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(71) Applicant: **REED PACKAGING LIMITED**
New Hythe House Aylesford
Maidstone Kent ME20 7PE(GB)

(72) Inventor: **Stott, Andrew Barker**
Raithlands 7 The Pightle Oving
Aylesbury Buckinghamshire HP22 4HS(GB)

(74) Representative: **Cockbain, Julian Roderick**
Michaelson et al
Frank B. Dehn & Co. European Patent Attorneys Imperial House 15-19, Kingsway
London WC2B 6UZ(GB)

(54) Sheet gripper for printing machines.

(57) There is provided sheet printing apparatus (I) having at least one printing station (4) for sheet printing, sheet transfer means (7, 8) for conveying printed sheets (3), and radiation curing means (II) arranged to direct curing radiation onto sheets conveyed by said sheet transfer means, said sheet transfer means comprising a sheet gripper means (7) whose length extends tranversely across the sheet feed direction of the sheet transfer means, wherein said gripper means has attached thereto and spaced therefrom a shielding plate (13) extending along at least part of the length of said gripping means, said shielding plate having as the surface remote from the gripper means a radiation reflecting polished surface which serves to shadow said gripper means from directed radiation from said radiation curing means. In the apparatus of the invention the shielding plate (13) serves to reduce overheating and heat damage resulting from the exposure of the sheet gripper means to ink-curing radiation. In a particularly preferred embodiment, the shielding plate is provided on its inner surface with fins or vanes (20) which serve to direct heated air towards the sides of the printing apparatus thus particularly assisting the avoidance of component overheating.

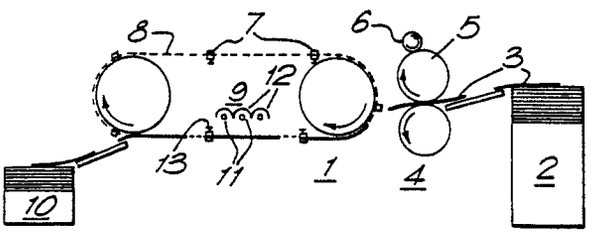

FIG.1.

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Improvements in and relating to printing apparatus

The present invention relates to improvements in and relating to printing apparatus, especially sheet printing apparatus.

Conventional sheet printing apparatus, such as for example the offset litho printing apparatus supplied by M.A.N. Roland Druckmaschinen AG of Offenbach and Augsburg, Federal Republic of Germany under the designation Roland 804, is generally provided with a sheet supply unit for feeding a supply of sheet to the printing station of the apparatus, a printing station at which ink is printed onto the sheets, and a sheet transfer means for conveying printed sheets from the printing station to a sheet receiving unit which receives and generally also stacks, the printed sheets. Apparatus having more than one printing station, such as the Roland 804 apparatus mentioned above which has two printing stations, is provided with further sheet transfer means for conveying the sheets from one printing station to the next.

Where the sheet printing apparatus is arranged to print a radiation-curable ink onto the sheets at one or more of the printing stations, the apparatus may also be provided with radiation curing means arranged to direct ink-curing radiation onto the printed sheets conveyed by a subsequent sheet transfer means. Apparatus of this type is disclosed in for example EP-A-194128.

In conventional sheet printing apparatus, the sheet transfer means comprises a drive means engaging a sheet gripper means (frequently termed a gripper bar or wagon) which itself engages the leading edge of the printed sheet and thereby serves to pull the printed sheet along. However, where the apparatus is provided with a radiation curing means, the gripper means as well as the printed sheet is exposed to the curing radiation. This results in a limitation being placed on the operating speed or daily operation period for such apparatus as a result of the heating effect of the curing radiation on the gripper means since machine damage will occur if components such as the gripper means overheat or remain overheated for a prolonged period.

While the heating effect on the gripper means may be reduced to a certain extent by polishing the surface of the gripper means that is exposed to the curing radiation, we have now found that overheating may be particularly effectively reduced or avoided by providing a reflection plate over, but spaced apart from, that surface. The reflecting plate reduces the direct exposure of the gripper means to the curing radiation, reflects away much of the radiation striking it and, by being spaced apart from the main body of the gripper means, may be particularly effectively cooled by the air flow over its surfaces during its travel in the printing apparatus.

