April 6, 1954 W. F. BURKE ET AL 2,674,225

APPARATUS FOR IMPRINTING CARBON ON PAPER

Filed Aug. 10, 1951 3 Sheets-Sheet 1

FIG. 1

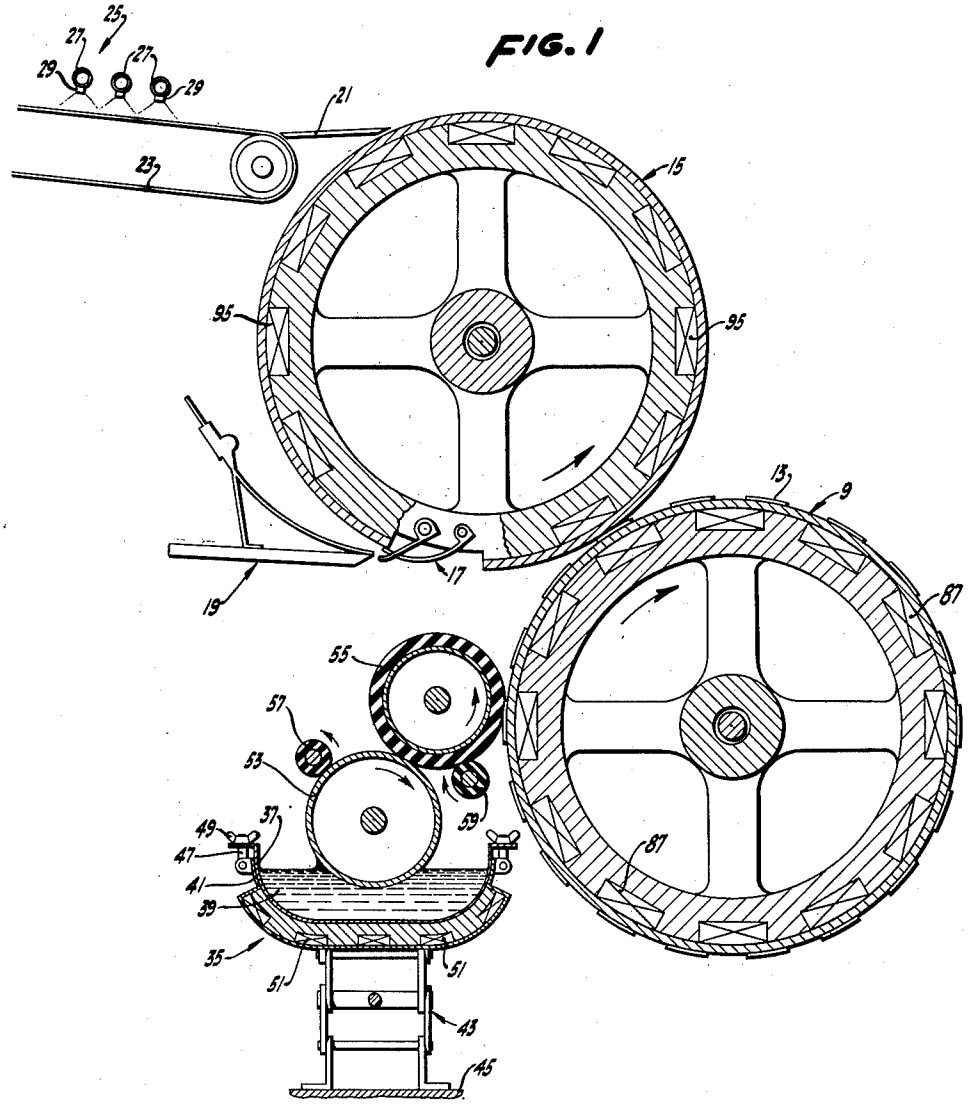
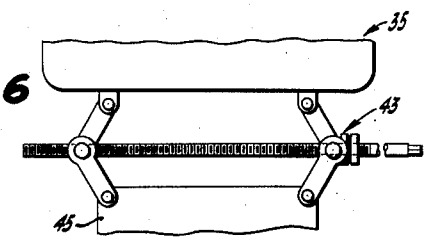


