Dec. 27, 1966 A. A. HEONIS 3,294,018

APPARATUS FOR SIMULTANEOUSLY PRINTING IMAGES WITH DIFFERENT KINDS OF INKS

Filed Nov. 20, 1963 3 Sheets-Sheet 1

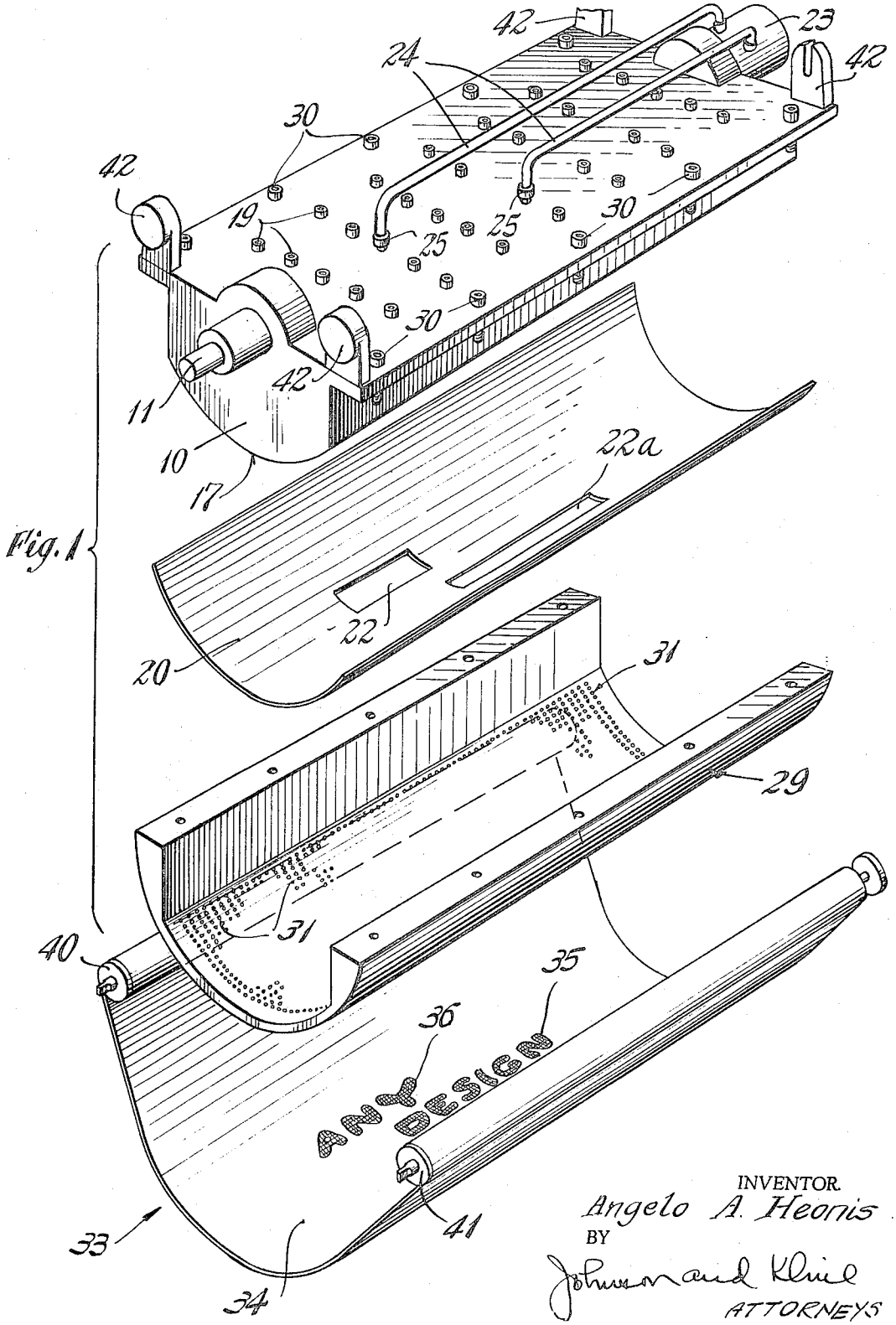

Fig. 1

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Fig. 3

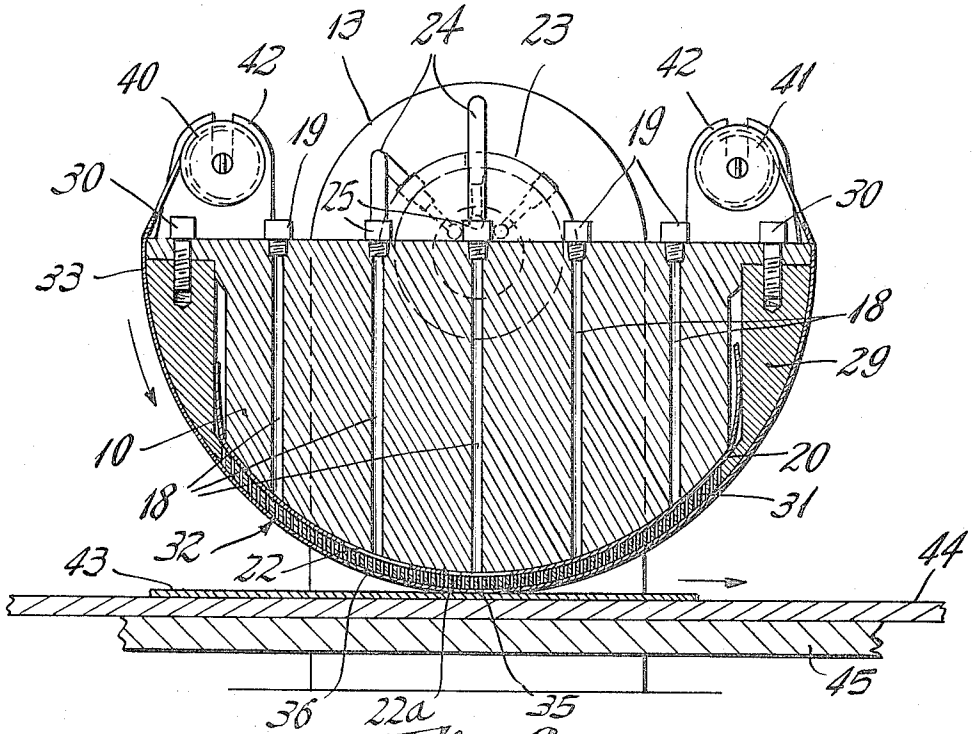

Fig. 2

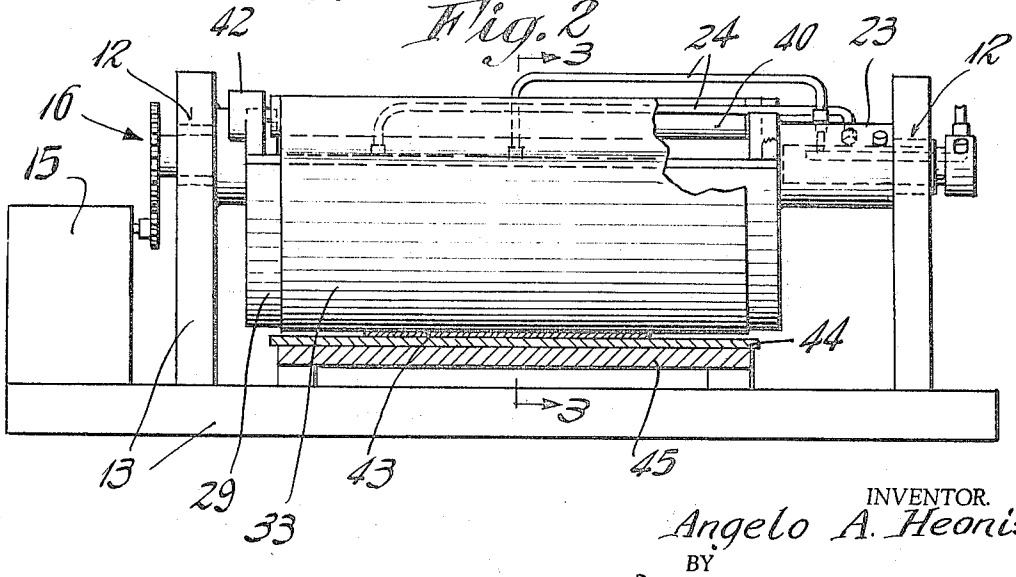

