

[54] **APPARATUS FOR DECORATING ROTATABLE ARTICLES**

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[51] Int. Cl.....**B41f 17/28**

[58] Field of Search.....101/38-40, 126

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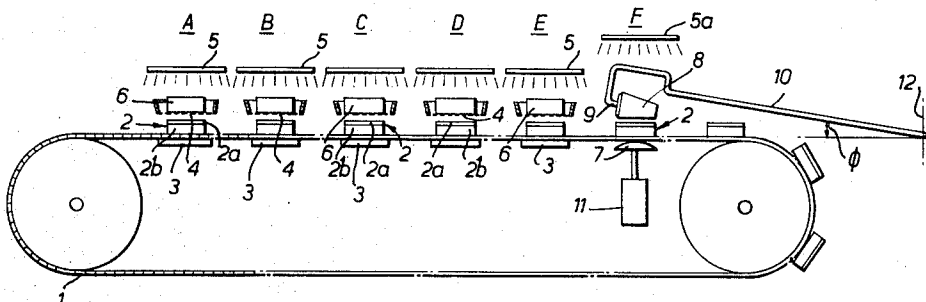
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[57] **ABSTRACT**

A machine for printing or decorating the external surfaces of articles has a freely rotatable work holder on which an article can be mounted, an offset printing blanket and a screen stencil or stencils by which an offsetting image presenting a developed view of the pattern to be applied to the article can be produced on the blanket. Either the work holder or the blanket is mounted on a pivotal arm pivotal movement of which produces relative movement of the article and blanket during which the article rolls along the surface of the blanket and thus picks up the image.

**4 Claims, 2 Drawing Figures**



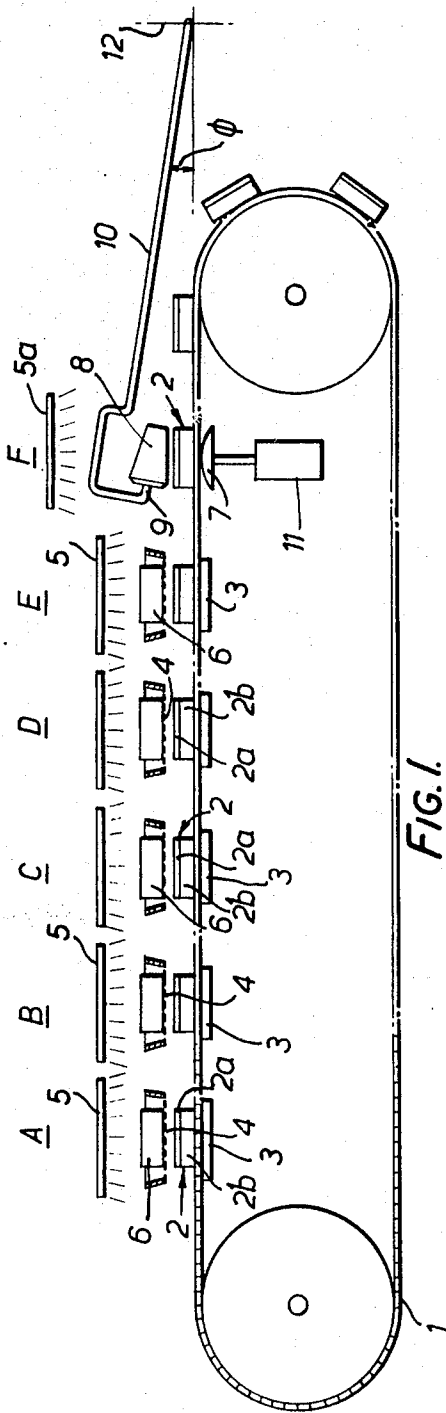


FIG. 1.

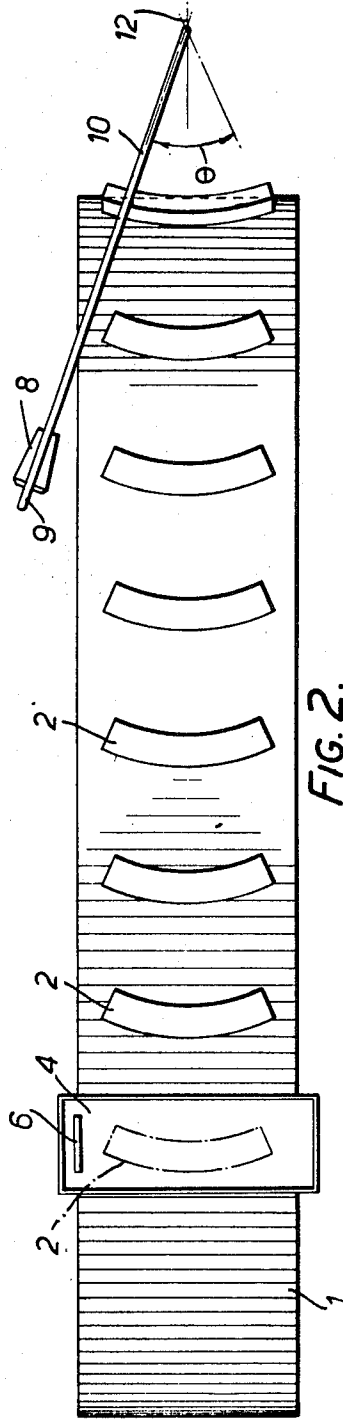


FIG. 2.