FIG. 6



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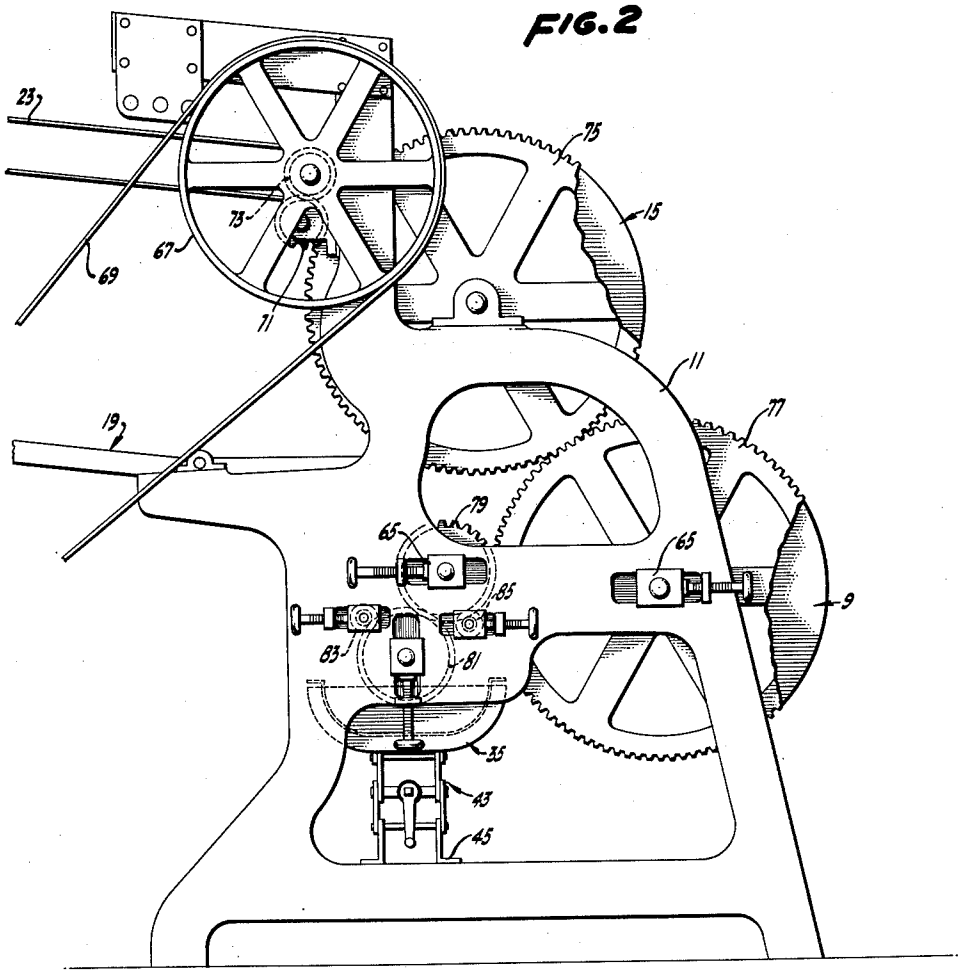
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April 6, 1954 W. F. BURKE ET AL 2,674,225

