

Oct. 1, 1968

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3,403,621

METHOD AND APPARATUS FOR EMBOSSED AND PRINTING DURING
A SINGLE PASS THRU A PLANOGRAPHIC OFFSET PRESS

Filed Oct. 4, 1966

FIG. 1

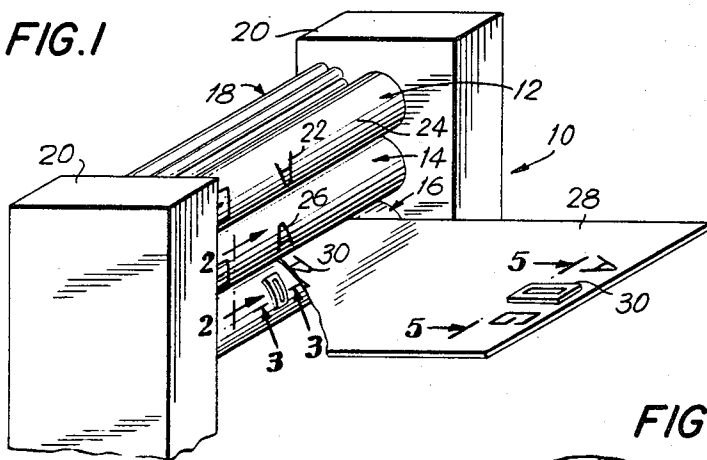


FIG. 2

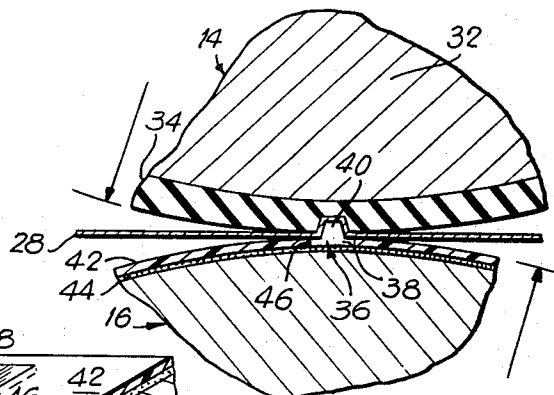


FIG. 3

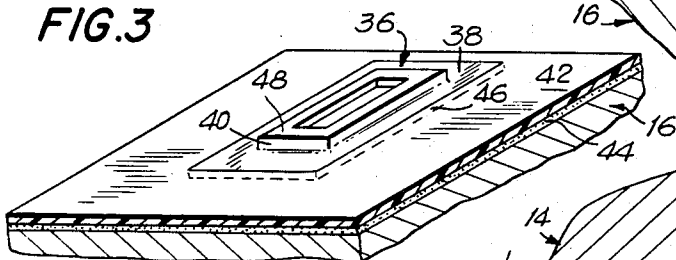


FIG. 4

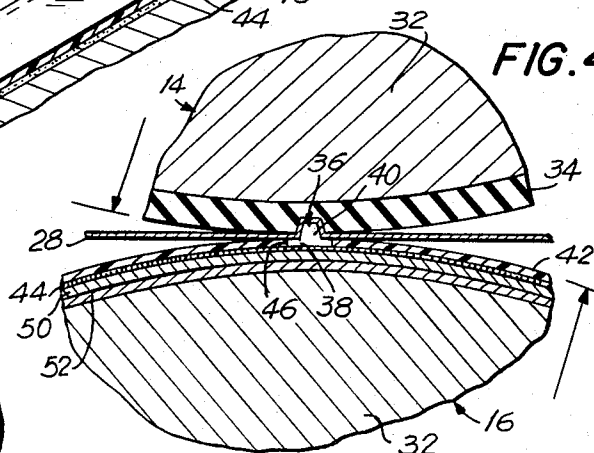
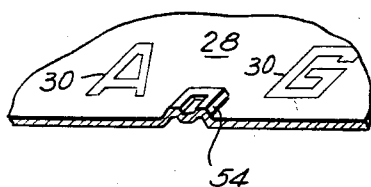


