(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 365 135 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **89309283.3**

(22) Date of filing: **13.09.89**

(51) Int. Cl.5: **B41M 1/40 , B41M 1/20 , B41M 1/34**

(30) Priority: **23.09.88 GB 8822376**

(43) Date of publication of application: **25.04.90 Bulletin 90/17**

(84) Designated Contracting States: **DE FR GB IT**

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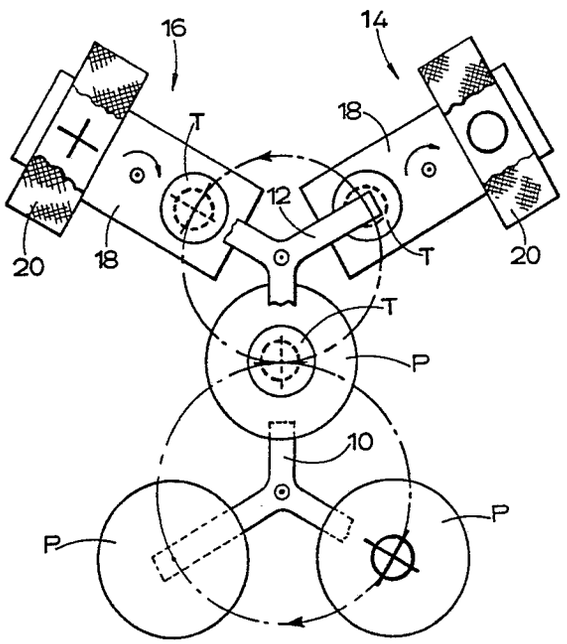
(54) Multi-colour off-set printing.

(57) In a repetitive off-set multi-colour printing process, two or more prints of ink in different colours are each laid down by screen printing on to an intermediate surface, and the prints taken up one by one on to the surface of a transfer pad. The design comprising the prints so collected together on the pad is then transferred to the surface of an article in a single impression by the pad.

Suitable apparatus comprises a rotatable pad support 12 carrying three uniformly-distributed pads T, an article support 10, and two print-supplying units 14 and 16. Each unit comprises a screen printing device 20 and a platen 18. The platen is rotatable to locate each end in turn beneath the printing device 20 and one of the pads T. Indexing rotations of the pad support bring each pad in turn into position to take up the prints successively and to impress the collected design on to an article P presented by the article support.



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MULTI-COLOUR OFF-SET PRINTING

This invention relates to the off-set printing of designs in two or more colours (i.e. multi-colour printing) using a transfer pad to apply the design to a surface to be decorated; the surface may be that of an article of ceramic or glass ware, for example.

In off-set printing of ceramic ware in repetitive production processes, it is well known to utilise a gelatine or silicone rubber transfer pad to take up an ink design from an intaglio plate, or from a flat intermediate surface on to which the design has been deposited by screen printing, and to apply the design to the surface of an article; the relative affinities of the ink for the pad and the article can be arranged to be such that the design becomes wholly transferred to the article and substantially no residual ink remains on the pad.

In transferring a screen-printed design from an intermediate surface, rather than a design taken from an etched or engraved intaglio plate, use has been made in the past of metal and glass intermediate surfaces. However, those surfaces have needed to be scraped clean by means of a blade between applications of the design, since it was not possible to avoid a residue of ink being left on the surface upon the design being taken up by the pad. More recently, the use of other materials for the intermediate surface has been introduced which, together with suitable selection of inks and control of their visco-elastic properties, enables a complete transfer of the ink design from the surface to the pad to take place; the need for cleaning the intermediate surface between applications of the design can so be eliminated. Such a process is described in patent specification GB-B- 2 118 900, and further in the publicly available file of European patent application No. 83302297.3, wherein contrasting silicone rubber materials are used for the intermediate surface and the transfer pad.

Such off-set printing techniques using transfer pads have been used in effecting multi-colour printing, layers of ink usually being built up on the article in successive applications, one colour at a time. Machines for effecting such processes are described, for example, in patent specifications GB-A- 1 247 001 and GB-A- 1 432 355. In those machines articles of ware are moved between successive printing stations of the machine, a transfer pad at each station being arranged to apply one layer of ink to the article in building up the multi-colour design on the article. Multi-colour printing machines operating in such a way may take the designs from intaglio plates or from screened intermediate surfaces, as hereinbefore described.

With a view to achieving greater efficiency of operation, attempts have been made in the past to gather the total design together on a collecting surface and then to the collected design to the article in a single application step, rather than applying the individual colours of a multi-colour design one at a time to the article. One such process was described in patent specification GB-A-804 751. According to that proposal, the various colours were to be successively stencilled, on to a flat stainless steel surface, the design so collected then being transferred from the surface to the article by means of a resilient pad. A later proposal was described in patent specification GB-A-1 273 621, in which the colours were stencilled successively on to a silicone rubber diaphragm. The diaphragm was then inverted and pressed against the article to transfer the design to the article. However, neither of those proposed processes was satisfactory and consequently neither found real commercial success.

It is an object of the present invention to provide an improved multi-colour off-set printing process.