APPARATUS FOR IMPRINTING CARBON ON PAPER

Filed Aug. 10, 1951 3 Sheets-Sheet 2

FIG. 2



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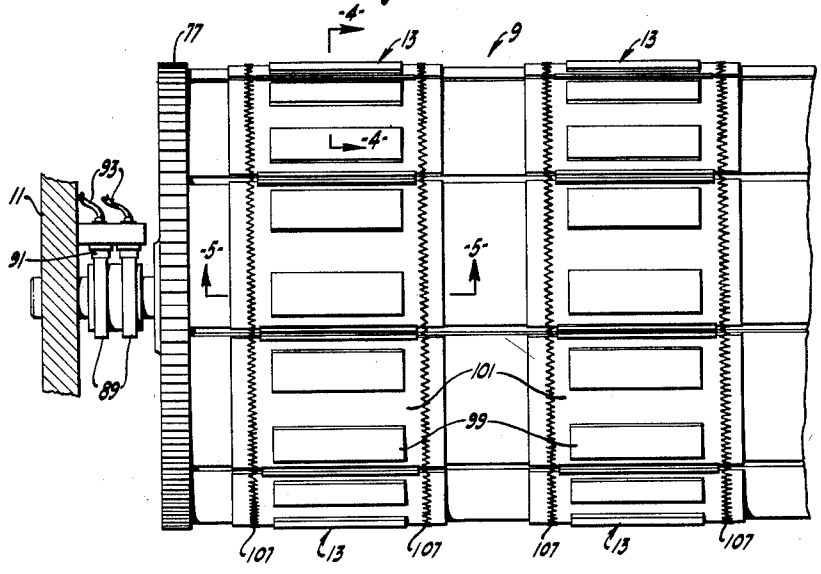
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APPARATUS FOR IMPRINTING CARBON ON PAPER

Filed Aug. 10, 1951 3 Sheets-Sheet 3

FIG. 3



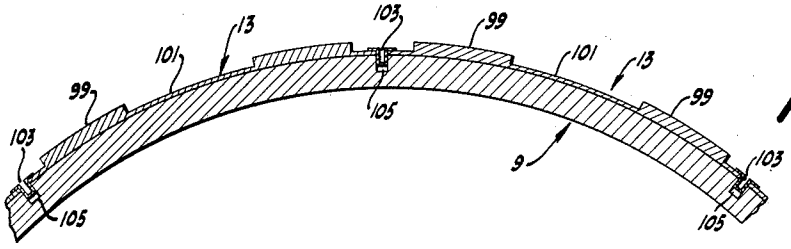


FIG. 4

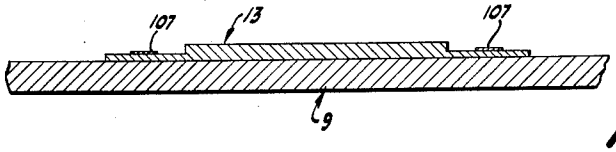


FIG. 5

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Patented Apr. 6, 1954

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UNITED STATES PATENT OFFICE

2,674,225

APPARATUS FOR IMPRINTING CARBON ON PAPER

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Application August 10, 1951, Serial No. 241,286

7 Claims. (Cl. 118—202)

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This invention relates to a wax carbon printing press and particularly to a sheet fed rotary wax carbon printing press.

The usual printing press of the above type now in use includes a printing cylinder, a wax carbon applicator mechanism for applying a film of wax carbon to the printing cylinder, and an impression cylinder for carrying paper sheets into printing contact with the printing cylinder to effect an application of wax carbon spots to the sheets. The above mentioned wax carbon applicator mechanism has assumed several forms, but the mechanism now in common use includes a fountain roller partially immersed in a body of liquid wax carbon and rotatably driven to pick up a film of wax carbon, and a form or transfer roller adapted to transfer the film to the printing cylinder.

It is important, in order to produce a commercially satisfactory product, that the wax carbon film applied to the printing cylinder be of uniform thickness throughout the width of the printing cylinder and be maintained at a uniform thickness during the operation of the press so that a group or groups of sheets can have wax carbon spots applied thereto of uniform thickness. It is also important to be able to regulate the thickness of the applied film to enable duplication of previously prepared stock and also to enable the application of spots of different uniform thicknesses to different kinds, grades, et cetera of paper stock.

With the above described type of press running at the speed commercially demanded, wax carbon piles up between the fountain roller and the form roller and this body of wax carbon forces itself between these rollers, thus depositing a film of excess thickness on the paper sheets, that is a film of greater thickness than desired, regardless of adjustments of the press.

