

(21) Application No **8613865**

(22) Date of filing **6 Jun 1986**

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(51) INTCL⁴
B65H 29/00

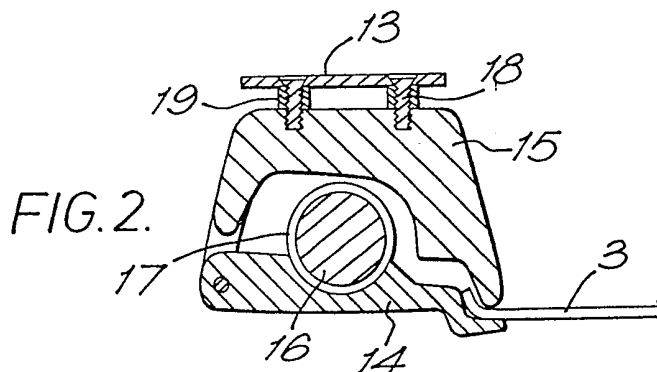
(52) Domestic classification (Edition I)
B8R 662 711 AL
U1S 2240 B8R

(56) Documents cited
None

(58) Field of search
B8R
B8A
Selected US specifications from IPC sub-classes B65H
B65G

(54) Improvements in and relating to printing apparatus

(57) In sheet printing apparatus (1), Fig. 1 having radiation curing means (11) arranged to direct curing radiation onto the sheets (3), the sheet transfer means comprise sheet gripper means (7; 14, 15 Fig. 2) extending transversely across the sheet feed direction of the sheet transfer means, and having attached thereto and spaced therefrom a shielding plate (13) extending along at least part of the length of said gripping means and having as the surface remote from the gripper means a radiation reflecting polished surface shielding said gripper means from directed radiation, thereby reducing overheating and heat damage resulting from such exposure. The shielding plate preferably has, on its inner surface, fins or vanes (20 Fig. 3) to direct heated air towards the sides of the printing apparatus.



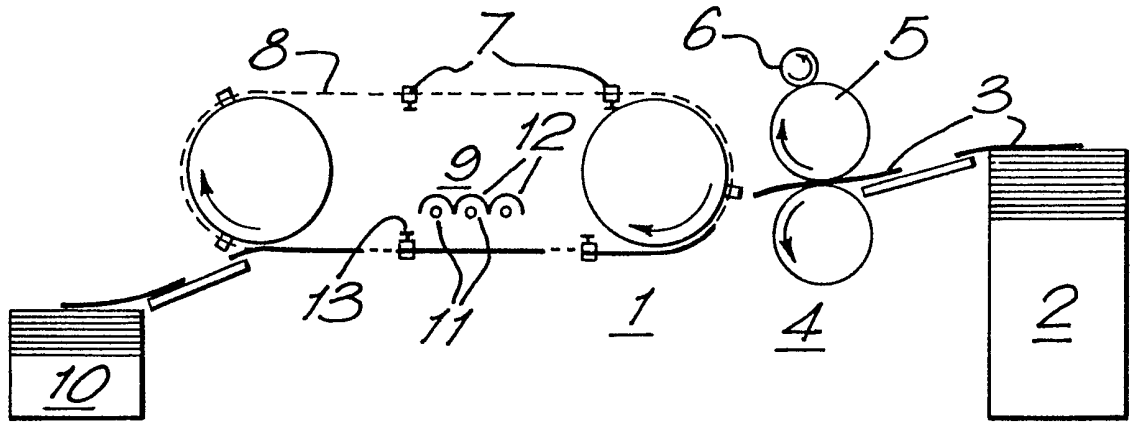


FIG. 1.

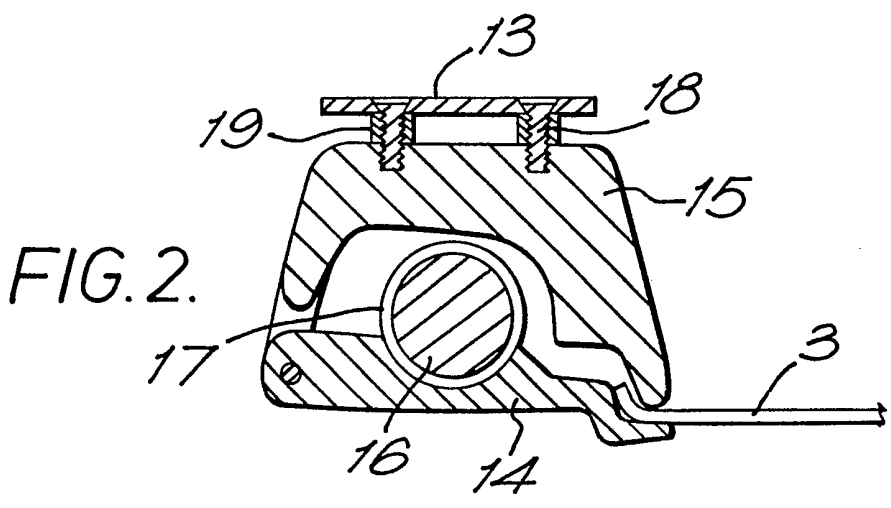


FIG. 2.

