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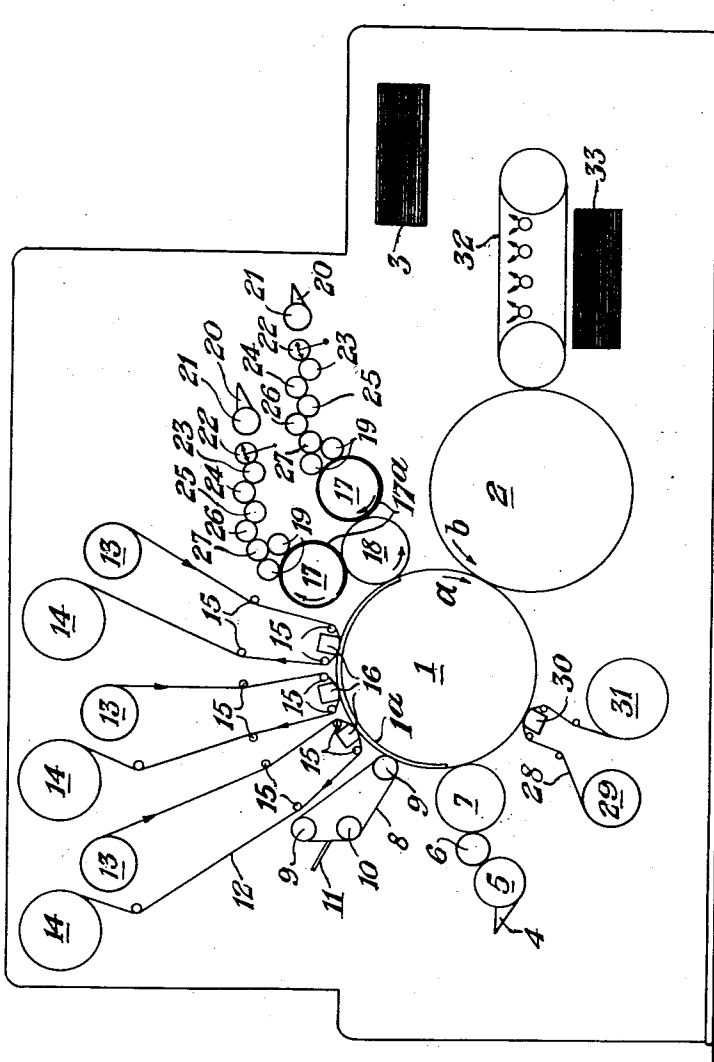
K. CHYBINSKI
PRINTING PRESS

3,003,414

Filed April 22, 1958

2 Sheets-Sheet 1

Fig. 1.



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2 Sheets-Sheet 2

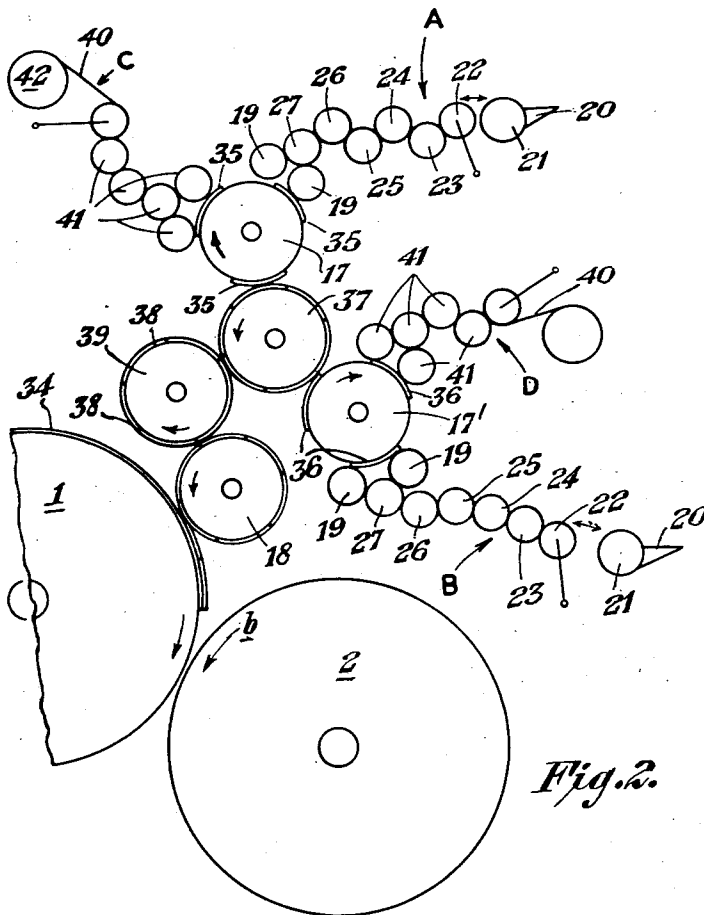


Fig. 2.

