

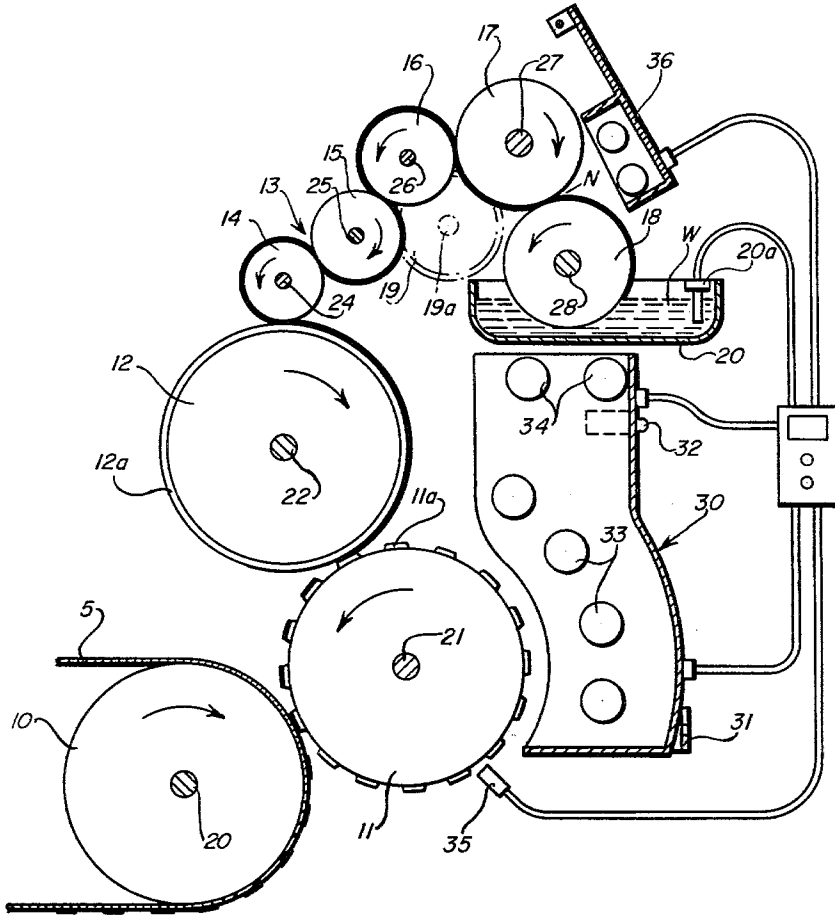
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METHOD FOR HOT WAX CARBON PRINTING

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METHOD FOR HOT WAX CARBON PRINTING

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This invention relates generally to a method for hot wax carbon printing and more particularly to a method for applying hot wax carbon spots to a sheet of paper.

Hot carbon printing is most commonly done on conventional flat bed cylinder presses to which various types of heating equipment are added. On such presses, melted wax compounds are used in lieu of printing ink and the printing plates are usually either molded or cut from rubber to desired shapes and areas. In this type of printing, the hot carbon wax compound, hereinafter referred to as wax or ink, is applied to the paper or backing sheet under impression and, as in conventional printing methods, the density of the imprint is controlled by the amount of ink which is applied to the plate by the inking mechanism.

In general, the inking mechanism, including the ink fountain and the fountain or dip roller is conventional except for the provision of heating equipment. In the use of these presses it is necessary to heat the press bed, the ink distribution plates, the ink fountain and usually one or more of the rollers in the inker roller train.

While presses such as these have found commercial acceptance, they are, nevertheless, characterized by certain basic faults or disadvantages. They operate at slow productive speeds resulting in increased product cost; the ink fountain is not well suited for controlling the low viscosity fluid inks that are commonly used; it is necessary to saturate large masses of iron and steel with heat in order to maintain correct temperature in a small volume of ink at the point of impression; and, excessive warm-up periods are required before productive operation of the press can start.