FIG. 5



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METHOD AND APPARATUS FOR EMBOSsing AND PRINTING DURING A SINGLE PASS THRU A PLANOGRAPHIC OFFSET PRESS

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Filed Oct. 4, 1966, Ser. No. 584,243
20 Claims. (Cl. 101—23)

ABSTRACT OF THE DISCLOSURE

Method and apparatus for embossing on high speed planographic web offset printing press comprising securing a high relief die member on the impression cylinder thereof and securing a masking layer on the impression cylinder adjacent the die member to provide substantially smooth continuity generally outwardly of the base portion thereof to enable embossing or debossing of a web passed between the impression cylinder and blanket cylinder.

This invention relates generally to methods and apparatus for printing and more particularly to methods and apparatus for embossing or debossing on offset printing presses to enable rapid and inexpensive production of printed materials provided with ink imagery and embossed or debossed imagery during a single pass.

It has long been recognized that printed materials that are provided with both ink imagery and embossed or debossed imagery provide an appearance which is far superior to flat printed materials. Particularly, advertising materials which are provided with multiple color ink imagery and embossed or debossed imagery provide both visual and tactile impact which has been proved to be highly effective. Previously, providing printed materials with both ink imagery and embossed or debossed imagery has been slow and expensive since the ink imagery and the embossed imagery have previously been provided only by separate operations. Furthermore, while printing presses have been developed which are capable of producing multi-color printed materials at very high rates, heretofore known embossing presses have been slow and expensive.

A most significant improvement in the production of low cost, high quality printed materials has been the development of the web offset printing press which directly prints on both sides of a web of material multiple color ink images at exceedingly high rates. However, heretofore it was impractical to emboss printed materials produced on web offset presses since it was necessary to cut the web into sheets after printing and to subsequently register the individual sheets with an embossing press which operated at substantially slower feed rates. Accordingly, the provision of both ink imagery and embossed or debossed imagery on printed materials has heretofore been accomplished by multiple printing operations using sheet-fed presses followed by a separate embossing operation in an embossing press. Since neither the embossing presses presently known, nor the sheet-fed presses utilized in conjunction therewith are capable of utilizing relatively inexpensive web materials and furthermore operate at relatively slow feed rates, the cost of advertising materials provided with both ink imagery and embossed or debossed imagery has heretofore been generally prohibitive.

Accordingly, it is a primary object of this invention to provide methods and apparatus for directly embossing or debossing a sheet-like material during passage thereof through an offset printing press to enable embossing and debossing to be accomplished in conjunction with offset printing at high speeds during a single pass.

Another primary object of the present invention, in addition to the foregoing object, is to provide such methods and apparatus for producing printed materials provided with ink imagery and embossed or debossed imagery economically, simply, and rapidly, with such printed materials producing the appearance of the heretofore expensive separate printing and embossing operations.

A further object of the present invention, in addition to each of the foregoing objects, is to provide methods and apparatus for adapting a web offset printing press to enable the printing press to provide inked imagery and embossed or debossed imagery to a web of material passed therethrough during a single operation.

Still another primary object of this invention, in addition to each of the foregoing objects, is to provide such methods and apparatus which enables the printing press to be set-up for a specific run in a minimum of time by relatively unskilled technicians.

It is also a primary object of this invention, in addition to each of the foregoing objects, to provide offset printing presses adapted to provide both inked imagery and embossed or debossed imagery to sheet-like material in a single operation, at high speeds, and at minimal cost.

It is another and yet still further primary object of this invention, in addition to each of the foregoing objects, to provide sheet-like materials having ink imagery and embossed or debossed imagery produced by the methods and apparatus of the present invention.