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Fig. 4

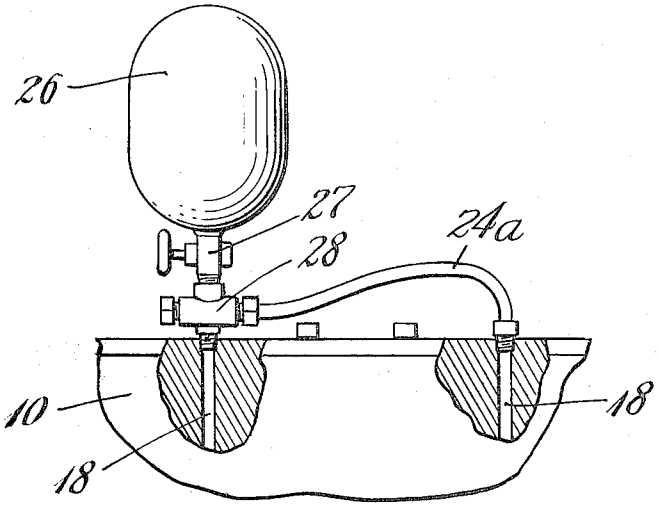
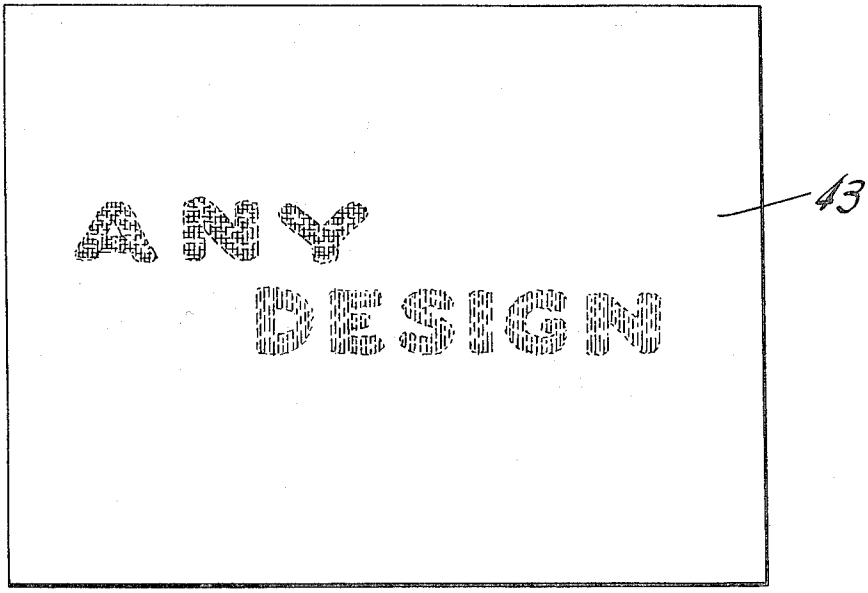


Fig. 5



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3,294,018

APPARATUS FOR SIMULTANEOUSLY PRINTING IMAGES WITH DIFFERENT KINDS OF INK

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9 Claims. (Cl. 101—115)

The present invention relates to a novel method and apparatus for simultaneously printing a plurality of images, preferably in different inks, by the use of printing plates having ink-pervious, image-forming portions, and more particularly to the simultaneous forming of a plurality of images of different kinds or colors of ink with a silk screen printing plate.