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## APPARATUS FOR DECORATING ROTATABLE ARTICLES

### BACKGROUND OF THE INVENTION

This invention relates to the offset printing or decorating of the external surfaces of articles, particularly holloware. Although the invention is generally of application to the pottery industry it can also be utilized in the printing or decoration of the outer surface of all generally cylindrical or conical objects having a profile over the portion to be printed of relatively small axial curvature.

The object of the invention is to provide a machine and method which although applicable to single-color work are of particular advantage with multi-color work in that the complete colored decoration or pattern can be applied to the article at a single impression. The invention enables articles to be so decorated on a surface which is irregular or rough, and it can very satisfactorily be adapted to semi-automatic and automatic procedures.

### SUMMARY OF THE INVENTION

According to the invention a machine for the printing or decoration of a generally cylindrical or conical outer surface of an article comprises a freely rotatable work holder on which such an object can be mounted, a plurality of resilient offset printing blankets mounted on a continuous conveyor, and a screen stencil means by which an offsetting image presenting a developed view of the pattern to be applied to the article can be produced on the blankets. The work holder is mounted on a pivotal arm so that in use pivoting of the arm produces relative movement of the mounted article and a blanket positioned on the conveyor at a printing station during which the article rolls along the surface of the blanket and thus picks up the image, and the blankets are advanced stepwise and in turn on the conveyor between a plurality of inking stations provided with said stencil means and said printing station. Support means for the back of the blankets are provided at each of said stations.

The degree of roughness or irregularity of the article surface which can be accepted depends upon the extent to which the blanket is resiliently deformable during offsetting, and the blanket is desirably plane with the resilience of the blanket also accommodating any axial curvature of the printing surface. A resilient pad may form each blanket or be provided as a backing for the blankets during offsetting, and to urge the blanket into conformity with the article surface. The blanket may be in the form of an elastomeric membrane, for example of silicone rubber or rubber which is silicone faced on its operative surface. The degree of such curvature which can be accommodated depends not only on the resilience of the blanket but the limit is reached when the differing peripheral distance between points on the printing surface of different radii result in unacceptable distortion and blurring of the image. It will be appreciated that an article having considerable overall axial curvature can be printed satisfactorily if only an appropriate width band of the total article surface is printed in one operation, and reference herein to a "generally cylindrical or conical printing surface" is to be construed accordingly as including such an article.

Preferably each blanket is of arcuate shape with a mean radius equal to that of the arm, so that it represents a developed view of the printing surface and the complete blanket area is usable.

The conveyor is preferably in the form of a slatted chain, although alternatively a conveyor drum or disc may be used.

Preferably each screen stencil is adapted to apply a thermo-plastic color with a melt temperature above ambient temperature, and to this end heated screens may be used so that the color is maintained in a molten state up to the instant of transferring it to a relatively cold blanket on to which the color "freezes", i.e., solidifies. The stencil screens are desirably of metal mesh, for example stainless steel or bronze, and thermo-plastic color may be used having a melt point of about 55° to 60° C and comprising an inorganic pigment in a wax base. It will be appreciated that as many colored images as are necessary to produce the complete color pattern can be successively applied to and frozen on to the blanket before the pattern is offset on to the article. As each color freezes and dries instantaneously there is no offset on to the back of subsequent screens used to apply successive images of different colors.

Heating of the stencil screens when thermo-plastic colors are used may be achieved by overhead radiant heaters positioned at the inking stations, and a further heater may be positioned at the printing station whereby to preheat a blanket, immediately prior to offsetting, to a temperature exceeding the melt point of the thermo-plastic colors. Thus the image first wets then freezes to the cool article when the latter is rolled across the blanket, and since the blanket retains its heat, clean separation of the transfer blanket from the article is ensured, with only a very small and tolerable amount of color left on the surface of the transfer member.

A bolster or the like may be positioned at the or each inking station to support the back of the blanket and maintain it flat while the color is applied, and at the printing station a deformable pad which is convex in relation to the surface to be printed may engage the blanket contemporaneously with engagement of the latter during printing, whereby to deform the blanket into conformity with the article during the actual offsetting of the pattern onto the article. The pad may be mounted on a pneumatic ram.