The invention resides in the combination, construction, arrangement and disposition of the various component parts and elements incorporated in improved printing apparatus constructed in accordance with the principles of this invention, methods of utilizing such apparatus, and the products produced thereby. The present invention will be better understood and objects and important features other than those specifically enumerated above will become apparent when consideration is given to the following details and description, which when taken in conjunction with the annexed drawing describes, discloses, illustrates and shows certain preferred embodiments or modifications of the present invention and what is presently considered and believed to be the best mode of practicing the principles thereof. Other embodiments or modifications may be suggested to those having the benefit of the teachings herein, and such other embodiments or modifications are intended to be reserved especially as they fall within the scope and spirit of the subjoined claims.

In the drawing:

FIG. 1 is a pictorial schematic illustration of an offset printing press adapted in accordance with the principles of the present invention to provide both ink imagery and embossed or debossed imagery to a sheet-like material in a single operation;

FIG. 2 is a partial cross-sectional elevational view taken along line 2—2 of FIG. 1;

FIG. 3 is a pictorial illustration of an embossing element of a portion of the apparatus shown in FIG. 1 viewed substantially along the line 3—3 of FIG. 1;

FIG. 4 is a cross-sectional partial elevational view similar to FIG. 2 illustrating another form of the present invention; and

FIG. 5 is a partial cross-sectional view taken along line 5—5 of FIG. 1.

Web offset printing presses are generally of two basic types. Referring now to FIG. 1 of the drawing, there is shown and illustrated a press unit with an impression cylinder, the press unit being designated generally by the reference character 10. The press unit 10 comprises a plate cylinder 12, a blanket cylinder 14, an impression cylinder 16, ink feed rollers 18 and opposed end housings 20. The various rollers and cylinders are opera-

tively associated for relative rotation by means of gears, or the like (not shown) contained within the end housings 20. In conventional operation, the ink feed rollers 18 apply an ink mixture to the surface of the plate cylinder 12 which is specially prepared to have ink receptive areas 22 and ink repellent areas 24 so that only the ink receptive areas 22 will receive ink from the ink rollers 18. The plate cylinder 12 rotates in rolling contact with the blanket cylinder 14 and the ink adhering to the ink receptive areas 22 of the plate cylinder is transferred to the surface of the blanket cylinder to provide an inked image 26 thereon. As a web of sheet-like material 28 is fed between the blanket cylinder 14 and the impression cylinder 16, the impression cylinder 16, which is conventionally provided with a hard surface, squeezes the web of sheet-like material 28 against the blanket cylinder 14 and an ink image 30 is transferred thereto from the blanket cylinder 14.

The other basic type of web offset printing press is the perfecting press unit. The perfecting press unit is similar to the press unit 10 but the cylinder 16, rather than being a hard surfaced impression cylinder comprises a blanket cylinder associated with a second plate cylinder and ink feed rolls (not shown) to enable ink images to be applied to both sides of the web of sheet-like material 28 simultaneously. While the blanket cylinders of either basic press type are capable of applying multi-colored ink images to the web of sheet-like material 28, the individual press units are conventionally associated in series so that the web of material is sequentially fed through each press unit of the series so that each blanket cylinder only applies a single color ink to the web of sheet-like material 28.

This invention is equally applicable to both basic types of printing presses, that is, to printing presses having impression cylinders or to perfecting type presses, as well as to any other printing presses, such as sheet fed rotary presses or flat bed presses.

