April 30, 1935. S. TCHECHONIN 1,999,550

PRINTING MACHINE

Filed April 5, 1933 3 Sheets-Sheet 1

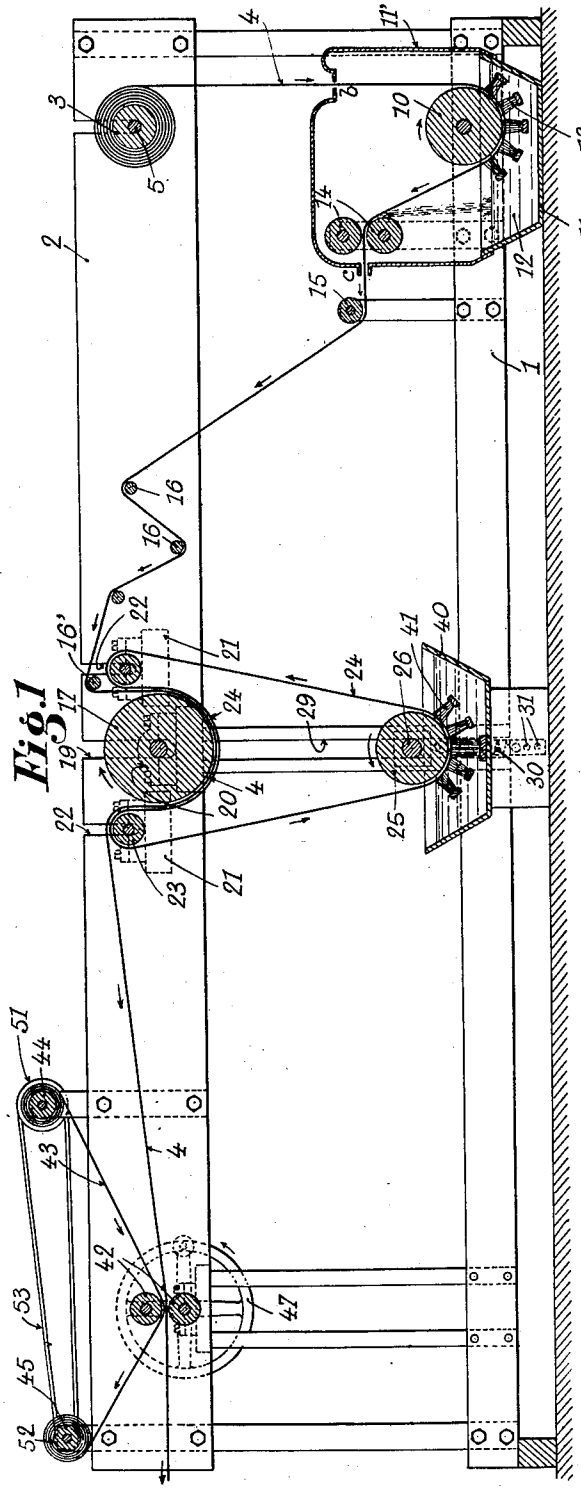


Fig. 1

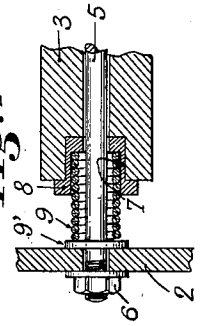