In one aspect therefore, the present invention provides a sheet printing apparatus having at least one printing station for sheet printing, sheet transfer means for conveying printed sheets, and radiation curing means arranged to direct curing radiation onto sheets conveyed by said sheet transfer means, said sheet transfer means comprising a sheet gripper means whose length extends tranversely across the sheet feed direction of the sheet transfer means, wherein said gripper means has attached thereto and spaced therefrom a shielding plate extending along at least part of the length of said gripping means, said shielding plate having as the surface remote from the gripper means a radiation reflecting polished surface which serves to shadow said gripper means from directed radiation from said radiation curing means.

Viewed from another aspect, the invention also provides elongate sheet gripper means for a sheet printing apparatus having extending thereover and spaced apart therefrom a shielding plate the outer surface whereof is reflective.

It should be noted that the term "ink" is used herein to designate other printable fluids, such as varnishes, release coatings etc., besides conventional inks.

In order to achieve a particularly effective cooling of the shielding plate, the inner surface of the plate, i.e. the surface facing the main body of the gripper means, is preferably provided with fins or vanes to increase the surface area and to increase the heat loss to the air flowing past the plate during the motion of the gripper means. Such fins or vanes will preferably extend generally transversely to the gripper means, i.e. generally along the direction of motion of the shielding plate. However, in a particularly preferred embodiment, the fins or vanes may be angled to the direction of motion in order to direct the air flow, which is heated by contact with the shielding plate, towards the sides of the printing apparatus where it may more readily be pumped away. In this way, avoidance of overheating of apparatus components is particularly assisted.

If the shielding plate and the main body of the gripper means to which it is attached are fabricated from different materials, as may well be the case since the material of the shielding plate is preferably selected to achieve optimum reflectance, then the mounting for the plate will generally be arranged to permit the different longitudinal expan-

sions of the plate and the gripper means to take place without undue distortion or strain occurring. Thus, for example, where the main body of the gripper means is fabricated from aluminium and the shielding plate is fabricated from stainless steel, the plate is conveniently attached only at its mid-portion with its ends extending in a somewhat wing-like fashion and being free to expand or contract without straining or deforming the gripper means. The precise means of attachment of the shielding plate to the main body of the gripper means is not critical and may for example simply comprise bolts passing through the shielding plate and through spacing collars to engage in threaded holes in the body of the gripper means.

An embodiment of the present invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure I is a schematic side elevation of a printing apparatus according to the present invention;

Figure 2 is a schematic cross-section through the mid-point of a gripper means according to the invention; and

Figure 3 is a perspective view of an alternative shielding plate for the gripper means of Figure 2.

Referring to Figure I, there is shown a sheet printing apparatus I, for example an offset litho printing apparatus, having a sheet supply unit 2 arranged to supply sheets 3, for example of paper or card, to a printing station 4 at which a radiation curable ink is printed onto the upper surface of the sheets by print roll 5 which is itself supplied with the ink by inker roll 6.

The leading edge of each sheet leaving the printing station 4 is engaged by a gripper means 7 driven by conveyor 8 and the sheets are thereby conveyed past a curing station 9 to a sheet receiving and stacking unit I0. At the curing station 9, the printed surfaces of the sheets are exposed to curing radiation from an array of curing lamps II, for example UV or IR emitting lamps, disposed tranversely to the sheet transport direction. The curing lamps preferably extend for at least the full widths of the sheets and may be provided with reflectors I2 to increase the intensity of curing radiation directed at the sheets.

With sheets having widths and lengths of about I400 mm and a print rate of about 4-5,000 sheets per hour, a UV curing lamp array at one curing station might be expected to operate at about 30-50 kW, for example 34 kW. Operating under such conditions using conventional unshielded gripper means, the temperature of the gripper means has been found to reach unacceptably high levels of 80°C or higher after only about 2 hours of operation. According to the present invention therefore the apparatus shown in Figure I has the gripper means 7 provided with a shielding plate I3 which serves to shadow it from directed radiation from the curing lamps II.

