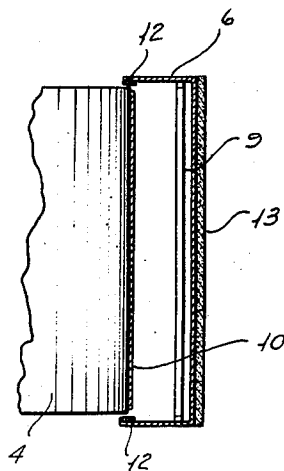
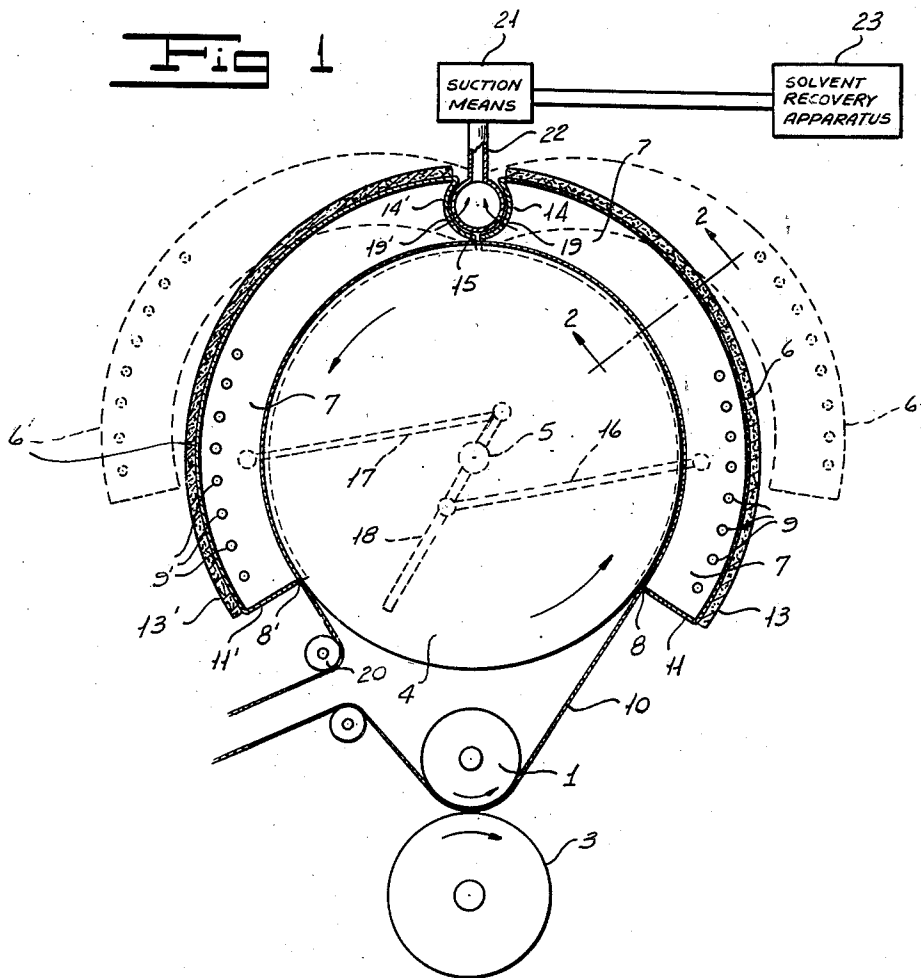


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M. MAUFFRE
DRIER FOR PRINTED WEBS
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INVENTOR
MARCEL MAUFFRE
BY *[Signature]*
ATTORNEY

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DRIER FOR PRINTED WEBS

Marcel Mauffre, Paris, France, assignor to La
Cellophane, Paris, France, a French company

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This invention relates to a device for drying the ink on continuous printed webs as delivered from an intaglio printing press, and more particularly to a drier for webs of non-absorbent material, such as regenerated cellulose, or the like.

Intaglio printing processes which have long been employed industrially for continuous printing on paper have for some years been applied to non-fibrous webs of cellulosic and other various synthetic products or derivatives of natural products. The printing members employed in such processes are engraved cylindrical rollers, the depressions in which are filled with ink which is transferred on to the web to be printed, the web being passed between the intaglio roller and a rubber impression roller.

