APPARATUS FOR EMBossING PAPER SHEETS IN AN OFFSET PRINTING PRESS

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5 Claims

ABSTRACT OF THE DISCLOSURE

This apparatus is for use with an offset or multilith printing press and the apparatus includes an accurate embossing plate having a dependent flange on the leading end thereof which extends inwardly of the impression cylinder in a printing press and is secured to such impression cylinder so that the embossing plate extends over a portion of the surface of the impression cylinder. The embossing plate is relatively thin and has elevated sections thereon forming indicia to be directly embossed or deindented on a paper sheet as it is fed between the transfer cylinder and impression cylinder for printing action thereon. The present invention also relates to a method of embossing paper sheets simultaneously while printing the same.

Heretofore there have been many different types of offset, or multilith printing presses provided for printing paper sheets and the like. However, in many instances, it is desirable to have an embossed section appear on a printed sheet and normally such embossing, as done heretofore, has comprised a special operation requiring special dies and an individual feed of the sheets through the embossing machine for such action thereon. These embossing plates or dies as used heretofore normally have been relatively expensive and difficult to produce.

The general object of the present invention is to provide a novel and improved apparatus and method for simultaneously embossing a paper sheet while printing thereon by an offset printing process.

A further object of the invention is to provide a novel, improved, relatively easily made embossing plate which is adapted to be carried by an impression cylinder of the printing press and wherein the embossing plate is attached to such impression cylinder and closely conforms to at least a portion of the perimeter thereof.

A further object of the invention is to provide relatively inexpensive embossing apparatus that can be attached to standard offset or multilith printing presses and not interfere with any printing action thereby.

Yet another object of the invention is to provide a novel and improved type of an embossing plate which is flexible and which can have raised indicia provided at any desired portion thereof for embossing a paper sheet simultaneously while a printing action is affected on such sheet.

Yet one further object of the invention is to provide a relatively inexpensive, but improved embossing plate for use in offset printing presses and wherein the embossing plate can extend over a portion or the complete operative periphery of an impression cylinder in an offset printing press and thereby securely retain and detached therefrom.

Yet another object of the invention is to reduce the cost of embossing paper sheets, but yet to provide a sharply defined, accurate embossed sections on a paper sheet.

The foregoing and other objects and advantages of the invention will be more apparent as the specification proceeds.

Attention now is particularly directed to the accompanying drawings, wherein:

FIG. 1 is a diagrammatic side elevation of an offset printing press to which apparatus of the invention can be attached;

FIG. 2 is a plan view of the impression cylinder, to an enlarged scale, of the printing press of FIG. 1;

FIG. 3 is a vertical section line 19—19 and line 20—20 of FIG. 2 and showing the novel embossing plate of the invention attached to such impression cylinder;

FIG. 4 is an enlarged view of the means used for securing the embossing plate to the impression cylinder;

FIG. 5 is an enlarged vertical section, similar to FIG. 3, of a modified embodiment of the invention;

FIG. 6 is a fragmentary enlarged section through the embossing plate of one embodiment of the embossing plate of the invention; and

FIG. 7 is a plan view of an embossed sheet provided by the invention.

When referring to corresponding members shown in the drawings, an offset, or multilith printing press is indicated diagrammatically in FIG. 1 by the numeral 10. Such offset press has conventional means therein including a plurality of ink rolls 11, 11 and a plurality of moisture, or water rolls 12, 12. These rolls 11 and 12 are of conventional construction and are adapted to receive and convey ink, or moisture to a printing plate which is suitably secured to and carried by the periphery of the printing cylinder 13. In accordance with conventional practice, a transfer cylinder 14 is in operative engagement with the printing cylinder 13 and such transfer cylinder 14 has a resilient transfer blanket secured thereto in a conventional manner for receiving the ink and moisture applied to the printing cylinder 13 on the resilient printing blanket (not shown) affixed to the operative portion of the periphery of the transfer cylinder 14. An impression cylinder 15 is also operatively associated with the transfer cylinder 14 and it forms and operative girt therebetween through which a sheet of paper 16 is adapted to be passed for printing action thereon. It should be understood that this offset printing press 10 is of conventional construction and that the paper sheets 16 are fed to and through the press in a conventional manner and that drive is transmitted to the various ink and moisture rollers and to the printing, transfer and impression cylinders in conventional manners for the rapid printing of a number of sheets of paper with desired indicia thereon.