Hot carbon printing is also accomplished by the use of modified sheet-fed, rotary offset presses. While the cost of product production on these presses is less than that on flat bed cylinder presses, the inefficiencies of the heating methods are almost as great as on the cylinder presses. Offset presses of this nature are disclosed in U.S. Patents to Burke et al. 2,674,225 and 2,724,362. In presses of this nature it is necessary that the ink in the fountain and throughout the inking train be heated to 200° F. or more so as to be in a low viscosity highly fluid state. Wax and oil compounds in such a state have very little affinity for either rubber covered or metal surfaced rollers and are difficult to handle.

Presses such as shown in Burke et al. 2,724,362 employ a roller in the ink fountain which is intermittently indexed and also an oscillating ductor roller to pick up the ink from the fountain roller and apply it to a continuously rotating distributor roller. If a viscous, tacking printing ink could be used, such a ductor roller might perform satisfactorily because there would be sufficient friction to cause the ductor roller to accelerate and decelerate to the different speeds of the fountain and distributor rollers. However, hot molten ink is neither viscous nor tacky and accordingly lubricates the surfaces of the rollers so that there is considerable skidding and poor transfer of ink from the fountain roller to the inking train. Then too, because of the lack of affinity of the hot molten ink for the rollers it is extremely difficult to control its flow down through the roller train. The lack of affinity factor also substantially affects the speed of operation of the press as even at relatively low press speeds the ink is thrown

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from the rollers by centrifugal force causing what is commonly known as "misting." Excessive misting spoils the product.

It has been proposed to heat the impression roller thus partially to reflow the ink to be applied to sheets carried by this roller. The disadvantages of such a system are at least two-fold. First, the ink coating on the sheet is intended for one-time usage. To obtain the best copy, all the ink film should release from the backing sheet at the points of pressure or impact, the cleanest and best copy resulting when the ink film lies on the very surface of the sheet. Heating induces penetration of the ink into the sheet thus adversely affecting product quality. Second, heat applied directly to paper causes it to change dimensionally. For the most part, hot carbon printing is performed on the back of a pre-printed sheet which must register with the printing on other sheets when they are superimposed. Dimensional changes caused by heat application to the paper will adversely affect sheet registry and accordingly product quality.

It is accordingly an object of the invention to provide a method of applying hot wax carbon spots to a sheet of paper which overcomes the above-mentioned disadvantages as well as others in a thoroughly practical and efficient manner.

Another object is to eliminate waste of electricity and increase productive press time by reducing the initial warm-up period. Other objects will be in part apparent and in part pointed out hereinafter.

The single figure in the drawing is a diagrammatic view in side elevation of the essential portions of one form of press capable of carrying out my method.

Broadly stated, in the practice of my novel method, wax which is usually supplied in solid granular form is so treated as to transform it to a liquid state wherein its viscosity is relatively high. In this state the wax has a relatively high affinity for steel and rubber covered surfaces. With the wax in this condition it is transported at high speed to an application area where its viscosity is reduced to a point where the wax will flow freely. Simultaneously, with the reduction of viscosity, the wax is applied or coated on a printing surface that is moving at a high rate of speed. The high speed printing surface then carries its coat of liquid wax to a printing position where it is deposited on a paper sheet delivered to the printing position preferably at substantially room temperature.

More specifically I provide a source of wax or ink which is usually supplied to a fountain in solid granular form. This ink is initially heated to about 165° F. wherein it is in a condition of relatively high viscosity. In this condition, the ink is somewhat tacky and has sufficient affinity to cause it to adhere to the surfaces of the steel and rubber covered rollers of the press. The viscous ink is picked up from the fountain by a constantly rotating high speed dip roller to which the ink, because of its aforeseaid affinity, adheres even at such high speeds. The film of ink thus formed is carried by the dip roller to the nip between this roller and a constantly counter-rotating high speed doctor roller which I rotate at a speed greater than that of the dip roller. I also variably control the width of the gap between these two rollers, thus to control the thickness of the ink film. By reason of the difference in the peripheral speeds of the rollers and by controlling the width of the gap therebetween, I am able to transport low temperature viscous ink and thus avoid what has been referred to above as "misting" as well as squirting at the nip between the rollers.