A main object of the present invention is to provide a printing press of the character above described wherein the above enumerated disadvantages are eliminated by the incorporation in such a press of a new and novel wax carbon applicator mechanism constructed and arranged to apply an even, uniform film of wax carbon to a printing cylinder, which applicator mechanism is so adjustable as to enable accurate variations of the thickness of the applied film.

More particularly, it is an object of the present invention to provide a press of the class described wherein there is provided a vibrating gauge roller, disposed in close proximity to the leading side of the fountain roller and operable

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to remove excess wax carbon off the fountain roller to prevent piling up of wax carbon between the fountain roller and form roller, and wherein there is another vibrating gauge roller disposed in close proximity to the leading side of the form roller to further regulate the thickness of the wax carbon film, both of said gauge rollers, said fountain and form rollers and said printing cylinder being adjustably mounted to enable precise variation of the thickness of the wax carbon spots applied to the paper sheets.

Prior printing presses of the character previously described have utilized a radiant heating arrangement for heating the printing cylinder and the impression cylinder. The heating elements in this prior arrangement have been attached to removable hoods positioned and designed to partially enclose the peripheries of the printing and impression cylinders. The above type of heating arrangement has failed to uniformly heat the printing cylinder and the paper sheets carried by the impression cylinder. This failure has been caused in part by air movements beneath hoods and out the ends thereof, and in part by lack of complete enclosure of the entire periphery of each cylinder. It has been found that the variation in temperature across the width of the printing and impression cylinders is sufficient to cause the resulting carbon coating to vary in quality to such a degree as to render the product commercially unsatisfactory.

Furthermore, the above manner of heating is necessarily carried on at temperatures so high that when the press is stopped, for any of a number of reasons, the printing and impression cylinders are detrimentally affected and made unfit for use, unless special precautions are taken to shield the cylinders or separate the heating elements and cylinders.

Another object of the present invention is to provide a printing press of the class described in which the heating elements are built into the printing and impression cylinders to thereby enable absolute control over the temperatures of the printing and impression cylinders and to maintain the cylinders at a uniform temperature throughout their widths and peripheries, said construction allowing the heating elements to be kept at a lower temperature than required in the hood-type structure thereby avoiding the detrimental effects resulting from the use of the high temperature previously required.

Prior sheet fed rotary wax carbon printing presses for printing wax carbon spots have also been objectionable in that it has been difficult to

maintain the printing plates in a fixed position on the printing cylinder, and therefore difficult to maintain registry of the wax carbon spots with respect to the sheets to which they are applied.

Another object of the present invention is to provide a printing press of the class described in which segmental printing plates are provided and so mounted on a printing cylinder, that although they can be readily replaced, they are held in a fixed position on the cylinder and therefore maintain registry of the spots applied thereby to the sheets.

In our copending application entitled Method and Apparatus for Applying Wax Carbon Spots on Paper Sheets, Serial Number 772,674, filed September 8, 1947, and now abandoned, the difficulties of obtaining a smooth wax carbon spot of uniform thickness because of the formation of irregularities at the time of the application of the spot are set forth. Briefly these difficulties arise as follows. Immediately after the application of a wax carbon spot to a sheet of paper carried by the impression cylinder, the sheet of paper and printing plate applying the spot are separated and the adherence of the spot to both the paper and printing plate creates minute peaks and valleys across the surface of the spot, resulting in an unsatisfactory product. In our copending application above identified, we disclose means for reflowing each carbon spot immediately after it has been applied to the paper and then chilling and solidifying the spot before it has had an opportunity to flow out of perfect uniformity.

Another object of the present invention is to improve on the manner of obtaining a smooth wax carbon spot of even thickness by providing an arrangement for maintaining the applied wax carbon spot in a semi-fluid state during the period of time between the application of a spot and chilling of the spot, thereby eliminating the step of reflowing the spot.