Fig. 7

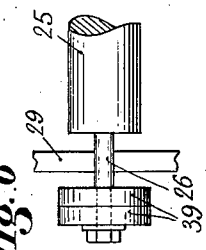


Fig. 6

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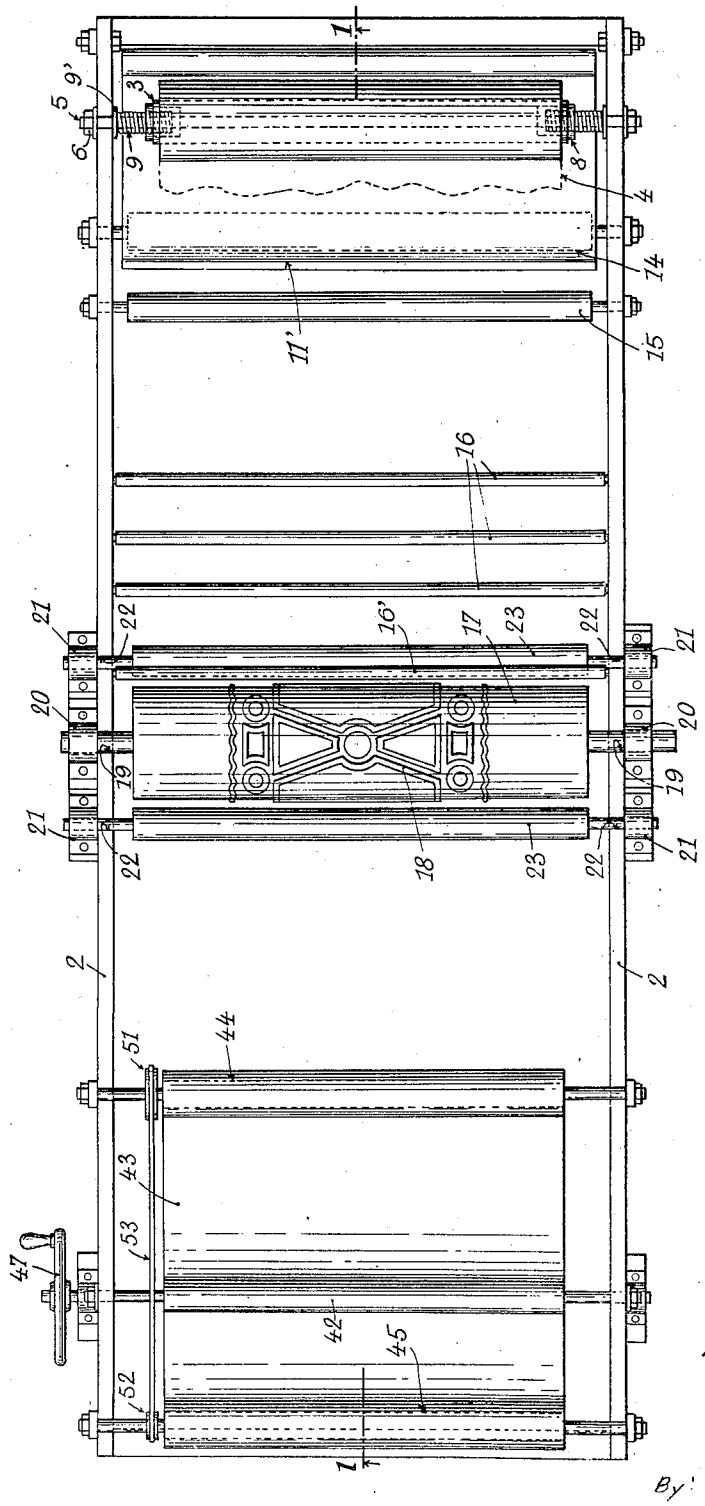


