and the chains 4, guided by the auxiliary gears 6^{viii}, 6^{ix} and 6^x and gliding over rollers 40 and 40', carries the gripper bar now with its clamps open back to the first printing unit I, where the same operation as heretofore described is repeated.

Since the gripper bars D, D', D'' and D''' etc. are arranged on the endless chains 4 at intervals equal to the circumference of paper cylinders C, C', C'' and C''' each of these gripper bars will alternately perform the aforesaid operation with each revolution of the said cylinders.

The auxiliary gear 6^x located near the printing unit I is preferably made to be shifted to the position shown in the dotted line in Fig. 1, so as to adjust the chains 4 in case of necessity.

In such existing type of a rotary multicolor printing press as a two-color lithographic printing press with two plate cylinders disposed around one impression cylinder or a two-color offset printing press with two blanket cylinders disposed around one impression cylinder, the distance between the two lines of contact whereon the printing operation theoretically takes place must necessarily be smaller than the circumference of the impression cylinder, hence the time capable of being allowed the ink deposited on a sheet by the first impression to dry or set before the sheet receives the next impression is limited according to the size and speed of the impression cylinder, while the fact remains that the said size and speed are also limited and determined by various conditions under normal circumstances. According to my invention, a two-color printing press, or any-number-of-color printing presses, can be so arranged as to cause the sheet to travel any length between successive printings on the component printing units as far as the length of the chain permits and within a certain range inside of which the intermediate auxiliary gears determining the course of the endless chain can be shifted without entailing practical disadvantage, and, in consequence, much longer time can be given a sheet between successive impressions supposing the size and speed of the two

classes of printing presses under comparison are alike.

Intermixing of colors during a long run of a printing job as is apt to happen in another existing type of two-color offset printing press with one blanket cylinder for two plate cylinders designed to print two colors simultaneously on a sheet is entirely eliminated by this invention. Again, a rotary multicolor printing press of my invention can be so arranged as to make it possible to convert temporarily, say, a four-color printing press into, say, a three-color printing press by removing one of the component units, or vice versa by putting the former number of printing units together, by means of a proper arrangement of rails and turntables if the printing units are made to stand on wheels instead of being bolted down to a foundation. Furthermore, any deviation, to a limited extent, from perfect alignment of the component printing units does not affect the smooth working of the whole multicolor printing system or the perfect register of the successive impressions, since each printing unit is practically an individual one-color printing press, the chain connecting the units serving just for feeding and delivering sheets and not interfering with the printing operation of the units, and since provision is made for fixing the gripper bar in its proper position on the impression cylinders even though the said bar is carried to the said cylinders at an angle or in any other way thrown out of the proper relation to the latter to a limited extent. It is often advisable in some class of printing jobs to have one color printed by the relief method and the rest of colors by the planographic method; in such or similar cases, a multicolor printing system consisting of printing units for different printing methods may be had in accordance with my invention. The most important feature of a rotary multicolor printing press embodying my present invention lies in the fact that there need be no transfer of a sheet from gripper to gripper no matter how many printing units are assembled in the manner described to constitute a multicolor printing press, which positively eliminates all chances for misregister attributable to a sheet being caught by different grippers at different points during successive color impressions. It is needless to add that a substantial saving is done in time and labor for turning out color jobs as well as in the initial cost of a printing plant since only one feeding machine and only one delivering and piling machine is required for each multicolor system.

While I have shown my invention by an example, it will be obvious to those skilled in the art that it is not so limited but is susceptible of various other changes and

modifications, without departing from the spirit thereof and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as specifically set forth in the appended claims.

Having now particularly described and ascertained my invention, what I claim as new and desire to secure by Letters Patent is:

10 1. A rotary multicolor printing press, wherein a number of rotary printing units are made to form a multi-color printing system by being connected by a set of common endless chains arranged to be driven with
15 the impression cylinders of the said units and equipped with a set of gripper bars capable of limited free motion within frames directly linked to the said set of endless chains and wherein the said gripper bars
20 are so arranged that one gripper bar after another may temporarily be fixed automatically in the exact corresponding position on, and temporarily form an attached part of, the impression cylinder of one unit
25 after another during a certain stage of the process of printing in the unit concerned and may automatically be cut off from such direct connection with the said impression cylinder of one unit after another at the
30 limit of the said stage of the process of printing in the unit concerned.

2. A rotary multicolor printing press, wherein a number of rotary printing units

are made to form a multicolor printing system by being connected by a set of common
35 endless chains arranged to be driven with the impression cylinders of the said units and equipped with a set of gripper bars capable of limited free motion within frames directly linked to the said set of endless chains
40 and wherein the said gripper bars are so arranged that one gripper bar after another may temporarily be fixed automatically in the exactly corresponding position on, and temporarily form an attached part of the
45 impression cylinder of one unit after another during a certain stage of the process of printing in the unit concerned and may automatically be cut off from such directly connection with the said impression cylinder
50 of one unit after another at the limit of the said stage of the process of printing in the unit concerned, such operations of the gripper bars being performed by means of a set of fixing devices arranged to take, or
55 retire from, a fixed operative position in its relation to the impression cylinder and a set of register blocks arranged to respond to the action of the said set of fixing devices.

In testimony whereof I affix my signature in presence of two witnesses.

KOSHIRO ICHIDA.

Witnesses:

KOSAKU WYŪNA,
MAKUGORS OTSUKA.