Another object of the present invention is to provide a printing press wherein the impression cylinder is cooled so that rapid cooling of the spots can be achieved immediately after the spots are applied to the sheets, to prevent penetration of the wax carbon into paper having a rough absorbing surface.

A still further object of the present invention is to provide an improved fountain and a new and novel means of adjusting the height of the fountain.

Various other objects will be apparent from the following description taken in connection with the accompanying drawings wherein:

Fig. 1 illustrates, diagrammatically, a sheet fed rotary wax carbon printing press embodying the concepts of the present invention.

Fig. 2 is a view, similar to Fig. 1, showing a frame and gears for driving various of the parts disclosed in Fig. 1.

Fig. 3 is a fragmentary plan view of a printing cylinder and means for supplying electric current to the cylinder

Fig. 4 is a sectional view taken along line 4—4 of Fig. 3 showing the clips for preventing relative circumferential movement between the printing plates to the printing cylinder.

Fig. 5 is a fragmentary longitudinal sectional view taken along line 5—5 of Fig. 3 showing the resilient bands for holding the printing plates against the exterior of the printing cylinder.

Fig. 6 is a fragmentary view taken in side elevation showing the scissors jack for adjustably supporting the fountain.

Referring to the accompanying drawings wherein similar reference characters designate similar parts throughout, the arrangement disclosed in Fig. 1 includes a printing cylinder 9 rotatably mounted in a frame 11 and having thereon segmental printing plates 13 secured thereto in a manner to be explained more in detail hereinafter. There is an impression cylinder 15 rotatably supported in frame 11 and having its periphery disposed closely adjacent to or in engagement with the printing plates 13 on the printing cylinder 9. There are a plurality of grippers 17 on the impression cylinder, only one gripper being shown schematically, for receiving in consecutive fashion a series of sheets from a delivery mechanism 19, which is also only schematically disclosed, said delivery mechanism and grippers being well known in the art.

The impression cylinder 15 is adapted to deliver sheets of paper which have had wax carbon spots applied thereto to a transfer finger bridge 21 which in turn transfers the sheets of paper to a belt 23 which carries the paper sheets, spot-side-up, under a cooling mechanism 25. Cooling mechanism 25 has a plurality of conduits 27 and on these conduits are provided nozzles 29 for directing blasts of cool air onto the wax carbon spots to cool same, it being preferable that the blasts of air overlap in two directions, in the direction along the belt as clearly shown in Fig. 1 and in a direction perpendicular to the plane of the paper.

There is an applicator mechanism for applying a film of wax carbon to the printing cylinder 9 and this mechanism is most clearly shown in Fig. 1. The applicator mechanism includes a fountain generally entitled 35 including a removable pan 37 adapted to hold a body of hot fluid wax carbon 39. Pan 37 is supported by a basin 41 which in turn is supported by a scissors jack 43 from the floor 45 or other equivalent supporting surface.

Basin 41 includes upwardly extending pivotally mounted threaded members 47 receivable by notches in an outwardly extending flange on pan 37, said pan being secured in place by wing nuts 49. Basin 41 has preferably incorporated therein a plurality of strip heating elements 51 which are adapted to be supplied with electric current from a source not shown, for maintaining the wax carbon 39 in a fluid condition.

The applicator mechanism includes a fountain roller 53 partially immersed in the wax carbon 39 and adapted to transfer a film of wax carbon to a form roller 55 which is disposed in engagement with or in close proximity to the fountain roller and also in engagement with or in close proximity to the printing plates of the printing cylinder 9. The direction of rotation of the fountain roller and form roller is clearly shown in Fig. 1 by the arrows and it can be seen that the fountain roller is driven in a clockwise direction whereas the form roller is driven in a counter-clockwise direction, such construction ensuring that any excess fluid which collects will collect in the nip of the fountain and form rollers opposite the printing cylinder 9.