Fig. 2

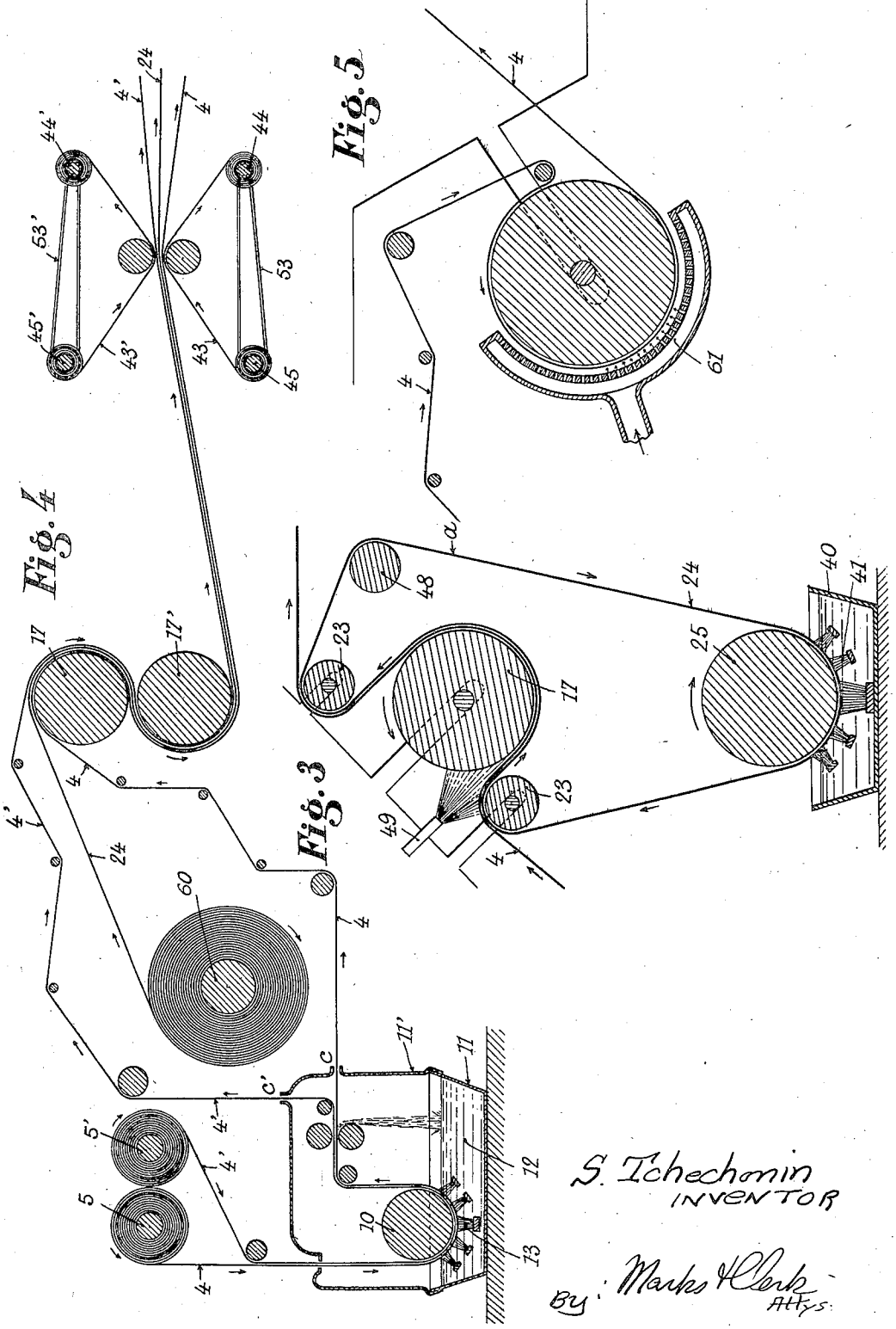
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1,999,550

UNITED STATES PATENT OFFICE

1,999,550

PRINTING MACHINE

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Application April 5, 1933, Serial No. 664,649
In France February 23, 1933

13 Claims. (Cl. 101—176)

The present invention has for its object a printing machine of the rotary type, which is chiefly adapted for use for polychromatic printing by means of a single printing plate, consisting of suitable colouring masses. Said machine is principally characterized by the fact that it comprises an elastic or yielding device by which the material which is to be printed upon, such as textile fabric, paper or the like, may be applied against the roller carrying the printing plate with an adjustable pressure.

On the other hand, the machine is so arranged that the material to be printed upon makes contact with the printing roller upon a relatively large surface.

A machine of this construction chiefly enables the use of an elastic printing plate, which is directly secured to the printing roller and makes contact with the fabric, paper or like material employed for the printing, upon a surface which may attain 95 per cent of the total lateral surface of the corresponding roller. In order to prevent any damage to the printing plate, this material is applied against the plate with an adjustable pressure, and by means of an elastic and adjustable device. The pressure is adjusted in accordance with the mechanical state of the plate, which can be elastic, hard, etc.

Further characteristics of the invention will be set forth in the following description.

In the accompanying drawings, which are given solely by way of example:

Fig. 1 is a lengthwise section on the line 1—1 of Fig. 2, of a machine constructed in conformity with the invention.

Fig. 2 is a corresponding plan view.

Fig. 3 is a diagrammatic view showing another form of construction of the machine, in conformity to the invention.

Figs. 4 and 5 represent two other forms of construction.

Fig. 6 shows a method of mounting the movable rollers.

Fig. 7 represents an arrangement of the rollers carrying the material to be printed upon.