The blanket, which is maintained cold during inking, is desirably preheated to bring the color to a liquid condition prior to offsetting on to the article; in addition to preheating the blanket in this manner, or in some cases as an alternative the surfaces of the blanket and the article may have or be treated to have, respectively, relatively low and high affinities for the thermo-plastic color. Thus the article surface may first be sized with an adhesive which provides a high surface affinity for the frozen image, which affinity materially exceeds the affinity of the colors for the surface of the blanket which need then only be raised to a critical temperature slightly below the melt point of the color. This critical temperature is such that the wax base of the color will deform, stretch or compress without cracking during the offsetting. It is in all cases normally desirable that the blanket surface should have a low affinity for the color.

## BRIEF DESCRIPTION OF THE DRAWINGS

A machine in accordance with the invention is illustrated in the accompanying diagrammatic drawings and will now be described by way of example. In the drawings:

FIG. 1 is a side view of the machine, and

FIG. 2 is a corresponding plan view, with overhead radiant heaters and other parts omitted.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

A slatted conveyor or chain 1 carries a large number of spaced offset printing blankets 2, for example of the order of 20, and is advanced in a stepwise manner either automatically or semi-automatically to bring the blankets 2 in turn below a row of inking stations A to E followed by a printing station F, the spacing of the stations being equal to the spacing of the blankets 2 on the conveyor chain 1. Each blanket 2 is in the form of a resilient and deformable pad which normally presents a flat surface of arcuate shape representing a developed view of the article surface to be printed. The number of inking stations is equal to the total number of colors to be applied, in the typical case illustrated the five inking stations A to E being present.

At each inking station a flat support bolster 3 is provided below the upper run of the conveyor 1 to support a pad 2 while being inked at that station with the corresponding thermo-plastic color, which is applied using a screen stencil 4 heated by a corresponding one of a row of overhead radiant heaters 5. The pads 2 comprise an elastomeric surface layer 2a and a thicker resilient backing 2b, and each screen stencil 4 is worked "off contact" with the pads 2 by means of a corresponding squeegee 6 movable laterally of the conveyor 1.

At the printing station F, instead of a support bolster a vertically movable convex deformable pad 7 is mounted on a pneumatic ram 11 below the upper conveyor run. Immediately prior to actual offsetting of the color which has been applied at the inking stations A to E the pad 7 is advanced to deform the corresponding inked pad 2 and press it against the article 8 as the latter is rolled along the surface of that pad. In lateral section, i.e. longitudinally of the conveyor, the deformable pad 7 as can be seen in FIG. 1 has an effective surface profile which is convex in relation to the surface to be printed, and in plan view it corresponds in shape to that of the inked pad 2. A further radiant

heater 5a is mounted above the printing station F in order to plasticize the thermo-plastic design on the inked pad immediately prior to offsetting on to the article 8. The heaters 5 and 5a and all except one of the screens 4 are for clarity omitted from FIG. 2.

During offsetting the article 8 is mounted on a freely rotatable work holder 9 on which it is held by vacuum means, the work holder being mounted on the free end of a pivotally mounted arm 10. The article 8 is coated with an adhesive prior to mounting on the work holder 9 so that it has good surface affinity for the thermo-plastic colors, and during offsetting the arm 10 swings across the conveyor 1 to roll the article 8 along the corresponding pad 2 from end to end of the latter. The angle of swing  $\theta$  (see FIG. 2) about an upright axis 12 is adjustable to suit the diameter of the article 8 and so that it corresponds to the developed angular length of the image to be printed. The pivot axis 12 of the arm is also adjustable about its generally horizontal position to vary the upward inclination  $\phi$  (see FIG. 1) of the arm 10 to suit the shape of the article 8 and provide the most satisfactory line contact between the article 8 and the pads 2 during offsetting.

I claim:

1. A machine for the printing or decorating of a generally cylindrical or conical outer surface of an article, comprising a freely rotatable work holder for supporting the article, a pivotal arm on which the work holder is mounted, an endless flexible conveyor, a plurality of resilient offset printing blankets mounted on and along the length of the endless conveyor, a plurality of successive inking stations spaced along the path of the endless conveyor, each inking station having screen stencil means by which ink is applied to the blankets, said inking stations being followed, in the direction of conveyor travel, by a printing station in which said work holder is located, fixed back support means for the endless conveyor for supporting the blankets in said inking stations, and ram means movably engageable with the back of the endless flexible conveyor in the printing station to press an inked blanket against the article supported by the work holder.

2. A machine as claimed in claim 1, said ram means having a deformable convex pad which engages said conveyor.

3. A machine as claimed in claim 1, said conveyor being a slatted conveyor.

4. A machine as claimed in claim 1, and a radiant heater in each inking station to heat the screens.

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