However, for preventing any accumulation of wax carbon between the fountain and form rollers and for varying the thickness of the wax carbon film, there is provided a vibrating gauge roller 57 disposed in engagement with or closely adjacent to the leading side of the fountain roller 53

so as to remove excess wax carbon picked up by the fountain roller 53 and also to smooth out and distribute the wax carbon film on the fountain roller by virtue of its vibratory motion. There is a second vibrating gauge roller 59 disposed in engagement with or closely adjacent to the leading side of the form roller 55. Vibrating roller 59 operates to regulate the thickness of the film on the form roller and also to prevent excess wax carbon from being applied to the printing cylinder 9. It will therefore be seen that by the provision of the two vibrating gauge rollers 57 and 59 in engagement respectively with the leading sides of the fountain and form rollers, excess wax carbon can be removed from the fountain and form rollers and a uniform film of wax carbon applied to the printing cylinder.

In order to enable accurate variation in the thickness of the wax carbon film, gauge rollers 57 and 59, fountain and form rollers 53 and 55, and printing cylinder 9 are adjustably supported in frame 11 by screw adjusted blocks 65. By an appropriate shifting of the rollers and printing cylinder a particular film thickness can be obtained.

A drive for the various rollers and cylinders preferably includes a main pulley 67 driven by a belt 69, pulley 67 driving an idler gear 71 by means of a gear 73 mounted on the pulley shaft for pulley 67, said idler gear being in driving engagement with an impression cylinder gear 75. Impression cylinder gear 75 in turn engages a printing cylinder gear 77. The printing cylinder gear in turn engages a form roller gear 79 which drives a fountain roller gear 81. The vibrating rollers 57 and 59 are provided with gears 83 and 85 respectively in driving engagement with gears 79 and 81. The distances the rollers and printing cylinder are shifted to vary the thickness of the wax carbon film are relatively small compared to the sizes of the gears, and therefore, this adjustment will not impair the gear drive. The vibrating drive for gauge rollers 57 and 59 has not been disclosed since such a drive, apart from the combination of the present invention, is old.

Figs. 3 through 6 disclose more in detail the construction of the printing cylinder 9 and also show the manner of supplying electric current to the printing cylinder. Whereas in prior constructions, radiant heat was used to supply heat to the printing cylinder 9, resulting in uneven wax carbon spots, in the present invention, heating elements 87 are carried by the printing cylinder 9 preferably at equally spaced points thereabout. Heating elements 87 are supplied with electric current through slip rings 89, brushes 91 and leads 93.

The impression cylinder also has a plurality of heating elements 95 carried thereby at equally spaced points therearound, heating elements 95 being supplied with electrical energy through a slip ring and brush arrangement similar to that described above but not shown in the drawings.

It has been previously mentioned that in prior devices there was encountered difficulty in achieving constant registry of the applied wax carbon spots on the sheets of paper. In the present invention this difficulty is obviated by a novel construction most clearly shown in Figs. 3 through 6. The segmental printing plates 13 previously referred to are arranged to extend completely around printing cylinder 9, said printing plates having raised printing surfaces 99 and depressed connecting web-like surfaces 101. The printing plates are adapted to be restrained against circumferential movement with relation to the printing cylinder 9 by means of a plurality of clips 103 yieldably receivable within a plurality of grooves 105 provided longitudinally of the periphery of printing cylinder 9.

To hold plates 13 against the peripheral surface of printing cylinder 9, a plurality of resilient metallic bands 107 are provided which encompass the printing cylinder 9 and engage portions 101 of segmental printing plate 13 as best shown in Figs. 3 and 5. Clips 103 stop short of resilient bands 107 as is apparent from Fig. 3. By the above arrangement it is obvious that the printing plates are secured to the periphery of the printing cylinder 9 in a manner such as to prevent any movement of the printing plates with respect to the cylinder thereby ensuring consistent registry of the wax carbon spots applied by the printing plates to the paper sheets.