In the form of construction shown in Figs. 1 and 2, the machine comprises a main support 1 having the form of a frame, between whose side members 2 are practically mounted all the rollers and mechanisms of the machine.

At one end of the support 1 is located a roller 3 adapted to receive the textile fabric, paper, or like material 4 to be printed upon and to deliver it to the printing roller. In order to prevent any too rapid unwinding of this material 4, as well as any lateral motion of roller 3, use can be made of known brakes for example of the counterweight type. According to the present invention, it is preferable to employ an arrangement analogous to the one shown in Fig. 7. In this embodiment, the roller 3 is loose on a stationary spindle 5 which is secured to the side member 2 of the support by a nut or the like. The roller is pierced at one end with a slot or recess 7 in which is located a friction ring or cup 8. A spring 9 is fitted by easy friction in the ring or cup 8, and it bears at its other end against the member 2 by means of a washer 9'. Thus the roller 3 will cause the said spring to rotate, and owing to the friction, the spring will be compressed, thus acting against an unduly rapid rotation of the roller, and hence all improper unwinding of the material will be prevented.

Below the roller 3 is a second roller 10 whose lower part is immersed in a receptacle 11 containing a substance 12 which is a solvent for the colouring masses forming the printing plate. This solvent may consist of alcohol, water or the like, according as the colouring masses forming the plate contain substances soluble in alcohol, water, etc.

The receptacle 11 further contains brushes 13 operating by friction and ensuring a very uniform moistening of the material, chiefly in the case where the material takes up the liquid with difficulty, as it may be incompletely moistened by a simple immersion in the liquid. At one side of the roller 10 and above the receptacle 11 is located a pair of rollers 14 which serve to remove the excess of solvent from the material 4 and to return it to the receptacle 11. Should the solvent be of a volatile nature, the receptacle 11 with the rollers 10, 14 and 15 may be contained in a casing 11' provided with slots *bc* for the entrance and the discharge of the material 4.

In front of the said rollers are located one or more rollers 15, as well as suitable bars 16 which serve to stretch and to spread out the material before it is printed, and the number of these elements will be variable according to needs. The last of these bars 16' is situate above a roller 17 which carries the printing plate 18 (Fig. 2). The said printing plate may be secured to the roller by cementing, by clasps, or by like means. The printing plate may be used until it is completely worn out.

The roller 17 is located in the support 1 by means of slots 19 and it rotates in bearings 20 secured to the side-members 2. The bar 16' is located with reference to the roller 17 in such

manner that these two parts will have a common tangent plane, which is preferably vertical.

On either side of the main roller 17 are mounted, in bearings 21 and slots 22, two other rollers 23 adapted to carry an endless band 24 consisting of an elastic or a yielding material, such as india rubber, metal or the like. The said band proceeds below the main roller, which it embraces more or less according to the position given to the rollers 23. The band is stretched by a roller 25 situated at the lower part of the machine. This roller 25 is vertically movable, and may exert a greater or less pressure upon the band 24, which transmits this pressure, while somewhat reducing it owing to its elasticity, to the material 4 which is in contact with the printing plate. This pressure can be regulated, and for this purpose the roller 25 is movable. It is loose on a spindle 26 whose ends are mounted in slots 29 in the main support (Fig. 6). The spindle might also be provided with springs 30 the lower ends of which are attached at variable points 31 (Fig. 1).

Any suitable known means may be further employed for adjusting the pressure at the ends of the spindle 26. As shown in Fig. 6, the springs may be replaced by calibrated weights 39 which are mounted on the spindle 26, for example.

The band 24 may be immersed in a receptacle 40, preferably provided with brushes 41 which in spite of the vertical movements of the roller 25 will be practically in constant contact with the band 24. The receptacle contains a liquid adapted for the cleaning and washing of the band.

In front of the roller 17, and preferably at a certain distance from the latter, are situated two tangent rollers 42 between which the printed material travels. The space between the roller 17 and the said rollers 42 may contain an air fan or like drying device. Such a device is not shown in the drawings, but instead of that there is represented a protecting band 43 which is unwound from a roller 44 and is wound upon a second roller 45, for instance, thus covering the printed material when latter is still wet and passes between the rollers 42. The spindles of the rollers 44 and 45 carry respective pulleys 51 and 52, upon which is mounted a belt 53. The pulley 51 has preferably a larger diameter than the pulley 52. The periphery of the pulley 51 may be chiefly covered with indiarubber, ebonite or the like, whilst the periphery of the pulley 52 may be metallic.