FIGS. 3 and 4 show certain of the novel elements of the present invention, and the impression cylinder 15 is shown in FIGS. 2, 3 and 4 of the drawings, which impression cylinder has a conventional paper stop means 17 secured to and extending axially of the impression cylinder 15. This paper stop means, or stop bar 17 has a plurality of substantially radially extending lugs or fingers 18 secured thereto or formed therewith which lugs 18 project radially a short distance beyond the periphery of the cylinder 15. As is conventional with impression cylinders 15, the operative peripheral surface of such cylinder 15 extends about 90° to ¾ of the circumference of such impression cylinder and where operative means to engage a paper sheet are provided and are carried by radially recessed portions of the impression cylinder. Normal, the impression cylinder 15 has end discs 19 and 20 and a plurality of clamp arms 21 are secured in axially spaced relation to a pivotally positioned clamp bar 22 that is carried by and extends axially of and between the end discs 19 and 20. The clamp arms 21 each position a clamp finger 21a thereon that extends in a downstream direction from the clamp arms. Such clamp fingers 21a project such distance as to overlies the
3 stop bar 17. This clamp bar is urged to rotate in a clockwise direction as indicated by the arrow 23 at all times by a spring 24 engaging a control arm or finger 26 that is secured to the clamp bar 22 and extends substantially radially therefrom. Thus, by the use of conventional means in layering press 10, paper sheets are fed to the right between the transfer cylinder 14 and the impression cylinder 15 and such paper sheets 16 contact the lugs 18 extending out beyond the periphery of the impression cylinder. Then the clamp arms 21 and fingers 21a, which have been raised to permit the insertion of the paper sheet, are released and clamp against the end of the paper sheet to cause it to move as a unit with the impression cylinder for one rotation, or portion of a rotation, for affixation of the desired printed indicia then existing from the transfer or printing blanket on the transfer cylinder 14 to such paper sheet as it moves through the cylinder bight, all in a conventional manner.

A particular novel feature in the apparatus relates to an arcuate embossing plate indicated as a whole by the numeral 30. This embossing plate 30 has a dependent, or radially inwardly extending flange 31 formed at the upstream end of such embossing plate as it is carried by the impression cylinder 15, as indicated in FIGS. 3 and 4. Such flange 31 is positioned between adjacent substantially radially extending surfaces provided on an edge of the stop bar 17 and an adjacent shoulder or leading edge section 32 that is formed at the upstream circumferential end of the peripheral working portion of the impression cylinder 15. Specifically, the flange 31 is clamped between the stop bar 17 and the shoulder 32 by use of screws 33 which extend through the stop bar and normally secure it to the impression cylinder 15, but where the screws 33 now also extend through holes or slots in the flange 31 to secure the embossing plate 30 to a peripheral portion of the impression cylinder.

It should be noted that the embossing plate hence is secured to the impression cylinder for movement therewith.

This embossing plate 30 normally is flexible but yet will take and maintain the shape given to it whereby an accurate, in vertical section, embossing plate 30 is shown in FIG. 3 and it is formed to such a contour that it lies directly on and is fully in contact with a portion of the periphery of the impression cylinder for support action thereby as a sheet of paper passes between the operative roll bight formed between the transfer cylinder 14 and the impression cylinder 15. This embossing plate 30 thus is thin and may be made from metal, plastic, laminations of metal and plastic material, or other suitable materials, as desired. The embossing plate 30 has certain elevated or raised sections or indicia 34 appearing thereon with such elevated sections 34 forming a positive image of the material to be embossed into the sheets of paper being processed.

One particularly suitable material for use in forming the embossing plate 30 is a "Dycril" printing plate made by E. I. du Pont de Nemours & Co., Inc. and which printing plate is described in U.S. Letters Pat. Nos. 2,760,863 and 2,791,504. Other plates such as relief plates made by Eastman Kodak Co. can be used.