It has been mentioned previously that there has been difficulty in achieving a consistently smooth and even spot. That is, when each sheet parts from the printing cylinder as it is carried around by the impression cylinder, the detaching operation of the sheet from the printing cylinder raises minute peaks and valleys on each spot of wax carbon. Heretofore, one method of attempting to achieve an even wax spot and eliminate the peaks and valleys has been by a reflowing step as disclosed in our co-pending application previously identified. In the present invention, however, by means of the heating elements 95 on the impression cylinder, the wax carbon spots can be kept in a semi-fluid state so that the peaks and valleys have a chance to level out before the cooling step. As the carbon sheets are delivered to the transfer figure bridge 21 and pass under the nozzle 29, they are then cooled while the surfaces of the wax carbon spots are smooth.

Where uncoated sheets are to have wax carbon spots applied thereto, the sheets are naturally rough and penetration of the wax carbon into the sheets is undesirable. Under these conditions, cooling passageways within the impression cylinder can be provided instead of the heating elements 95 so as to immediately cool the wax carbon spots as the spots are applied, therefore preventing penetration of the wax carbon into the rough sheets.

By the above described structure, the present invention provides a sheet fed rotary wax carbon printing press wherein an even film of wax carbon can be continuously applied to the printing cylinder therefore ensuring that a consistently even film will be applied to a series of sheets. By the provision of the vibrating rollers 57 and 59, there is also assurance that the printing plates, which are axially or longitudinally spaced from one another, will each print a wax carbon spot of the same thickness on the sheet registered with such plate. By virtue of the heating elements 95, the wax carbon spots applied to the paper sheets are kept in a semi-fluid state to allow leveling of the spots prior to the chilling. The scissors jack enables the amount of immersion of the fountain roller 53 in the bath 39 to be adjusted while the press is operating. The adjustment of the vibrating rollers, and the fountain and form rollers, and printing cylinder enables the thickness of the film applied to the printing cylinder and therefore the thickness of the resulting wax spots can be regulated and determined. The provision of segmental printing plates 13 and the securing structure, including clips 105 and bands 107, assures that the printing plates will be fixedly held with relation to the printing cylinder 9 to always

ensure accurate registry of the wax carbon spots on the sheets, yet allows the printing plates to be readily removed and replaced when desired.

While we have shown the preferred form of our invention, it is to be understood that various changes may be made in its construction by those skilled in the art without departing from the spirit of the invention as defined in the appended claims.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. In a press of the character described, an impression cylinder, a rotary printing cylinder adjacent thereto, a wax carbon fountain, a fountain roller partially immersed in the fountain, a form roller engaging both said fountain roller and said printing cylinder for transferring a film of wax carbon from the fountain roller to the printing cylinder, a first vibrating roller engageable with the leading side of the fountain roller for smoothing out the film picked up by the fountain roller and for removing excess wax carbon, and a second vibrating roller engaging the leading side of the form roller for smoothing out the transferred film thereon and removing excess wax carbon, each of said rollers being adjustable toward and away from its adjacent roller to enable varying the thickness of the film applied to the printing cylinder.

2. In a press of the character described, an impression cylinder, a rotary printing cylinder adjacent thereto, a wax carbon fountain, a fountain roller partially immersed in the fountain, a form roller engaging both said fountain roller and said printing cylinder for transferring a film of wax carbon from the fountain roller to the printing cylinder, a first vibrating roller engageable with the leading side of the fountain roller for smoothing out the film picked up by the fountain roller and for removing excess wax carbon, and a second vibrating roller engaging the leading side of the form roller for smoothing out the transferred film thereon and removing excess wax carbon, each of said rollers and said printing cylinder being adjustable toward and away from the element which it engages to enable varying the thickness of the wax carbon spots applied by the printing cylinder.