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PRINTING PRESS

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2 Claims. (Cl. 101—178)

This invention relates to rotary printing presses and especially concerns a press for the printing of multi-colour designs upon ink receptive material in the production of e.g. bank notes, stamps and other security documents.

Bank notes are often produced with a background printed with different coloured inks by means of a letter-press or an offset printing process. It is a well known fact that it is difficult to separate by photography the elements which in several colours comprise such a background and this provides a protection against the production of counterfeits. In addition, it is very difficult for a forger to produce counterfeits having the various coloured elements forming the background in correct register with one another.

In known procedure for the production of bank notes with so-called multi-colour protection background the background is applied by means of a letter-press or an offset printing process and the main design is produced on the paper in a second and separate operation on either the same or a second machine by means of intaglio printing plate produced from originals engraved by artist engravers to provide an effective security feature.

In order to obtain a bank note which is still more difficult to counterfeit it is essential to obtain perfect register between the background and intaglio printings. It is, however, very difficult to obtain perfect register when the two printing processes are produced by separate operations as referred to above.

An object of this invention is to provide means whereby bank notes are printed with both a letter-press printed coloured background and an intaglio printed main design in a single operation, providing additional desirable security features.

Where hereinafter reference is made to bank notes it will be appreciated that this term is used for simplicity to include also other coloured printed sheets such as stamps and other security documents.

According to the present invention a rotary printing press comprises a plate cylinder carrying an intaglio printing plate, an impression cylinder adapted to co-operate with said plate cylinder, inking means to supply ink in a single colour to said plate, wiping means for removing ink from the plane surface of the intaglio plate, and further inking means to supply ink in a different colour or colours and in a predetermined pattern to the wiped surface of the intaglio plate in such a way that the pattern is in desired register with the intagliated parts of said plate whereby paper fed through the nip of the two cylinders can be printed both with a letter press printed design and with a intaglio printed design simultaneously.

Preferably the means to ink the intaglio plate in a single colour comprises an intaglio inking roller in pressure contact with said plate and which receives ink from an inking unit or other source of supply.

Preferably also the means to ink the wiped surface of the intaglio plate with the letter-press design comprises a letter-press ink transfer roller in pressure contact with said plate and one or more subsidiary rollers adjusted so as to ink the letter press ink transfer roller in a pre-determined pattern in one or more colours. Preferably two or more subsidiary rollers are provided

and a letter-press printing plate, representing one part of the desired design, is preferably provided on each of the subsidiary rollers to ink the letter-press ink transfer roller in such a way that, when the ink has been transferred by the letter-press ink transfer roller to the intaglio plate, said plate will be inked with the pattern in correct register with the intagliated parts of the said plate.

In an alternative arrangement a key letter-press printing plate carried by a subsidiary roller and formed with the complete background design is in pressure contact both with the letter-press ink transfer roller and with an ink collecting roller. The ink collecting roller preferably receives ink from one or more ink-area letter-press plates which are carried on rollers and are in communication with ink supply means. Each ink-area letter-press plate is formed in the shape of the area of the background design required in any one colour and if more than one ink-area plate is provided the ink impressions transmitted to the ink collecting roller are in correct register with one another.

When hereafter in the description and claims one cylinder or roller is described as being in pressure contact with another it will be understood that the circumference of one cylinder or roller is an integral divisor of the circumference of the other and that the tangential velocity of any point on the circumference of one is equal to that of any point on the circumference of the other.

A preferred embodiment of the present invention will now be described with reference to the accompanying drawings, in which:

FIGURE 1 is a diagrammatic elevational view of one arrangement of a printing press, embodying the invention, and

FIGURE 2 is a diagrammatic view showing a modification of the arrangement illustrated in FIGURE 1.

Referring to FIGURE 1, a rotary printing press comprises a plate cylinder 1 which is in pressure contact with, and has the same diameter as, an impression cylinder 2, said cylinders rotating with the same speed and in opposite directions as illustrated by the arrows *a* and *b*. An intaglio printing plate 1^a is carried by the plate cylinder 1 and bears the main portion of a design which is to be printed on a bank note. Wet or dry sheets of paper are fed from a pile 3 by means (not shown) to the nip between the plate cylinder 1 and the impression cylinder 2 where they are to be printed by the intaglio plate.