The gripper means 7 and the shielding plate I3 are shown schematically in cross-section in Figure 2 where sheet 3 is shown gripped between the jaws of the lower I4 and upper I5 members of the gripper means. The aluminium lower and upper members are mounted from the drive belts of conveyor 8 by means of a steel drive bar I6 which passes through collars I7 on the gripper means. The shielding plate I3, conveniently of polished stainless steel, is secured to the upper surface of the upper member I5 at its mid-point by means of bolts I8 which engage with threaded holes in the upper member. To ensure that the shielding plate is adequately spaced apart from the upper member, the bolts I8 are provided with spacing collars I9. It will be appreciated therefore that conventional gripper bars and wagons may readily be modified to carry a shielding plate I3 simply by tapping holes to receive bolts I8.

The shielding plate I3 shown in Figure 2 has smooth, flat upper and lower surfaces. However, as shown in Figure 3, the lower surface, the surface facing the main body of the gripper means, may be provided with fins 20 to increase heat loss to the airflow and to direct the heated airflow (in the direction of the arrows shown in the figure) towards the sides of the printing apparatus.

Claims

I. A sheet printing apparatus (I) having at least one printing station (4) for sheet printing, sheet transfer means (7, 8) for conveying printed sheets (3), and radiation curing means (II) arranged to direct curing radiation onto sheets conveyed by said sheet transfer means, said sheet transfer means comprising a sheet gripper means (7) whose length extends tranversely across the sheet feed direction of the sheet transfer means, wherein said gripper means has attached thereto and spaced therefrom a shielding plate (I3) extending along at least part of the length of said gripping means, said shielding plate having as the surface remote from the gripper means a radiation reflecting polished surface which serves to shadow said gripper means from directed radiation from said radiation curing means.

2. Apparatus as claimed in claim I wherein said shielding plate (I3) is provided on the surface facing the main body (I5) of said sheet gripper means (7) with fins or vanes (20).

3. Apparatus as claimed in claim 2 wherein said fins or vanes (20) extend generally transversely relative to said gripper means (7).

4. Apparatus as claimed in claim 2 wherein said fins or vanes (20) are angled towards the ends of said gripper means (7).

5. Apparatus as claimed in any one of claims I to 4 wherein said shielding plate (I3) is mounted from the main body (I5) of said gripper means (7) by mounting means (I8, I9) disposed at the mid-portion of said shielding plate.

6. Apparatus as claimed in any one of claims I to 5 wherein said shielding plate (I3) is of stainless steel.

7. An elongate sheet gripper means (7) for a sheet printing apparatus (I) having extending thereover and spaced spart therefrom a shielding plate (I3) the outer surface whereof is reflective.

8. An elongate sheet gripper means as claimed in claim 7 wherein said shielding plate (I3) is provided on the surface facing the main body (I5) of said sheet gripper means (7) with fins or vanes (20).

9. An elongate sheet gripper means as claimed in claim 8 wherein said fins or vanes (20) are angled towards the ends of said gripper means (7).

I0. An elongate sheet gripper means as claimed in any one of claims 7 to 9 wherein said shielding plate (I3) is mounted from the main body (I5) of said gripper means (7) by mounting means (I8, I9) disposed at the mid-portion of said shielding plate.

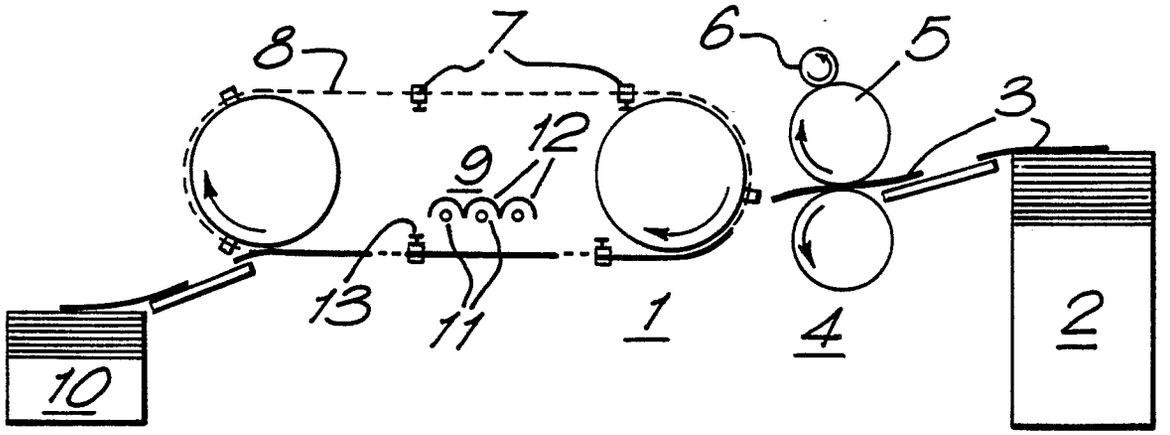

FIG.1.