The inks employed in such printing operations are prepared with volatile solvents with the object of causing rapid drying after printing. In practice, however, this drying is rapid only in the case of printing on paper, because the paper, owing to its fibrous nature, allows the ink to penetrate partially into the more or less porous base which facilitates rapid absorption and elimination of the solvents.

In the case of printing on thin non-fibrous webs as for example webs of regenerated cellulose, on the other hand, the ink does not penetrate into the mass of the web, but remains on the surface and the time taken in the elimination of the solvents is relatively long, so that it is necessary to provide a much longer drying path than in the case of paper, to reduce the printing speed considerably and to employ extensive drying arrangements.

The method of drying most frequently employed consists in passing the web over a number of guide rollers located in a chamber through which hot air is circulated. The heat may be supplied in the vicinity of the web by electrical resistors which heat the circulating air. This method of drying by hot air circulation is harmful to regenerated cellulose webs, which thus lose a substantial proportion of their normal moisture content and become fragile while at the same time contracting, thereby leading to serious difficulties in exact registering of webs when it is necessary to superimpose several impressions of different colors in a number of successive operations.

The arrangement according to the present invention overcomes these serious disadvantages, while providing in addition other advantages which will hereinafter be described in greater detail with reference to a specific embodiment,

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which is shown for purposes of illustration only. This example concerns more particularly printing on thin webs of regenerated cellulose, but the invention is also applicable to printing on other non-fibrous webs.

In the drawing:

Fig. 1 is a sectional view of a drier embodying the present invention; and

Fig. 2 is a partial section taken on the line 2-2 of Fig. 1.

Referring to the drawing more in detail the web 10 of regenerated cellulose first passes between a pressure roller 1 and an intaglio printing roller 3 of a printing press. The printed web then passes around a cylindrical drum 4 of fairly large diameter having a plain or perforated periphery. The said drum may consist of aluminum or any other suitable metal. It must be perfectly machined and be of perfectly regular cylindrical form so as to avoid registering difficulties at the following printing stations. Preferably, it is mounted for free rotation on a shaft 5 which is journaled on ball bearings for free rotation. Under these conditions, the drum 4 is driven without effort by the web, which is taken up by a following printing roller or by a cutting or reeling device indicated as a roller 20. The web delivered onto the drum 4, due to the great surface contact area, does not slide thereon, thereby eliminating all possibility of transverse displacement, which is almost unavoidable in cases where a web is guided over spaced rollers or fixed surfaces, such as are commonly employed in intaglio printing presses.

The periphery of the drum 4 is covered along the path followed by the web by a pair of arcuate casings 6 and 6' which with the peripheral surface of the drum 4 form a chamber 7 above the web. These casings have end walls 11 and 11' which leave only narrow slots 8 and 8' respectively above the drum, for entry and exit of the web. An enclosed space is thus provided which, while not being fluid-tight, is practically cut off from the outside atmosphere. The casings may touch the sides of the drum either directly or through the intermediary of strips 12 of flexible material, but it may be sufficient in certain instances to fit the said casings so that only a slight clearance is left on the sides of the drum, the said distance being just sufficient to prevent friction (Fig. 2).

Inside the casing 6 on the side at which the web enters, there is disposed against the peripheral wall thereof an infra red ray heating system constituted preferably by tubes 9 of transparent

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quartz or translucent silica enclosing electrical resistors brought to red heat and emitting essentially a radiation of wave length from 10,000 to 30,000 angstrom units, to which quartz is very transparent, so that it is possible to absorb most of the heat emitted in the layer of pigmented ink constituting the impression. This method of heating reduces to a minimum the supply of heat required, which in the prior systems is generally provided by a rapid circulation of a current of air heated externally through electrical resistors. In addition, these thin silica tubes of small diameter have low heat capacity, which is very advantageous for obtaining rapid heating or for effecting prompt cooling when it is necessary to stop the machine.

The lower inner face of the casings and the periphery of the drying drum 4 are made of polished metal which assists in conserving the heat of radiation.

The outer surface of the casings is also polished to reduce heat losses to a minimum. However, this face may also be coated with a layer 13 of suitable heat-insulating material.

The upper ends of the casings include arcuate walls 14, 14' which are mounted to rotate about a tube 15 having aligned openings 19, 19' affording communication between the interiors of the casings and suction means 21 connected to a tube 22. The said suction means 21 draws in a predetermined relatively small volume of air, which ensures a sufficient renewal of the interior atmosphere of the casings, which gradually becomes charged with solvent vapors. The air thus drawn in may be passed into a solvent-recovery apparatus 23 which operation takes place under particularly advantageous conditions since the drying of the layer of pigmented ink by internal heating by means of infra red rays in accordance with the invention requires a much smaller volume of air than in the prior systems in which an intense circulation of hot air is effected.