With particular reference to FIG. 2, the blanket cylinder 14 comprises a hard core 32 fabricated, for example, of cast iron or steel. A blanket member 34, such as a layer of rubber, or the like, is secured along the circumferential surface of the blanket cylinder 14. To provide for simultaneous embossing or debossing of the web of sheet-like material 28, a high relief die member 36 is secured on the surface of the impression cylinder 16 so that upon operation of the press unit 10, the die member 36 will deform a portion of the web of sheet-like material 28 and the juxtaposed portion of the blanket member 34 to form the web of sheet-like material 28 to the configuration of the die member 36. An ink image may be transferred from the blanket member 34 to the web of sheet-like material 28 during such forming, embossing or debossing operation, if desired. The high relief die member 36 comprises a generally flat base portion 38 and a raised portion 40 extending generally upwardly from the base portion 38. If it is desired to transfer an ink image from the blanket member 34 to the web of sheet-like material 28 during the embossing or debossing operation, then it is necessary that constant pressure be applied to all portions of the web of sheet-like material 28 in contact with the blanket member 34 by the impression cylinder 16. If it is not desired to transfer an ink image to the web of sheet-like material 28 during the embossing or debossing operation, then the impression cylinder 16 may be spaced from the surface of the blanket member 34 a distance sufficient that only the raised portion 40 of the die member 38 will be pressed against the blanket member 34 and the base portion 38 will not provide any embossed image on the web of sheet-like material 28. If, however, it is desired to transfer an ink image from the blanket member 34 to the web of sheet-like material 28, then it is necessary to provide pressure against the web of sheet-like material 28 at all points of contact with the blanket member 34. Accordingly, a masking layer 42 may be provided on the surface of the impression cylinder 16 adjacent the base portion 38 of the die member 40 to effectively build up the im-

pression cylinder 16 the thickness of the base portion 38. With such a masking layer 42 so positioned, the base portion 38 of the die member 36 will be enclosed by the masking layer 42 and will therefore not present any edges capable of embossing the web of sheet-like material 28.

The die member 36 may be positioned on the impression cylinder 16 in any desired manner, for example, by means of an adhesive, an adhesive tape, or the like. For example, a layer of double faced adhesive tape 44 may be secured to the surface of the impression cylinder 16 and the masking layer 42 secured on the upper surface of the double faced adhesive layer 44. The masking layer 42 may comprise any desired material, and it has been found that a relatively tough plastic material, for example, a polyester film material comprising polymers of ethylene terephthalate such as that manufactured and sold under the trademark Mylar, is especially suitable. The proper positioning of the die member 36 may be determined by operating the press unit 10 without passing the web of sheet-like material 28 therethrough to thereby transfer an ink image from the blanket member 34 directly to the masking layer 42, and then cut an aperture 46 at the appropriate location entirely therethrough to define a recess with the double faced adhesive 44 being exposed on the bottom surface thereof. The aperture recess 46 should be configured substantially complementary to the periphery of the base portion 38 of the die member 40 so that the die member 40 may be inserted therein and secured to the impression cylinder 16 by the upper adhesive surface of the double faced adhesive layer 44 (see also FIG. 3).

Accordingly, if the thickness of the base portion 38 and the masking layer 42 are chosen to be substantially the same, the raised portion 40 of the die member 36 will project generally upwardly from a substantially smooth and continuous surface defined by the base portion 38 and the masking layer 42. The raised portion 40 of the die member 36 may be formed to any desired configuration, and may be provided with a substantially smooth upper surface 48, as shown, or the upper surface 48 may be provided with ridges, points, or any other desired surface treatment.

While the diameters of the impression cylinder 16 and the blanket cylinder 14 should be substantially the same, it should be noted that most commercially available web offset press units utilize blanket and impression cylinders of approximately eight inch diameters, with the blanket member 34 being of a thickness in the range of .060 to .075 inch, and it has been found that a masking layer 42 and base portion 38 thickness of approximately .010 inch and a raised portion 40 height of approximately .022 inch operates effectively and any difference in the effective diameters of the cylinders is negligible.

It has been found that the die member 36 may be fabricated of any conventional type material, such as metal or plastic, and preferably fabricated of magnesium alloy relieved to depths up to .025-.030 inch.

Referring now to FIG. 4, the present invention may be practiced on the perfecting type press, heretofore referred to. However, since the blanket member of the lower blanket cylinder 16 of a perfecting type press does not provide a sufficiently rigid base for the die member 36 the lower blanket is removed during the make-ready process and a blank printing plate 50 secured on the core 32 of the lower cylinder 16. The proper diameter may be built up by providing a layer of paper 52, or the like, between the core 32 of the lower cylinder 16 and the blank plate 50. The lower cylinder 16, including the paper layer 52 and the blank plate 50 is then utilized as hereinabove described to form the base for adhesively securing the die element 36 thereto, and the masking layer 42, if desired.