Heretofore, in printing by the silk screen method where different colors or different types of ink have been required in the final copy, it has been necessary to form a silk screen for each color or type and to print one color of ink or one type of ink in a separate printing operation, and thereafter to dry the ink thereon. This had to be repeated for each of the different colors or different types of ink, and, in each case, it was necessary to accurately locate each of the silk screens with the image-receiving material so as to produce the proper register of the images. This has been time consuming, costly and tedious.

The present invention overcomes these difficulties by providing a novel method and apparatus whereby a plurality of images can be simultaneously printed in different inks by a sinple plate on an image-receiving material in a simple and yet effective manner.

This is accomplished, according to the present invention, by providing a plate-carrying base over which a plate having ink-impervious portions and ink-pervious portions of the desired image to be printed is mounted or stretched, which base carries a plurality of supplies of different inks required for the composition to be printed. The various supplies are connected, by means on the base, to the ink-pervious sections so as to continuously feed ink to said sections and form images thereon which, when the plate is pressed against an image-receiving material, transfers the ink images thereto.

A feature of the invention resides in the fact that a novel ink-separating means is provided for controlling the passage of ink from the supplies to the ink-pervious portions of the plate.

Another feature of the invention resides in the simplicity with which the colors or different kinds of ink can be set up to supply the different inks to the various parts of the plate as required to simultaneously produce separate distinct images thereby.

Other features and advantages of the invention will be apparent from the specification and claims when considered in connection with the accompanying drawings in which:

FIGURE 1 shows a perspective of the elements of the machine.

FIG. 2 is a side elevation of the machine.

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2.

FIG. 4 is a view showing a modified form of ink supply.

FIG. 5 is a view of the finished design as imprinted on the image-receiving material.

While the present invention may be employed in connection with a platen press having plates provided with porous or ink-pervious, image-forming portions, the invention is herein illustrated as being applied to a rotary carrier having thereon means including a silk screen plate for performing the printing operation.

As shown in FIGS. 1 and 2, the device comprises a

main base **10** adapted to be mounted for rotation about a horizontal axis by pivot pins **11** at each end which are adapted to be rotatably mounted in a bearing means **12** carried by each end of a frame **13**. The base can be oscillated or rotated by any means, as, for example, a suitable motor **15** and gearing **16**.

The base **10**, as indicated in FIGS. 1 and 3, is provided with a bottom surface **17** which, in the illustrated form of the invention, is concentric with the axis. The base has a plurality of bores or tubular passages **18** passing therethrough and opening in the curved surface **17**. The bores **18** are adapted to have ink supplies connected thereto as will be explained and preferably are normally closed at their upper ends by removable plugs **19**.

A color separation mask **20** is formed of a thin sheet of plastic or other ink-impervious material and is provided with separate openings **22**, **22***a* for each kind of ink to be used in the copy. These openings may be formed by hand cutting the mask material or by a photographic process and are to be located in accordance with the colors to be printed.

"Ink" as used herein denotes any printing substance such as printer's ink, lacquer and the like compositions. This ink, which may be of different kinds, i.e., different colors or transparent with or without effect materials such as fluorescent or reflecting materials, is fed to the bores or tubular passages **18** in the base which are in communication with the openings **22**, **22***a* in the mask **20**.

The ink is fed under pressure during the operation of the device. While the pressure may be supplied solely by centrifugal force during the rotation of the drum, it is preferred to employ positive pressure producing means for continuously feeding the ink to the openings. The viscosity of the ink and the pressure under which it is fed can be controlled to produce the desired flow of ink to insure satisfactory operation.