Ink is supplied to the intaglio plate from an ink fountain 4 by means of a steel fountain cylinder 5, a distribution roller 6 and an intaglio inking roller 7 which is in pressure contact with the surface of the intaglio plate carried by the plate cylinder 1. The circumference of the printing roller 7 is an integral divisor of the circumference of the plate cylinder 1.

An ink economizer unit positioned around the circumference of the plate cylinder 1 after the inking roller 7 in the direction of rotation of the cylinder 1, comprises an endless band 8, e.g. of rubberized felt, which is fed around two rollers 9, said band being driven by one of said rollers and tensioned by a tension roller 10. The band 8 is so positioned as to contact the intaglio plate and thus remove excess ink from the surface thereof, the ink being scraped from said band by a doctor 11 from whence it is fed back to the ink fountain 4 for further use.

Three conventional wiping units are situated around the circumference of the plate cylinder 1 after the ink economizer unit. Each wiping unit comprises a band 12 of wiping material e.g. calico, paper or the like which is drawn from a supply roller 13 to a further roller 14 over positioning rollers 15 and between an oscillating pressure member 16 and the surface of the intaglio plate. The units are adjusted to wipe all ink from the surface of the

said intaglio plate but to leave ink in the intagliated parts thereof.

A number of letter-press plate cylinders 17 for the production of a multi-coloured background is provided, the number corresponding to the number of colours in which it is desired to print the paper, two being present in the arrangement illustrated in FIGURE 1. Each of the two cylinders 17 has a letter-press printing plate attached to its circumference, each printing plate corresponding to a portion of the background design to be printed in each colour. Each cylinder 17 when rotating is in pressure contact with a letter-press ink transfer roller 18 which is covered with a resilient material. The ink transfer roller 18 is also in pressure contact with the surface of the intaglio plate carried by the plate cylinder 1 when this is in a position adjacent thereto. A different coloured ink is transferred to the printing plates on each cylinder 17 by inking units each comprising an ink fountain 20, a steel fountain cylinder 21 which transfers ink to a composition roller 22, which oscillates in a direction transverse to its axis between the cylinder 21 and a steel cylinder 23. The cylinder 23 oscillates on its axis evenly to distribute the ink onto a composition type distribution roller 24. The ink is then picked up from the roller 24 by a further steel cylinder 25 oscillating on its axis and passed via a composition roller 26 to a further oscillating steel cylinder 27 from whence it is fed to two composition form rollers 19 which are in contact with the surfaces of the cylinders 17 and ensure good ink distribution.

The letter-press ink transfer roller 18 received an impression in correct register of the designs, each in a different colour, from the letter-press plates carried by the cylinders 17 and transfers this impression to the wiped surface of the intaglio plate. The impression formed on the wiped surface of the intaglio plate is arranged to be in correct register with the intagliated parts of said plate and it will be appreciated therefore that the circumference of the letter-press ink roller 18 is an integral divisor of the circumference of the plate cylinder.

After the intaglio plate carried on the plate cylinder 1, has passed that position in which it is in pressure contact with the impression cylinder 2, in which position a paper sheet is printed, the ink remaining on the surface of the plate, after the printing, is wiped therefrom by a further wiping unit similar to those hereinbefore described and comprising a paper, calico or the like band 28 passing from a supply roller 29 between an oscillating pressure member 30 and the circumference of the plate to a further roller 31.

In operation, as the plate cylinder rotates in a clockwise direction, as seen in FIGURE 1, and with the other cylinders and roller rotating in synchronism therewith, the intaglio printing plate is inked by the intaglio inking roller 7, surplus ink being removed by the band 8 of the ink economizer unit. The surface of the plate is then thoroughly wiped by the bands 12 of the three wiping units which are arranged to leave ink in the intagliated parts of the intaglio plate, which parts print the main portion of the bank note design.

The wiped surface of the plate is then inked with the background design in two colours in correct register with the intagliated design by means of the letter-press ink transfer roller 18. The letter-press inks can not make contact with the inks in the intagliated parts of the intaglio plates as concave ink menisci are produced in the engraved parts when the plate is wiped. This results in the coloured background design being transferred to the surface of the intaglio printing plate in such a way that there is no gap or overlapping between the lines of the background design and the design on the intagliated part of the plate.

A dry or wet sheet of paper 3 which has been fed by means (not shown) to the nip of the plate cylinder 1 and impression cylinder 2, is passed therebetween and is

printed by the intaglio plate in three colours; a single colour main intaglio design and a two coloured letter-press background in one printing operation. The sheet 3 is then taken from the impression cylinder by a conventional chain delivery conveyor diagrammatically indicated at 32 to a pile 33.