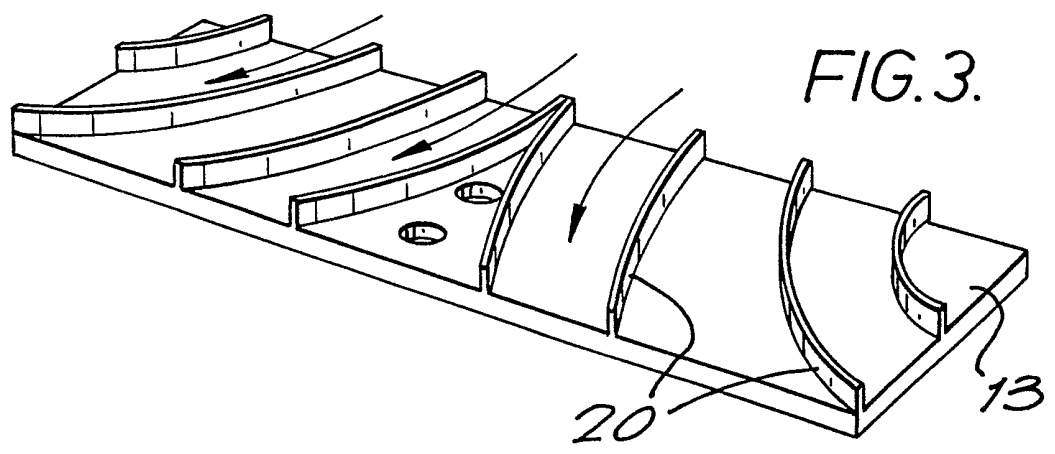


FIG. 3.

SPECIFICATION

Improvements in and relating to printing apparatus

5 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
10 by M.A.N. Roland Druckmaschinen AG of Offenbach and Augsburg, Federal Republic of Germany under the designation Roland 804, are generally provided with a sheet supply unit for feeding a supply of sheet to the printing station of the apparatus, a printing
15 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
20 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
25 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.
30 Apparatus of this type is disclosed in for example out co-pending European Patent Application No. 86301507.9 (publication number EP-A-.....).

In conventional sheet printing apparatus, the sheet transfer means comprises a drive means engaging a
35 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
40 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
45 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
50 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
55 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
60 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
65 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 transversely across the sheet feed direction of the sheet transfer
70 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
75 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
80 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
85 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
90 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
95 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
100 the shielding plate, towards the sides of the printing apparatus where it may more readily be pumped away. In this way, avoidance of over-heating of apparatus components is particularly assisted.

If the shielding plate and the main body of the
105 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
110 permit the different longitudinal expansions 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
115 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
120 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.

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

Figure 1 is a schematic side elevation of a printing apparatus according to the present invention;

130 *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*.

5 Referring to *Figure 1*, there is shown a sheet printing apparatus 1, 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

10 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 10. At the curing station 9, the printed surfaces of the sheets are exposed to curing radiation from an array of curing lamps 11, for example UV or IR

20 emitting lamps, disposed transversely 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 12 to increase the intensity of curing radiation directed at the sheets.

25 With sheets having widths and lengths of about 1400 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

30 *Figure 1* has the gripper means 7 provided with a shielding plate 13 which serves to shadow it from directed radiation from the curing lamps 11.

The gripper means 7 and the shielding plate 13 are shown schematically in cross-section in *Figure 2* where sheet 3 is shown gripped between the jaws of the lower 14 and upper 15 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 16 which passes through collars 17 on the gripper means. The shielding plate 13, conveniently of polished stainless steel, is secured to the upper surface of the upper member 15 at its mid-point by means of bolts 18 which engage with threaded holes in the upper member. To ensure

40 that the shielding plate is adequately spaced apart from the upper member, the bolts 18 are provided with spacing collars 19. It will be appreciated therefore that conventional gripper bars and wagons may readily be modified to carry a shielding plate 13

45 simply by tapping holes to receive bolts 18.

The shielding plate 13 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

1. 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 transversely 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.

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2. Apparatus as claimed in claim 1 wherein said shielding plate is provided on the surface facing the main body of said sheet gripper means with fins or vanes.

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

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

5. Apparatus as claimed in any one of claims 1 to 4 wherein said shielding plate is mounted from the main body of said gripper means by mounting means disposed at the mid-portion of said shielding plate.

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6. Apparatus as claimed in any one of claims 1 to 5 wherein said shielding plate is of stainless steel.

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7. Apparatus as claimed in any one of claims 1 to 6 wherein said radiation curing means are ultra-violet or infra-red emitting lamps.

8. Sheet printing apparatus substantially as herein described with reference to the accompanying drawings.

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9. An 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.

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10. An elongate sheet gripper means as claimed in claim 9 wherein said shielding plate is provided on the surface facing the main body of said sheet gripper means with fins or vanes.

11. An elongate sheet gripper means as claimed in claim 10 wherein said fins or vanes extend generally transversely relative to said gripper means.

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12. An elongate sheet gripper means as claimed in claim 10 wherein said fins or vanes are angled towards the end of said gripper means.

13. An elongate sheet gripper means as claimed in any one of claims 9 to 12 wherein said shielding plate is mounted from the main body of said gripper means by mounting means disposed at the mid-portion of said shielding plate.

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14. An elongate sheet gripper means as claimed in any one of claims 9 to 13 wherein said shielding plate is of stainless steel.

15. An elongate sheet gripper means substantially as herein described with reference to the accompanying drawings.

Printed for Her Majesty's Stationery Office by
Croydon Printing Company (UK) Ltd, 10/87, D8991685.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.