The viscous film of ink is transferred from the doctor roller to a train of more or less conventional steel and rubber rollers, the last roller in the train transferring or applying the viscous low temperature film to a rubber covered high speed blanket roller. The viscous ink film

on the rotating blanket roller is then engaged by heated printing plates on a high speed rotating plate roller, the plates being sufficiently hot, about 200° F. to 220° F., to immediately transform the ink from a viscous to a free flowing liquid state, the printing plates accordingly being coated with liquid ink. The coated plates rapidly move to printing position where they substantially immediately after coating, impress their ink coating on the paper sheet. The sheet is fed to the printing position at approximately room temperature by a high speed impression roller so that the ink is printed only on the surface of the paper without penetrating it. Thus by transporting viscous ink and liquifying it just before printing, I am able to attain production of a high quality product at a rate of 6500 to 8500 impressions per hour.

Referring now to the drawing where I have shown a preferred form of my wax carbon printing press, the press frame (not shown) journals an impression roller 10 which is so arranged with respect to a plate roller 11, also journaled in the press frame, as to print wax carbon spots on paper sheets S serially fed thereto by any suitable sheet feeding mechanism (not shown). Journaled in the press frame above plate roller 11 is a blanket roller 12, this roller being provided with a rubber surface 12a adapted to be engaged by printing plates 11a formed on the surface of plate roller 11.

An ink distributing train, generally indicated at 13 comprises a roller 14, covered with rubber or a rubber-like material, a steel axially reciprocable roller 15 and a roller 16, covered similarly to roller 14, the train 13 overlying plate and blanket rollers 11 and 12 and its several rollers being journaled in the press frame. Rollers 10, 11, 12, 14, 15 and 16 are respectively mounted on shafts 20, 21, 22, 24, 25 and 26, each shaft carrying a gear (not shown) the successive gears being in mesh to form a gear train whereby the several rollers can be driven from any conveniently located power input (not shown).

Adjacent roller 16 is a steel doctor roller 17 mounted on a shaft 27 journaled in the press frame. This shaft also carries a gear (not shown) which meshes with an idler gear 19 mounted on a shaft 19a journaled in the press frame. Idler 19 is in mesh with the gear on shaft 25 thus connecting the doctor roller gear to the power input.

A steel dip roller 18 is mounted below doctor roller 17 on a shaft 28 journaled in the press frame, the dip roller being disposed in an ink fountain 20. The journals (not shown) which bear shaft 28 are adjustably mounted in the press frame in any convenient manner as to permit movement of the dip roller axis relative to the doctor roller axis, thus to enable selective variation of the space or gap between adjacent surfaces of the two rollers. Thus the amount of wax carried away from the dip roller 18 by the doctor roller can be accurately controlled and accordingly the thickness of the wax ultimately layed or printed on paper sheet S by plate roller 11.

Dip roller shaft 28 is driven through a speed change mechanism (not shown) of any well known construction connected in any suitable manner to the power input so that the rate of rotation of dip roller 18 may be varied quickly and at will thus to control with high accuracy the amount of wax delivered to doctor roller 17 by the dip roller. In operation, the speed change mechanism is so set as always to effect rotation of dip roller 18 at a lesser r.p.m. than the fixed r.p.m. of doctor roller 17. As the rate of rotation of dip roller 18 may thus be selectively varied, it follows that the amount of wax W carried from fountain 20 to doctor roller 17 may be controlled with a high degree of accuracy. It further follows that the combination of variable relative speeds and adjustable gap in the dip roller-doctor roller couple provides a highly effective means for controlling feed-in of the wax and obviates the deficiencies and disadvantages of the conventional system of intermittently

driven dip roller, scraping doctor blade and oscillating doctor roller.