In general, these plates, as shown in FIG. 6, comprise a base layer or sheet 35 which may be made from a flexible metal such as steel, aluminum, or other flexible metal sheets, or which may be made from a suitable plastic film or other plastic sheet plastic to polyester sheet. To this base layer 35, a photosensitive top layer 36 is attached as by means of a bonding layer 37. The overall thickness of the embossing plate 30 is usually made to be approximately .017 inch or less in thickness, and with the base layer 35 being, for example, about .007 inch thick and having approximately an .008 or .009 inch thick top layer 36 thereon. With thicker or thinner layers 36, the embossed areas may extend from about .003 to about .012 inch above the surrounding surfaces. Preferably the embossed areas are from about .005 to about .009 inch high and they usually do not extend the full thickness of the layer 36. In order to form the elevated sections or indicia 34 on the embossing plate 30, the photosensitive top layer 36 is processed in a manner very similar to that used for lithography work. A negative is made from the art work showing the embossing desired, and this negative is then placed in contact with an unexposed Dycril plate that has been preconditioned in a conventional manner by being placed in a carbon dioxide atmosphere in most instances and then the negative and plate are drawn into intimate contact, as by use of a flat or rotary-type vacuum frame. The plate is then exposed through the negative to ultra violet light. Where this light strikes the printing areas, it makes the photo polymer insoluble so that the unexposed or soluble areas of the photosensitive top layer 36 are washed away by a spray of dilute sodium hydroxide and water. The plate is then dried. All of these steps are known and conventional except that a Dycril plate is assembled in a novel and unusual type of a printing press for a special embossing action therein.

It should also be realized that the embossing plate 30 can be made in any known manner from a sheet or piece of metal, or cast metal, and wherein suitable mold or die means are used as to provide a positive plate with embossed areas thereon. Such plate need not be flexible as it can be made to the shape required. In processing the plate 30, the flange 31 and a desired arcuate contour can be suitably permanently formed therein by a light pressure metal forming action.

Such embossing plate must be quite thin, and the maximum of .017 inch as referred to hereinbefore has been found not to interfere with desired printing action as a paper sheet is passed between the transfer cylinders 14 and 15. Normally, in printing action by passing a sheet through this type of a printing press, the resilient transfer plate carried by the transfer cylinder 14 is compressed in the range of between about .002 to about .003 inch. However, in the embossed sections of the paper being printed, it naturally will be necessary to deflect the transfer printing blanket to a greater extent to compensate for the elevated sections 34 that may extend, for example, about .008 inch up from the corresponding adjacent and normally flat or at least substantially flat surfaces provided on the unembossed parts of the embossing plate 30. The trailing edge of the embossing plate 30 presents no difficulty in the offset printing action.

FIG. 5 shows a further modification of the invention wherein an embossing plate 40 is provided that has a dependent flange 41 on it secured to an impression cylinder 42. In this instance, the embossing plate 40 extends the full operative periphery length or circumference of the impression cylinder 42 and with the trailing end of the embossing plate 40 being secured, as by a coil spring 43, to a lug 44 suitably attached to a cross bar 45 provided in this impression cylinder 42. Or, a plurality of such coil springs 43 may be provided at axially spaced portions of the embossing plate 40. It will be seen that the embossing plate 40 preferably is flexible and will closely conform to and be supported by the operative cylindrical surface of the impression cylinder 42.

FIG. 7 of the drawings shows a paper sheet 50 which may have embossing sections or areas 51 and 52 provided at end portions thereof and wherein portion of the sheet 50 then having any desired printed picture or indicia appearing thereon. It has been found that printed data can be applied closely adjacent any embossed section or area provided on a paper sheet, by the apparatus and method of the invention. Thus, the embossed area can be directly outlined with printed data, or even the raised surfaces of the embossed indicia pro-
vided on the printed sheet can have printed data affixed or applied thereto. Hence, in the present invention, almost no limit exists on the area of a given printed sheet on which printing can be placed by conventional offset printing procedures. However, at the same time and with no additional operations or passage through the offset printing press, desired areas of this paper sheet being processed can be embossed concurrently or simultaneously with the printing action thereon so that both printing and embossing will, in all events, be secured by one pass of the paper through the operative printing bight in the printing machine.