In the form of the invention shown in FIG. 1, the ink for each opening is pumped from supplies (not shown) through a manifold **23** and through flexible tubes **24** which have at their ends couplings **25** adapted to be threaded into the transverse bore in the base communicating with the openings in the mask and from which the plugs **19** have been removed. This ink is under pressure and is fed continuously through the tubes **24** into the transverse bores **18** into the openings in the color mask.

In the form of the invention shown in FIG. 4, each of the different inks is contained in a pressurized container **26** having a control valve **27** connected to a nipple **28** threaded in a selected bore **18**. If desired, the nipple can be connected to one or more additional bores **18** in the base by a flexible connector **24***a* when the opening in the mask to be supplied by said ink extends over more than one bore **18**.

The color separating mask **20** is clamped against the curved surface **17** of the base by an arcuate member or plate **29** which is secured in position by bolts **30**. The plate **29**, in clamping the color-separating mask against the base, effectively seals the openings in the mask to prevent the inks deposited therein from migrating into the other parts of the mask. The surface **17** of the base, if desired, can be grained or satin finish to improve the sealing action. The plate **29** is provided with means for uniformly distributing the ink from the openings to the printing plate. In the illustrated form of the invention plate **29** is provided with a plurality of closely spaced fine passages **31** therethrough, as shown in FIG. 3, opening into the outer surface **32** thereof to form a diffuser plate for uniformly distributing ink in the openings as it is fed therefrom. Since the invention is illustrated in a rotary printing device, the outer surface **32** of the plate **29** is concentric with the axis of rotation for the base.

Over the diffuser plate is stretched a printing plate **33**. While the printing plate can be any type having ink-pervious or porous image-forming portions, it is herein illustrated as being formed of the usual silk screen material which may be treated in the usual manner to render the main part **34** impervious to ink while the image-forming parts **35, 36** are ink-pervious. For example, the copy, as shown in FIG. 5, consists of two words ANY and DESIGN which are to be printed in different colors as indicated by the hatching. It will be noted in FIG. 1 that the ink-pervious portions on the plate are coordinated with the mask so as to overlie the openings **22, 22*a*** in the mask when the plate is stretched tightly over the diffuser plate and is sealingly clamped thereto so as to continuously receive ink from the openings **22, 22*a***. While the plate may be clamped in any manner, it is herein illustrated as having its ends secured to spring rollers **40, 41** of the shade roller type which are mounted in brackets **42** carried on the base **10**. This means is simple and easy to operate and continuously holds the plate tightly against the surface **32**. The diffuser plate feeds the ink evenly and uniformly to the ink-pervious portions **35, 36** of the silk screen and continuously supplies ink thereto of the desired color or character.

The plate is pressed against an ink-receiving or receptor material **43** to transfer the image thereto. This receptor material may be paper, cardboard, glass, wood, fabrics, plastics, metals and foils and may be flat or sheet stock or have cylindrical or irregular surfaces as may be found on bottles, cases or the like.

While the plate can rotate as it moves over a stationary piece of receptor material in the form of the invention shown in FIG. 2, the receptor material **43** is flat or sheet stock supported on a moving belt or movable platen **44** operable over a backup table **45**. The movement of the image-receiving material **43**, as is usual in a printing operation, is synchronized with the rotation of the plate by any conventional drive means (not shown) and the different inks which are forced under pressure into the separate ink-pervious portions of the printing plate are then transferred to the image-receiving material **43** and simultaneously print the images on the material **43** so that a finished print can be obtained in which the two separate images or elements of the printed copy, as shown in FIG. 5, are printed in different colors from a single plate and in a single printing operation.

Thus, it will be seen that it is unnecessary to print each color separately or to re-register the sheets for each printing operation. After the sheets are printed, they are dried in the usual manner.

Variations and modifications may be made within the scope of the claims and portions of the improvements may be used without others.