The second casing 6' may not include any heating means, the web being dried therein at the same time as it cools sufficiently to prevent the constituents of the ink, which are more or less plastic when hot, from being transferred onto the outlet guide roller 20. However, if the printing arrangement is adapted to be operated in either direction according to requirement, an assembly of heating elements 9' similar to that provided in the first casing 6 would also be provided in the second casing 6', in which case either assembly may be individually operated. The electric heating elements in the inlet casing may be disposed along the whole length of the casing, but it is generally preferably to concentrate them on the first half as shown in Fig. 1, especially if it is desired to obtain high drying speeds.

Should the machine stop for any reason, the casings may be removed with the aid of a system of articulated rods 16 and 17 and an operating handle 18 articulated to the shaft 5 in order to bring the casings into the position shown in dot-and-dash lines.

This has the effect of withdrawing the heating elements from the drum and of cutting off the communication between the casings and the suction owing to the closing of the ports 12 resulting from this movement. Over-drying of the web lying stationary on the drum is thus prevented and air not charged with solvent vapor is prevented from being sent to the recovery means.

With the arrangement hereinbefore described

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it is possible under practical conditions to inject live steam into the casings or drum and thus to provide additional heat in order to facilitate the drying of the ink and to compensate for the moisture losses in the web of regenerated cellulose.

Should it be necessary, by reason of the particular operating conditions, for example the necessity for more rapid cooling, a single heating casing 6 could be employed. It may be desirable in certain cases, for example for printing on continuous aluminum strips, to line the drum with a coating of non-thermoplastic varnish or with a sheet providing thermal insulation for the purpose of preventing substantial heat losses due to conductivity.

It is to be understood that a specific embodiment has been shown for purposes of illustration and that various modifications may be made therein as will be apparent to a person skilled in the art.

What is claimed is:

1. A device for drying the ink on printed webs of non-absorbent material, comprising a drum having a peripheral surface around which the web passes for drying, an arcuate casing extending around a substantial portion of the periphery of said drum and having closed sides and ends forming with said drum an arcuate drying chamber, sources of infra red radiations in said casing disposed to radiate onto said web at least at the entrance end of said chamber, a suction duct communicating with said casing to remove vapors from said chamber, means mounting said casing to be elevated from said drum, and means actuated by elevation of said casing to close said suction duct.

2. A device for drying the ink on printed webs of non-absorbent material, comprising a drum having a peripheral surface around which the web passes for drying, a cylindrical suction chamber disposed adjacent the periphery of said drum, an arcuate casing on each side of said chamber extending from said chamber around the periphery of said drum and having walls forming with said drum an arcuate drying chamber, said casing having end walls having a clearance with the periphery of said drum to permit entrance and exit of said web, the ends of said casings adjacent said suction chamber being arcuate to conform to said cylindrical suction chamber and having ports registering therewith, means pivotally elevating said casings from said drum about said suction chamber as a pivotal center, and a source of heat rays disposed in at least one of said casings to direct heat rays onto said web for drying purposes.

3. A device for drying the ink on printed webs of non-absorbent material as set forth in claim 1 in which the sources of infra red radiations comprise a plurality of electrical heating units adapted to radiate infra red rays, the inner surface of said casing being made of polished metal for reflecting rays from said source onto the web.

4. A device for drying the ink on printed webs of non-absorbent material, comprising a drum having a peripheral surface around which the web passes for drying, an arcuate casing extending around a substantial portion of the periphery of said drum and having closed sides and ends forming with said drum an arcuate drying chamber, sources of infra red radiations in said casing disposed to radiate onto said web at least at the entrance end of said chamber, said casing being pivoted at one end to be elevated from said drum, a cylindrical wall forming a suction chamber dis-

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posed adjacent the periphery of said drum at said pivoted end, said casing having an arcuate end wall disposed to rotate about said cylindrical wall as said casing is raised about said pivoted end, said cylindrical wall and said arcuate end wall having apertures which are in registration when said casing is in lowered position and are non-registering when said casing is in elevated position.

MARCEL MAUFFRE. 10

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