The resilient material which covers the intaglio inking roller 7 may be cut away at a point in register with a part of the intagliated design to form a seal or the like which it is desired to reproduce on the bank note as an embossed impression. That part of the intaglio plate comprising the seal is thus not inked by the inking roller 7 and the impression is obtained with a background of either of the two letter-press colours.

The arrangement illustrated in FIGURE 2 is an alternative design for applying the letter-press background to the surface of the intaglio printing plate shown at 34 attached to the circumference of the plate cylinder 1. Two inking units A, B, similar to those hereinbefore described, are arranged to ink each in a different colour, letter-press ink-area plates 35, 36 attached to the circumferences of cylinders 17, 17' respectively. The ink-area plates 35, 36 are so formed as to correspond to the areas of the background of the bank note design which are required in each colour.

The cylinders 17, 17' are each in pressure contact with an ink collecting roller 37 which has a diameter equal to the cylinders 17, 17' and to which ink from the ink-area plates 35, 36 is transferred in desired register. The ink collecting roller 37 is also in pressure contact with the key letter-press printing plates 38 carried on a key printing plate cylinder 39. Each key printing plate 38 is formed with the complete required background design and is inked in two colours by the collecting roller 37 in accordance with the arrangement of ink transferred from the ink-area plates 35, 36. The key printing plates are in pressure contact with the ink transfer roller 18 which in turn is arranged to ink the wiped surface of the intaglio plate 34 with the required background design in the two colours and in register with the intagliated parts of the said plate.

In order to prevent contamination of the letter-press inks on the form rollers with ink carried on the letter-press ink-area plates 35, 36 beyond the ink collecting roller 37, wiping units C and D are provided for the letter-press ink-area plates 35, 36 respectively. The wiping units C and D wipe the ink-area plates after they have transferred ink from the rollers 19 to the collecting roller 37 and before they are re-inked.

Each wiping unit C and D comprises a band 40 of wiping material such as paper, calico or the like, fed around and between rollers 41 from a main roller 42. This particular arrangement provides the means for obtaining a background in which each line of the coloured design may be printed in different colours without interruption and without overlap of the colours.

It will be appreciated that the invention in general affords the advantage that the lines of the designs of the coloured background are not only in correct register with the intaglio printing, but also the lines of the coloured background and those of the design produced by the intaglio printing are printed side by side without any gap between them and without overlapping to give rise to a colour effect which cannot be obtained when intaglio printing is superimposed on a previously printed letter-press background.

In addition the uniformity of the background colours throughout the printing of the bank notes does not depend to any marked degree upon the smoothness of the surface of the paper. The letter press ink lies in a thin layer on the surface of the intaglio printing plate and the considerable printing pressure used to effect the intaglio printing causes a good contact between the paper and the letter press ink.

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What is claimed is:

1. A rotary printing press comprising in combination a rotatable plate cylinder with an intaglio printing plate on its circumference; a rotatable impression cylinder of diameter equal to the overall diameter of the plate cylinder in pressure contact therewith; inking means to supply ink to said intaglio plate; wiping means engageable with the surface of said plate cylinder circumferentially between said inking means and said impression cylinder for removing ink from the outer surface of the intaglio plate after it has been inked by said inking means whilst leaving ink in the intagliated portions of said plate; second inking means comprising an off-set roller of a diameter which is an integral divisor of the diameter of said plate cylinder, said off-set roller being in pressure contact with said plate cylinder circumferentially between said wiping means and said impression cylinder to supply ink to the wiped surface of the intaglio plate in desired register in juxtaposition with the intagliated parts of the plate; and further inking means for inking said off-set roller in a predetermined pattern in more than one colour, said further inking means comprising a cylinder carrying a key letter press printing plate in pressure contact with said off-set roller, an off-set ink collecting roller in pressure contact with said cylinder carrying said key letter press printing plate, two cylinders carrying ink area letter press printing plates respectively in pressure contact with

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said ink collecting roller, separate means for respectively applying inks of different colours to said two cylinders carrying said letter press printing plates, and wiping means acting on those portions of the surfaces of said ink area printing plate carrying cylinders between their respectively associated separate ink applying means and said ink collecting roller for wiping the inks of different colours from said ink area printing plates during travel of the latter from contact with said ink collector roller toward contact with said separate ink applying means.

2. A rotary printing press as claimed in claim 1 in which said inking means to supply ink to said intaglio plate comprises an intaglio inking roller surfaced with resilient material, and in which a portion of said resilient surface material, which is registrable with a part of the intagliated portions of the intaglio plate, is cut away, whereby to produce an embossed impression on the sheet printed by said impression cylinder at the same time that the multi-coloured printing is effected.

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