With reference to FIG. 5 of the drawing, the sheet-like material 28 may be provided with ink images 30 and embossed or debossed images 54 on one or both sides thereof with a single pass through the apparatus 10. The

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units or apparatus 10 is conventionally utilized in an in-line or tandem arrangement, with the web of sheet-like material passing sequentially continuously through two or more units. Accordingly, the inked image may be aligned with the embossed or debossed image, so that portions of the sheet-like material are both embossed or debossed and printed, as shown at 54, or the inked and embossed or debossed images may be spatially separated.

Furthermore, the embossed or debossed image may be of any desired configuration and design and may be rough surfaced, smooth surfaced or with any variation in surface desired. For example, vouchers, credit vouchers, bonus certificates, discount certificates, coupons, and the like may be readily and inexpensively produced having a credit line, such as "The sum of \$1 and 50 cts." embossed like a bank check or a realistic appearing seal may be embossed and printed to give a little extra measure of authenticity. The embossed imagery may be used to reinforce the impact of the inked imagery, as by being registered with selected portions thereof, or the embossed imagery may be used in its own right to provide designs and/or alpha-numeric information.

While examples of suitable materials have been suggested above, such examples are to be construed and interpreted without limitation since other materials may also produce similar results. For example, while it has been pointed out that the high relief die members may be fabricated of magnesium, the die members may also be fabricated of other materials, such as aluminum, plastic, etc. Similarly, while it has been pointed out that the masking layer has been successfully fabricated of Mylar, other materials, such as acetates, sheet metal, and even paper may also be used. In each case, the selection of appropriate materials depends only on the proper balancing of ease of working of the material and toughness and durability during operation.

It is to be understood that terminology such as "upper," "lower," "upwardly" and "downwardly," as used in the preceding description and in the subjoined claims, along with other similar directional terminology, is to be construed and interpreted in its normal and accepted sense. However, such terminology is not to be construed or interpreted in a limiting sense either in the preceding description or the subjoined claims, since the same is used merely to facilitate an understanding of, and to clearly set forth and particularly define the present invention.

While the invention has been shown, illustrated, disclosed and described in terms of certain embodiments or modifications which it has assumed in practice, the scope of the invention should not be deemed to be limited by the precise embodiments or modifications herein shown, illustrated, described or disclosed, such other embodiments or modifications as may be suggested to those having the benefit of the teachings herein being intended to be reserved especially as they fall within the scope and spirit of the claims hereto appended.

What is claimed is:

1. Method of imprinting sheet-like material comprising, at least the steps of, securing embossing or debossing die means provided with a base portion and a deforming portion stationary relative to an impression member of a planographic offset printing press, securing masking means stationary relative to an impression member at least adjacent the die member base portion and engaging sheet-like material between the deforming portion and a cooperating portion of a blanket member of the press to emboss or deboss the sheet-like material to the configuration of the deforming portion of the die means.

2. Method defined in claim 1 wherein said step of securing the die means comprises at least the step of adhesively securing the base portion of the die means stationary relative to the impression member with a pressure-sensitive adhesive.

3. Method defined in claim 1 wherein the blanket member and the impression member comprise mating blanket

members of a perfecting type printing press, the method comprising at least the additional step of securing a blank plate with the surface of the impression member prior to securing the die means thereto.

4. Method defined in claim 1 wherein the step of securing masking means comprises at least the steps of securing a masking layer to substantially the entire surface of the impression member and providing recess means in the masking layer configured substantially to the periphery of the base portion of the die means.

5. Method defined in claim 4 wherein the masking layer is of substantially uniform thickness and is fabricated of a material having the characteristics of polyester film comprising polymers of ethylene terephthalate.

6. Method defined in claim 4 further comprising at least the additional steps of transferring an ink image from the blanket member to the masking layer and providing the recess by cutting an aperture through the masking layer in reference to the ink image to provide registration between the die means and ink image on the blanket member.