The embossing plate 30 can be shaped after it has been embossed. If a plastic backing sheet is used, it may be of a heat set type that would retain a flange section formed at an end thereof.

If the printing press with which the invention is used does not have a removable stop bar 17, the upstream end of the embossing cylinder 20, or slotted to extend around the clamp arms on the impression cylinder 20 and the turned in end flange would be secured to such cylinder in any desired manner. For example, the embossing plate can be positioned by providing tapped holes in an exposed leading edge of the impression cylinder and attaching the flange to the cylinder by screws, or by any suitable adhesive means or member.

Embossing plates made in accordance with the present invention have been made and tested and have given very satisfactory action over long service runs. Such plates are relatively inexpensive, but are quite sturdy as they are preferably made from a relatively rigid plastic material (carried by a suitable base sheet), but yet one which is flexible enough to assume the arcuate contour of the impression cylinder to which they are secured.

Embossing as used in this specification and claims is used in its usual sense but also to include the provision of perforated, scored or die cut sections in the embossing action. In die cutting action small areas or ticks in the paper are left intact to retain the scrap in removable engagement with the remainder of the paper sheet. The embossed indicia when used for scoring or perforating action can obviously be continuous or spaced sections as desired.

From the foregoing, it is believed that the objects of the invention have been achieved.

While two complete embodiments of the invention have been disclosed herein, it will be appreciated that modifications of these particular embodiments of the invention may be resorted to without departing from the scope of the invention as defined in the appended claims.

What is claimed is:

1. Apparatus for embossing paper in an offset printing press including a printing plate cylinder, a transfer cylinder having a resilient blanket thereon, and an impression cylinder with all of said cylinders being of the same size and said transfer cylinder and said impression cylinder being in operative engagement with each other to receive a paper sheet therebetween, said impression cylinder having an operative peripheral surface of less than the circumference of such cylinder and having a transversely extending gap between the ends of such operative peripheral surface, said impression cylinder having axially extending paper stop means and a releasable paper embossing means operatively positioned in said gap, said impression cylinder having a leading edge at said gap extending radially thereof, the improvement comprising said paper stop means being mounted in the gap of said impression cylinder in juxtaposition to said leading edge, and one surface thereof being adjacent said leading edge at said gap, and a portion thereof forming a paper stop, an arcuate embossing plate on said impression cylinder and having a dependent flange on one end thereof, said flange extending into the gap of said impression cylinder and abutting said one surface of said paper stop means at said gap and being secured to said impression cylinder, the remainder of said embossing plate being carried by and closely conforming to the surface of said impression cylinder, and said embossing plate being relatively thin and having elevated sections thereon forming indicia to be directly embossed in a paper sheet as it is fed between said transfer cylinder and said impression cylinder.

2. Apparatus as in claim 1 where said paper stop means comprise a bar extending transversely of said impression cylinder within the periphery thereof, and bias means positioning said bar in said gap and forcing said one surface thereof to clamp said dependent flange against the leading edge of said impression cylinder at the gap.

3. Apparatus as in claim 2 where said portion of said bar comprises a plurality of upstanding lugs thereon adjacent its leading edge extending out beyond the periphery of said impression cylinder to form a stop for paper fed into the apparatus and wherein said embossing plate has a deformable metal backing thereon.

4. Apparatus as in claim 3 where said embossing plate is flexible but retains a given contour and said elevated sections thereon are between about .003 to about .012 inch high.

5. Apparatus as in claim 4 where said embossing plate extends around the operative circumference of said impression cylinder, and means secure the trailing end of said embossing plate to said impression cylinder.

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WILLIAM B. PENN, Primary Examiner

U.S. Cl. X.R.

101—229, 415.1
It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Claim 2, line 24, "bias" should be -- holding --

SIGNED AND
SEALED
SEP 8 - 1970

(SEAL)
Attest:
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