I claim:

1. A device for simultaneously printing in a plurality of colors comprising a frame, a base mounted thereon for movement into and out of printing position and having a surface adapted to receive a color separation mask, said base having a plurality of spaced passages opening in said surface, supplies of different colored inks connected to selected of said passages, a thin sheet of flexible ink-resisting material having separate openings therein and forming said color separation mask disposed over said surface with said openings being in communication with said passages to continuously receive ink therefrom, an ink diffuser plate disposed over said mask and clamping said mask to said surface to seal the mask to the base, a sheet of flexible, printing plate forming material tightly and sealingly secured over the diffuser plate, said sheet having porous portions conforming to the image to be printed and overlying said openings and said diffuser plate having means therein for transmitting ink from the openings in the mask to porous portions of the sheet overlying the same to cause the ink to spread thereover and form ink images thereon, and means moving the base and assembled elements to cause the sheet to be pressed against a receiver material to transfer the ink therefrom and print an image on the receiver material.

2. A device for simultaneously printing in a plurality of different kinds of inks comprising a frame, a base mounted on the frame to turn about a horizontal axis and having a surface adapted to receive an ink separation mask, said base having a plurality of spaced tubular passages therein opening in said surface, supplies of different kinds of inks connected to selected of said passages, a thin sheet of flexible, ink-resistant material having separate openings therein and forming said ink separation mask disposed over said surface with said openings being in communication with said passages to continuously receive ink therefrom, an ink diffuser plate disposed over said mask and clamping said mask to said surface to seal the mask to the base, a sheet forming a printing plate tightly secured over the diffuser plate, said sheet having porous ink-pervious sections overlying said openings and said diffuser plate having means for transmitting ink from the openings in the mask and distributing the ink over the porous sections of the sheet overlying the same, said sheet receiving and holding the transmitted ink and forming ink images thereon, and means causing the sheet to be pressed against a receiver material to transfer the ink images therefrom and print images on said receiver material.

3. A device for simultaneously printing in a plurality of colors comprising a frame, a base mounted thereon to rotate about a horizontal axis and having an arcuate surface adapted to receive a color separation mask, said base having a plurality of spaced tubular passages opening in said surface, supplies of different colored inks connected by tubes to selected of said tubular passages, a thin sheet of flexible, ink-resistant, plastic material having separate openings therein and forming said color separation mask disposed over said surface with said openings being in communication with said selected passages to continuously receive said colored inks therefrom, an ink diffuser plate disposed over said mask and clamping said mask to said surface to seal the mask to the base, said plate having an outer surface concentric with said axis, a sheet of silk-screen material tightly secured over the outer surface of the diffuser plate, said silk screen having porous ink-pervious portions overlying said openings and said diffuser plate having a plurality of fine passages therein for transmitting said different colored inks from the openings in the mask to fill the porous silk-screen portions with said ink to form ink images thereon, and means causing the screen to be pressed against a receiver material in response to rotation of the base to transfer the ink carried thereby and print an image on the receiver.

4. A device for simultaneously printing in a plurality of colors comprising a frame, a base rotatably mounted thereon and having a surface adapted to receive a color separation mask and having a plurality of spaced tubular passages opening in said surface, a plurality of supplies of different colored inks, a plurality of tubes on the base selectively connecting said supplies of inks to predetermined of said tubular passages in said base, a thin sheet of flexible, ink-resistant plastic material having separate openings therein and forming said color separation mask disposed over said surface with said openings being in communication with said passages to receive the ink therefrom, an ink diffuser plate disposed over said mask and clamping said mask to said surface to seal the mask to the base, a printing plate having predetermined ink-pervious, image-forming areas tightly secured over the diffuser plate with said areas overlying said openings, said diffuser plate having a plurality of fine passages therein for transmitting ink from the openings in the mask and diffusing said ink over the ink-pervious areas in the printing plate to form ink images thereon, and means causing the printing plate to be pressed against

a receiver material to transfer the ink on the printing plate and print an image thereon.