3. In a press of the character described, an impression cylinder, a rotary printing cylinder adjacent thereto, a wax carbon fountain, a fountain roller partially immersed in the fountain, a form roller engaging both said fountain roller and said printing cylinder for transferring a film of wax carbon from the fountain roller to the printing cylinder, a first vibrating roller engageable with the leading side of the fountain roller for smoothing out the film picked up by the fountain roller and for removing excess wax carbon, and a second vibrating roller engaging the leading side of the form roller for smoothing out the transferred film thereon and removing excess wax carbon, electrical heating elements carried by the printing cylinder for maintaining the wax carbon in a semi-fluid state, electrical heating elements carried by the impression cylinder for maintaining the wax carbon in a semi-fluid state, and means for supplying electric current to the heating elements.

4. In a press of the character described, an impression cylinder, a rotary printing cylinder adjacent thereto, a wax carbon fountain, a fountain roller partially immersed in the fountain, a form roller engaging both said fountain roller and said printing cylinder for transferring a film of wax carbon from the fountain roller to the printing cylinder, a first vibrating roller engageable with the leading side of the fountain roller for smoothing out the film picked up by the fountain roller and for removing excess wax carbon, and a second vibrating roller engaging the leading side of the form roller for smoothing out the transferred film thereon and removing excess wax carbon, said printing cylinder having a plurality of segmental printing plates thereon, and means for detachably fixedly securing said plates to the printing cylinder to prevent shifting of the plates relative to the printing cylinder.

5. In a press of the character described, an impression cylinder, a rotary printing cylinder adjacent thereto, a wax carbon fountain, a fountain roller partially immersed in the fountain, a form roller engaging both said fountain roller and said printing cylinder for transferring a film of wax carbon from the fountain roller to the printing cylinder, a first vibrating roller engageable with the leading side of the fountain roller for smoothing out the film picked up by the fountain roller and for removing excess wax carbon, and a second vibrating roller engaging the leading side of the form roller for smoothing out the transferred film thereon and removing excess wax carbon, said printing cylinder having a plurality of segmental printing plates thereon, and means for detachably fixedly securing said plates to the printing cylinder to prevent shifting of the plates relative to the printing cylinder, said means including longitudinally extending clips receivable in grooves in the periphery of the cylinder and resilient bands encompassing the printing cylinder and retaining said plates in place.

6. In a press of the character described, an impression cylinder, a rotary printing cylinder adjacent thereto, a wax carbon fountain, a fountain roller partially immersed in the fountain, a form roller engaging both said fountain roller and said printing cylinder for transferring a film of wax carbon from the fountain roller to the printing cylinder, a first vibrating roller engageable with the leading side of the fountain roller for smoothing out the film picked up by the fountain roller and for removing excess wax carbon, and a second vibrating roller engaging the leading side of the form roller for smoothing out the transferred film thereon and removing excess wax carbon, said printing cylinder having a plurality of segmental printing plates thereon, and means for detachably fixedly securing said plates to the printing cylinder to prevent shifting of the plates relative to the printing cylinder, said means including longitudinally extending clips receivable in grooves in the periphery of the cylinder and resilient bands encompassing the printing cylinder and retaining said plates in place, electrical heating elements carried by the printing cylinder for maintaining the wax carbon in a semi-fluid state, electrical heating elements carried by the impression cylinder for maintaining the wax carbon in a semi-fluid state, and means for supplying electric current to the heating elements.

7. In a press of the character described, an impression cylinder, a rotary printing cylinder adjacent thereto, a wax carbon fountain, a fountain roller partially immersed in the fountain, a form roller engaging both said fountain roller and said printing cylinder for transferring a film of wax carbon from the fountain roller to the printing cylinder, a first vibrating roller

engaging the leading side of the fountain roller for smoothing out the film picked up by the fountain roller and for removing excess wax carbon, and a second vibrating roller engaging the leading side of the form roller for smoothing out the transferred film thereon and removing excess wax carbon, each of said rollers and said printing cylinder being adjustable toward and away from the element which it engages to enable varying the thickness of the wax carbon spots applied by the printing cylinder, the adjustment of each of the rollers being in a horizontal direction except in the case of the fountain roller which is in a vertical direction.

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