It should be noted that an additional advantage accrues to driving the dip roller at a rate of rotation less than that of the doctor roller. When it is borne in mind that the press is operated at speeds enabling production at the rate of 6500 to 8500 impressions per hours, it is obvious that the peripheral velocities of the dip and doctor rollers at the nip N therebetween are quite substantial. Were these rollers operated at the same speed wax would accumulate rapidly at the nip and inevitably result in highly objectionable spitting or squirting. By rotating the dip roller at a slower rate than the doctor roller, no such wax accumulation can result and spitting or squirting of the wax is prevented.

On prior sheet-fed, hot carbon presses of both the flat bed and offset type, the printing plates are usually heated from the back side. To accomplish this it is necessary, in the flat bed type, to saturate the bed, the plate mounting material, and the plate itself to maintain approximately 200° F. temperature at the surface of the pad. To obtain and maintain this surface temperature greater temperatures in the masses involved are required and it is necessary to saturate these masses by pre-heating before printing can begin. The usual pre-heating period is three to three and a half hours depending on ambient temperature conditions and other factors. Thus, on the basis of an eight hour working day, the effective or productive press time is four and a half to five hours with three to three and a half hours of electricity consumption being unproductive.

On the off-set presses the same conditions obtain in spite of the recent use therein of radiant heating means. In order to maintain adequate printing temperatures within a tolerable range, saturation by preheating is requisite. Thus, because these off-set presses can only produce with high temperature low viscosity ink, it is necessary to saturate the plate roller and other masses, thus, in effect, to heat the printing plates from the back. It is also necessary in the use of both flat bed and offset presses to pre-heat the rubber-covered inking rollers in heated cabinets before placing them on the press to begin operation as the ink must be delivered to the plate roller in a highly fluid low viscosity condition. Consequently the wasteful electricity consumption also characterizes the use of off-set presses.

In the use of my press these heating problems are overcome by reason of the fact that the press operates at considerably lower temperature and because of the type of heating means employed. As noted above the wax delivered to plate roller 11 is quite viscous, hence the wax W in fountain 20 is heated only to about 165° F., plate roller 11 being heated to about 200° F. to 220° F. This is accomplished through the provision of a radiant heating device, generally indicated at 30, which is preferably hingedly secured to the press frame by a hinge 31, a latch 32 being utilized to lock the heater in operative position relative to plate roller 11 and fountain 20. Heater 30 includes a plurality of heating elements 33 and 34 which are preferably long wave, infrared quartz tubes. Tubes of this nature attain maximum heat output almost instantaneously and lose about 80 percent of their heat output within two seconds after the current is shut off. Most other types of heating elements require a considerable time to heat up and continue to radiate heat for long periods after the current is cut off. Such continued radiation damages printing plates and makes it difficult for operators to make plate changes immediately after completing a job.

I have shown heater 30 as having four heating elements 33 arcuately arranged about plate roller 11 and two elements 34 underlying fountain 20. It will, of course, be understood that more or less heating elements may be used as is convenient or desirable.

The current flow to elements 33 is controlled by a

thermocouple 35 to maintain continuous, uniform temperatures at the surface of printing plates 11a. The thermocouple wires are in close proximity to, but not in contact with the peripheral surface of the plate roller bearer. Since there is no contact with the bearer surface and since the bearer surface is highly polished, the thermocouple senses reflected heat which is considerably greater than the saturated temperature of the roller itself. Thus, it is possible to start printing after pre-heating the printing plates only. Also there is enough up-draft of warmth from the plate roller heating elements 33 to sufficiently heat the rollers in the inking train.

Heating elements 34 for fountain 20 may be controlled by a thermal switch 20a immersed in the wax in the fountain.

As dip roller 18 and doctor roller 17 require saturation, I preferably provide a supplementary heater 36. This heater is used only for initial warm up and is not required during operation.