The material 4 actuates or is actuated by the rollers 42, which aid in the unwinding of the band 43. The pulley 51 drives the pulley 52, which rotates at a greater speed and takes up the part of the band 43 which is situated between the rollers 44 and 45. On the other hand, as the periphery of the pulley 51 consists of indiarubber, all improper unwinding of the band 43 will be prevented.

In the case in which the material 4 is of a strong nature, the machine may be operated by actuating the rollers 42 either by hand, by means of a hand-wheel 47, or by a motor. Should the material not have sufficient strength, as in the case of paper, the machine will be controlled by actuating the main roller 17 or the rollers 23, according to the degree of hardness of the printing plate 18, whilst the rollers 42 will only take up and slightly stretch the material arriving from these rollers 17 or 23.

In the case in which the printing requires the use of fixing substances, it will be an easy matter to mount in front of the machine and in line with it, a steam chamber or any other suitable device necessary for this operation.

The operation of the machine is as follows. The material 4 which is wound upon the roller 3 is provided in the first place with the quantity of solvent necessary for the printing. The excess of this solvent is removed by the rollers 14, and the material, after it has been spread out by the bars 16, comes tangentially into contact with the roller 17. It is applied against the printing plate 18 by the band 24 by which it is surrounded, and after the printing operation, it travels in the direction of the drying device, through the rollers 42, and if necessary to the fixing devices.

Fig. 3 shows a modification in which the rollers 17 and 23 are mounted in inclined slots 19 and 22. An auxiliary roller 48 holds the band 24 at a distance and prevents the part *a* from making contact with the roller 17. In these conditions, the receptacle 11 may be eliminated, and the printing plate and the material may be directly moistened simultaneously by a sprayer 49, which operates in the space between the rollers 17 and 23, and tangentially with reference to the direction of rotation of the roller 17. It is further possible to maintain the vertical arrangement of the slots and to mount the sprayer directly above the roller 17.

It is evident that the speed at which the printing is effected will vary on the one hand according to the pressure exerted upon the printing plate and on the other hand according to the degree to which the material embraces the roller, and to the diameter of said roller. As the pressure is limited by the nature of the printing plate, and as the size of the roller is limited by the available space, the speed of the operation may be considerably increased by increasing the degree to which the roller 17 is surrounded by the material, and even as far as 90 to 95%. This offers another advantage. Since the distance between the rollers 23 now becomes very small, it is possible to use very volatile solvents which would evaporate too rapidly if applied to a large open surface, as in the case of the machine shown in Fig. 1.

Fig. 4 represents a constructional form of a machine in which the printing is effected simultaneously upon two pieces of material 4 and 4' which are wound upon respective rollers 5 and 5'. The two pieces proceed into a receptacle 11 and issue at *c* and *c'*. Between the two pieces of material 4 and 4' is located a roller 60 which is provided with a suitable braking device (for instance as above set forth) and carries a metal band 24 or the like. The materials 4 and 4' take their place on either side of the band 24, and travel successively upon two rollers 17 and 17', each provided with a printing plate. The roller 17 prints upon material 4 and the roller 17' upon material 4'. The material continues to travel in the direction of the arrows, and is provided with two cleaning devices 43 and 43' which are wound upon rollers 44—45 and 44'—45'. The pressure of the material 4 and 4' is thus assured by the braking action of the roller 60 and by the tension of the band 24 which applies the piece 4 against the roller 17 and the piece 4' against the roller 17'.

Fig. 5 is a diagrammatic view of a machine in which the material 4 to be printed is applied against the printing roller 17 by compressed air which enters the part 61 and is distributed regularly around the whole periphery of the roller by suitable means, not shown. This arrangement is particularly favourable in the case where the

printing plate is very flexible, so that an excessive pressure cannot be employed in order to apply the material against the corresponding roller, without risk of damage to the printing plate.

Certain parts of the printing plate may also be concealed by the use of masks which are applied directly upon the plate.

Obviously, the invention is not limited to the forms of construction herein set forth, these being given solely by way of example.