5. A device for simultaneously printing in a plurality of different inks comprising a frame, a base rotatably mounted thereon about a horizontal axis and having a surface adapted to receive an ink separation mask and having a plurality of spaced tubular passages opening in said surface, a plurality of supplies of different inks, a plurality of tubes selectively connecting said supplies of inks to predetermined of said tubular passages in said base, a thin sheet of flexible ink-resistant material having separate openings therein and forming said ink separation mask disposed over said surface with said openings being in communication with said tubular passages to receive ink therefrom, an ink diffuser plate disposed over said mask and clamping said mask to said surface of the base to seal the mask to the base and having a printing plate supporting surface concentric with said axis, a printing plate having predetermined ink-pervious image-forming areas tightly secured over the plate supporting surface of said diffuser plate with said areas overlying said openings, said diffuser plate having a means therein for diffusing and transmitting ink from the openings in the mask to the ink-pervious areas in the printing plate to form ink images thereon, and means causing the printing plate to be pressed against a receiver material to transfer the ink from the plate and print an image thereon.

6. A device for simultaneously printing in a plurality of colors comprising a frame, a base mounted thereon for movement into and out of printing position and having a surface to receive a color separation mask, said base having a plurality of spaced tubular passages opening in said surface, a plurality of pressurized containers, each having different colored inks therein mounted on the base and connected to selected of said tubular passages, a thin sheet of flexible ink-resisting material having separate apertures therein and forming a color separation mask disposed over said surface with said openings being in communication with said passages to continuously receive ink under pressure therefrom, an ink diffuser plate disposed over said mask and clamping said mask to said surface to seal the mask to the base, a sheet of printing plate material tightly secured over the diffuser plate, said sheet having porous portions conforming to the image to be printed and said diffuser plate having a plurality of fine passages therein for transmitting the different colored inks from the openings in the mask and distributing the ink over the porous portions of the sheet overlying the same to form ink images thereon, and means moving the base and assembled elements to cause the sheet to be pressed against a receiver material to transfer the ink therefrom and print an image on the receiver material.

7. A device for simultaneously printing in a plurality of colors comprising a frame, a base rotatably mounted thereon and having a surface adapted to receive a color separation mask and having a plurality of spaced tubular passages opening in said surface, a plurality of pressurized

supplies of colored inks, a manifold connecting said supplies to said base, a plurality of tubes selectively connecting said colored inks in the manifold to predetermined of said tubular passages in said base, a thin sheet of flexible ink-resistant material having separate openings therein and forming said color separation mask disposed over said surface with said openings being in communication with said passages to receive ink under pressure therefrom, an ink diffuser plate disposed over said mask and clamping said mask to said surface to seal the mask to the base, a printing plate having predetermined ink-pervious, image-forming areas tightly secured over the diffuser plate with said areas overlying said openings, said diffuser plate having a plurality of fine passages therein for transmitting ink from the openings in the mask to the ink-pervious areas in the printing plate to form ink images thereon, and means causing the printing plate to be pressed against a receiver material to transfer the ink from the printing plate and print an image on the receiver material.

8. A device for simultaneously printing a plurality of separate images of different kinds of ink comprising a frame, a base movably mounted for movement between an operative printing and an inoperative position, an ink separation mask on the base comprising a sheet having openings therethrough, a printing plate disposed over the mask and having ink-impervious portions and spaced ink-pervious portions adapted to form the image thereon, said plate being secured to said base and having the ink-pervious portions disposed over said openings in the mask in sealing relation therewith, a plurality of supplies of different kinds of inks, conduit means selectively connecting said supplies of different kinds of inks to the openings in said mask located under said pervious portions of the plate to continuously supply ink therethrough to form ink images on the plate, and means causing the plate to be pressed against a receiver material to simultaneously transfer the ink images of different kind from the plate to said receiver material.

9. The invention as defined in claim 8 wherein the different kinds of inks comprise inks of different colors.

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