7. Method defined in claim 6 wherein the masking layer is secured with the impression member by adhesive material, the step of cutting thereby exposing a portion of the adhesive material to enable the die means to be secured with the back-up member thereby.

8. Method of imprinting sheet-like material during a single pass through a single unit of a planographic offset printing press system comprising, at least the steps of, securing embossing or debossing die means stationary relative to an impression member of the press unit for cooperation with a portion of the blanket member thereof, transferring ink imagery from a planographic printing plate to another portion of the blanket member and engaging the sheet-like material between the impression member and the blanket member to emboss or deboss a portion thereof and apply ink imagery to another portion thereof, wherein the die means comprises a base portion and a deforming portion, the method comprising at least the additional step of securing masking means with the impression member for cooperation with said other portion of the blanket member for tightly engaging said other portion of the sheet-like material therebetween to enable transfer of ink therebetween.

9. Method defined in claim 8 wherein the blanket member and the back-up member comprise mating blanket members of a perfecting type press unit, the method comprising at least the additional step of securing a blank plate stationary relative to the surface of the impression member prior to securing the die means thereto.

10. Method defined in claim 8 wherein the die means is secured with the impression member with a pressure sensitive adhesive.

11. Method defined in claim 8 wherein the masking layer is of substantially uniform thickness and fabricated of a material having the characteristics of polyester film comprising polymers of ethylene terephthalate and wherein said step of securing the masking layer comprises, at least the steps of, providing a recess in the masking layer configured substantially to the periphery of the base portion of the die means and securing the masking layer to substantially the entire surface of the impression member with the deforming portion of the die means extending outwardly of the recess.

12. Method defined in claim 11 wherein the recess extends completely through the masking layer to define an aperture, the method comprising, at least the additional steps of, securing the masking layer with the impression member by a pressure sensitive adhesive, enabling the aperture to expose a portion of the pressure sensitive adhesive and securing the die means with the impression member with the exposed portion of the pressure sensitive adhesive.

13. Method defined in claim 12 further comprising, at least the additional step of, transferring an ink image

from the blanket member to the masking layer and providing the aperture by cutting through the masking layer in reference to the ink image to provide registration between the embossed or debossed portion of the sheet-like material and the ink printed portion thereof.

14. Planographic web offset printing press adapted to enable embossing or debossing and planographic offset printing of a web of material during a single pass therethrough comprising, in combination, a blanket cylinder mounted for rolling contact with a moving web of material, an impression cylinder positioned relative to said blanket cylinder for rolling contact with an opposed side of said web of material adapted to press the web of material into firm engagement with said blanket cylinder, die means associated with said impression cylinder for rotation therewith adapted to deform said web of material and the juxtaposed portion of said blanket cylinder during such movement of the web of material, said die means comprising a base portion and a deforming portion extending generally outwardly thereof, and a masking layer positioned stationary relative to said impression cylinder at least adjacent said base portion of said die means to define therewith a substantially smooth and continuous surface extending peripherally outwardly of said base portion.

15. Printing press defined in claim 14 further comprising pressure sensitive adhesive means for securing said die means with respect to said impression cylinder.

16. Printing press defined in claim 14 wherein said impression cylinder comprises a blanket cylinder of a perfecting type press unit and an outer layer secured thereabout for rotation therewith, said outer layer comprising a blank printing plate.

17. Printing press defined in claim 14 wherein said masking layer extends substantially completely circumferentially of said impression cylinder and said masking layer is provided with a recess configured to receive the base portion of said die means therein.

18. Printing press defined in claim 17 further comprising a layer of pressure sensitive adhesive for securing said masking layer with said impression cylinder and wherein said recess extends entirely through said masking layer defining an aperture, enabling said adhesive layer to secure said die means with said impression cylinder.

19. Printing press defined in claim 18 wherein said masking layer is of substantially uniform thickness and is fabricated of a material having the characteristics of polyester film comprising polymers of ethylene terephthalate.

20. Printing press defined in claim 19 wherein said die means comprises a die member fabricated of a material having the characteristics of magnesium.

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