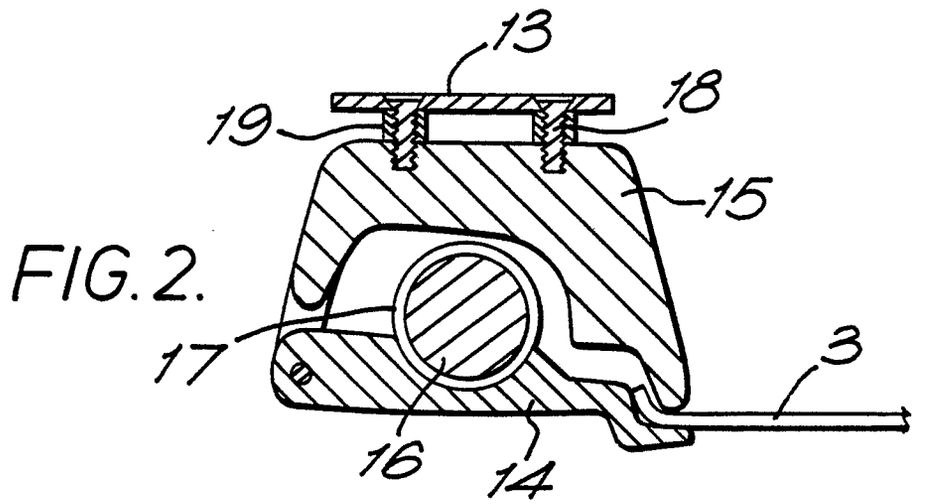

FIG.2.

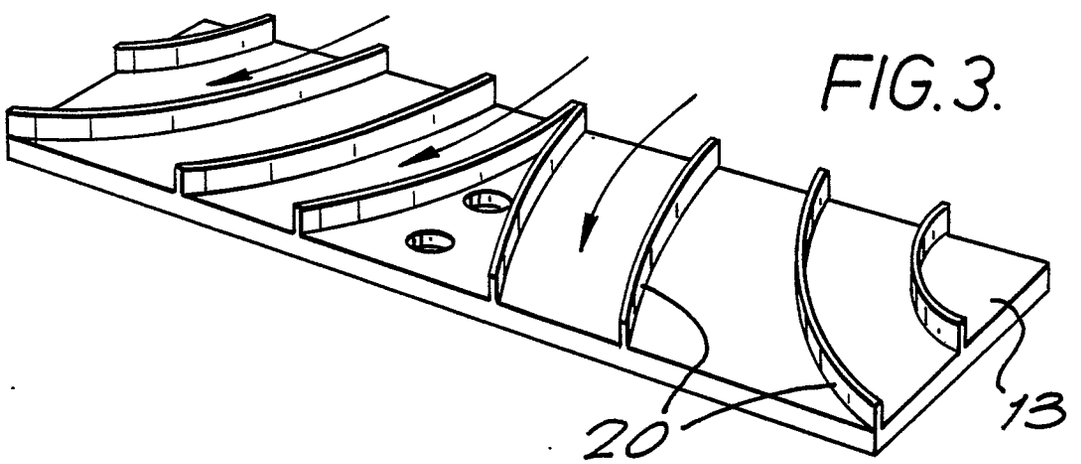

FIG.3.

European Patent Office

EUROPEAN SEARCH REPORT

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 87304999.3

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US - A - 4 530 495 (ZIMMERMANN) * Totality * --	1,5,7,9	B 41 F 21/04 B 65 H 29/04 B 41 L 21/06
A	DE - A1 - 2608 661 (MOESTUE) * Page 13, lines 2-23 * ----	1,2,7,8	B 41 J 13/22

TECHNICAL FIELDS SEARCHED (Int. Cl 4)

B 41 F
B 41 J
B 41 L
B 65 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	27-08-1987	MEISTERLE

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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