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

1. A printing machine for polychromatic reproduction by means of a single printing plate consisting of a number of colouring masses, comprising at least one stationary shaft, at least one main rotary roller carrying the printing plate, and supported by said shaft, a movable shaft adapted to freely move in a vertical direction and preferably situated below said main roller, another roller mounted on said movable shaft, a number of guiding rollers disposed on both sides of said main roller and flexible endless means passing on said guiding rollers, surrounding said main roller and always stretched and tensioned by said movable roller, said flexible means being adapted to apply the material to be printed upon against said printing plate always with the same pressure whatever be the degree of wear and the variations of thickness of said printing plate.

2. A printing machine according to claim 1, wherein a device is provided for cleaning said flexible means after it has applied said material upon the printing plate.

3. A machine according to claim 1, wherein pneumatic means are provided for applying with a desired pressure the material to be printed upon, on the printing plate.

4. A printing machine for polychromatic reproduction by means of a single printing plate consisting of a number of colouring masses, comprising at least one stationary shaft, at least one main rotary roller carrying the printing plate and supported by said shaft, a movable shaft adapted to freely move in a vertical direction and preferably situated below said main roller, another roller mounted on said movable shaft, a number of guiding rollers disposed on both sides of said main roller, elastic preferably adjustable reaction means acting upon said movable roller, and flexible endless means passing on said guiding rollers, surrounding said main roller and always stretched and tensioned by said movable roller and said reaction means, said flexible means being adapted to apply the material to be printed upon against said printing plate always with the same pressure whatever be the degree of wear and the variations of thickness of said printing plate.

5. A printing machine for polychromatic reproduction by means of a single printing plate consisting of a number of colouring masses, comprising at least one stationary shaft, at least one main rotary roller carrying the printing plate and supported by said shaft, a movable shaft adapted to freely move in a vertical direction and preferably situated below said main roller, another roller mounted on said movable shaft, a number of guiding rollers disposed on both sides of said main roller and flexible endless means passing on said guiding rollers, surrounding said main roller and always stretched and tensioned by said movable roller, at least one feeding roller carrying the material to be printed upon, means for moistening and stretching said material, said flexible means being adapted to apply the material to be printed upon against said printing plate always with the same pressure whatever be the degree of wear and the variations of thickness of said printing plate.

6. A machine as claimed in claim 5 further comprising braking means for said feeding roller.

7. A printing machine according to claim 5, wherein the device for moistening said material consists of a receptacle containing a solvent of the colouring masses forming the printing plate and further provided with brushes for moistening the said material by friction.

8. A printing machine according to claim 5 further comprising actuating means for driving the main roller.

9. A printing machine of the type described comprising two feeding rollers for two distinct bands of material to be printed upon, moistening and stretching devices for said bands, two printing rollers each provided with a printing plate, and a yielding band disposed between said two bands and successively applying in the S-like manner one of said bands against one printing plate and the other band against the second plate.

10. A printing machine for polychromatic reproduction by means of a single printing plate consisting of a number of colouring masses comprising a frame, a stationary shaft on said frame, a rotary main roller mounted on said shaft, and carrying a printing plate, a vertically movable shaft, guiding means on said frame for said movable shaft, yielding reaction means acting upon said movable shaft, a second roller mounted on said latter shaft, guiding rollers mounted on said latter shaft, guiding rollers mounted on said frame on both sides with respect to said main roller, flexible means passing on said guiding rollers, surrounding said main roller and stretched and tensioned by said second roller and reaction means, said flexible means being adapted to apply the material to be printed upon against the printing plate with a constant pressure, whatever be the wear and thickness of said printing plate, a cleaning device for said flexible means, a feeding roller for the material to be printed upon, and a moistening device for said material.

11. A machine according to claim 1 further comprising means for longitudinally and vertically guiding said movable shaft.

12. In a machine for simultaneous polychromatic printing, a soluble printing plate, a support for said plate, a color receptive web contacting said plate, and means including a flexible endless support for maintaining said web under a constant pressure contact irrespective of any diminution of said plate.

13. In a machine for simultaneous polychromatic printing, a soluble printing plate, a support for said plate, a color receptive web, a flexible endless support urging said web against said plate, and take up means maintaining a fixed tension upon said flexible support, said means compensating for the gradual diminution of said plate.

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