Thus, through the provision of the above-described heating system it is possible to pre-heat the press to operating temperature in one to one and a half hours thereby saving substantial amounts of electricity and lengthening the daily productive time of the press.

It will now appear that I have provided a method and apparatus for hot wax carbon printing that attains the several objects set forth above in a thoroughly practical and efficient manner.

As many variations of the method and the apparatus may be made, it will be understood that the foregoing should be interpreted as illustrative, the scope of the invention being defined in the appended claims.

I claim:

1. The herein method which includes the steps of heating a substantially solid carbon wax ink to a first elevated temperature to render it flowable but of relatively high viscosity so that it has a high affinity for steel and rubber covered rollers, forming and moving a film of said highly viscous ink while at said first temperature to a transfer point, heating the printing surface areas of a printing plate to a second elevated temperature that is higher than the temperature of said ink at said transfer point, moving said heated printing surface areas into contact with the ink at said transfer point to thereby increase its fluidity and lower its viscosity so as to readily coat said printing surface areas, and finally transferring the ink coating from said printing surface areas to a relatively cool sheet of paper.
2. In an offset printing press utilizing a carbon wax ink which is substantially solid at room temperature and whose viscosity varies inversely with temperature, the steps of:

heating said ink to a first elevated temperature to render it flowable but of relatively high viscosity, forming and moving a thin continuous film of said heated ink to an application surface of a blanket cylinder while in its state of relatively high viscosity, externally heating the printing surface areas of a printing cylinder to a second elevated temperature which is higher than said first temperature to render said thin film of ink highly fluid and of relatively lower viscosity at the point of transfer from said blanket cylinder to said printing surface areas, and finally transferring said ink from said printing surface areas to a sheet of paper while said ink is in its highly fluid state.

3. The herein described method of applying hot wax carbon ink to a sheet of paper comprising the successive steps of:

heating solid wax carbon ink to a first temperature to render it flowable but of relatively high viscosity, forming and moving a thin continuous film of said

heated wax carbon ink to an application surface of a blanket cylinder,

externally heating the printing surface areas of a printing cylinder to a second temperature higher than the temperature of said thin film of wax carbon ink on said blanket cylinder,

transferring said thin film of wax carbon ink to said externally heated surface areas of said printing cylinder to instantly increase the fluidity and lower the viscosity of said wax carbon ink film,

and finally transferring said carbon wax ink film from said printing cylinder to said sheet of paper while in its low viscosity highly fluid state.

4. The herein described method of applying hot wax carbon ink to a sheet of paper comprising the successive steps of:

heating solid wax carbon ink to a first temperature to render it flowable but of relatively high viscosity, forming and moving a thin continuous film of said heated wax carbon ink to an application surface of a blanket cylinder,

externally heating the printing surface areas of a printing cylinder to a second temperature higher than the temperature of said thin film of wax carbon ink on said blanket cylinder immediately prior to surface engagement of said printing surface areas with said blanket cylinder whereby the viscosity of said carbon wax ink is instantly lowered,

and finally transferring said wax carbon ink from said printing surface areas of said printing cylinder to a sheet of paper.

5. The method as set forth in claim 2 further comprising the steps of sensing the surface of said printing cylinder thereby to control said heating whereby the printing surface areas of said printing cylinder are maintained uniformly heated at said temperature.

6. In an offset printing press utilizing a carbon wax ink which is substantially solid at room temperature and whose viscosity varies inversely with temperature, the steps of:

heating said ink to a first elevated temperature to render it flowable but of relatively high viscosity,

forming and moving a thin continuous film of said heated ink to an application surface of a blanket cylinder while in its state of relatively high viscosity, applying radiant heat to the external printing surface areas of a printing cylinder to a second elevated temperature which is higher than said first temperature to render said thin film of ink highly fluid and of relatively lower viscosity at the point of transfer from said blanket cylinder to said printing surface areas,

and finally transferring said ink from said printing surface areas to a sheet of paper while said ink is in its highly fluid state.

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