The invention provides, in one of its aspects, a repetitive off-set printing process in which in a cycle of operation a design in two or more colours is applied to the surface of an article, the cycle comprising at least the following steps:

(i) laying down ink of a first colour in a predetermined pattern on an intermediate surface to form a first print;

(ii) bringing a transfer pad into engagement with the intermediate surface bearing the first print and separating the pad from the surface to take up the first print on the pad;

(iii) laying down ink of a second colour in a predetermined pattern on an intermediate surface to form a second print;

(iv) bringing the transfer pad bearing the first print into engagement with the intermediate surface bearing the second print and separating the pad from the surface to take up the second print; and

(v) bringing the transfer pad bearing the first and second prints into engagement with the surface of an article and separating the pad from the article to leave the first and second prints applied to the surface of the article.

Since the total design, comprising the first and second (and any further) prints, is collected on the surface of the one transfer pad prior to application to the article, problems normally associated with ensuring accurate registration of the two colour prints are reduced. Also, since each print is laid down on to a clean intermediate surface (i.e. any print previously formed on that surface has already been removed from the surface) there is no danger

of extraneous ink being picked up by equipment employed in forming the prints. The design being applied to the article in a single impression, the total number of movements by the pad in taking up and setting down the prints making up the design is fewer (three instead of four, for two colours) than in a multiple-impression process and cycle time can be correspondingly less.

In applying the multi-colour design to the article, the transfer pad may simply be pressed against the article surface (e.g. in decorating a plate) or a suitable pad form may be utilised to lay down the design progressively along a length (e.g. substantially from handle to handle around the outside of a cup or mug).

There now follows a description, to be read with reference to the accompanying drawing, of a machine and its use which illustrates the invention by way of example.

The accompanying drawing is a diagrammatic plan view of the machine.

A multi-cclour off-set printing machine is arranged for backstamping dinner plates with designs in two colours.

The machine comprises a rotatable ware support 10 arranged to hold three plates P (level but inverted) uniformly disposed about a vertical axis of rotation of the support; the ware support comprises means of a conventional kind for centring each plate in its correct disposition. The support is arranged to be indexed in uniform steps of 120° rotation about its rotational axis.

A rotatable pad support 12 similarly carries three silicone rubber transfer pads T above the level of the ware support 10, the pad support also being arranged to be indexed in uniform steps of 120° rotation about a vertical axis. The transfer pads are of a conventional dome-shaped kind, well known in off-set printing ceramic ware. The pad support 12 has its axis so off-set from that of the ware support 10 that between indexing steps of the two supports one transfer pad T is positioned directly above one of the plates P on the ware support, as shown in the drawing.

The transfer pads T are each mounted on the pad support 12 by means of a vertically aligned cylinder unit. Each pad can thereby be raised and lowered on the support, the three cylinder units being arranged to operate in unison.

The machine comprises also first and second print-supplying units 14 and 16. Each of the units 14 and 16 comprises a platen 18 presenting a flat horizontal upper surface which forms an intermediate surface for the printing process. The platen 18 is rotatably mounted at its mid-point, with a vertical axis of rotation, and is arranged to be indexed in 180° steps about its axis to present each end of the platen alternately beneath a transfer pad T on the pad support 12 and a screen printing device 20 of the print-supplying unit. Each printing device 20 is arranged to lay down ink in a predetermined pattern onto the upper surface of the platen beneath, in a conventional manner.

The surface of each platen 18 is formed by a layer of a suitable silicone rubber material; the selection of that material, in conjunction with the material of the silicone rubber transfer pads T and suitable ink compositions, is generally as taught in patent specification GB-B- 2 118 900 and European patent application No. 83302297.3. The platens 18 and the screens of the printing devices 20 are both heated to maintain the inks in a suitable condition.

In operation of the machine, the first print-supplying unit 14 is set up to form a first print (shown in the drawing as a circle) on its platen in a first colour, and the second print-supplying unit 16 is set up to form a second print (shown as a cross) on its respective platen in a second colour. Each platen can be rotated through 180° to bring the print to a position directly beneath one of the transfer pads T on the pad support 12.

With the indexing movements of the ware support 10, the pad support 12 and the platens 18 synchronised to cccur together each time the transfer pads T are raised, each pad goes through a cycle comprising the successive steps of (i) being lowered to engage the platen 18 of the first print-supplying unit 14, and being raised to take up the first colour print on its surface, (ii) being lowered to engage the platen of the second print-supplying unit 16, and being raised to take up the second colour print superimposed on the first print, and (iii) being lowered to engage a plate P on the ware support 10, and being raised to leave the first and second prints together applied to the surface of the plate.

In such manner, a design formed by the combination of the first and second prints is collected on the surface of the transfer pad before being applied to the ware in a single impression. In principle there is no reason why designs comprising three or more colours could not similarly be collected and applied.

Claims

1. A repetitive off-set printing process in which in a cycle of operation a design in two or more colours is applied to the surface of an article, the cycle comprising at least the following steps:

(i) laying down ink of a first colour in a predetermined pattern on an intermediate surface to form a first print;

(ii) bringing a transfer pad into engagement with the intermediate surface bearing the first print

and separating the pad from the surface to take up the first print on the pad;

(iii) laying down ink of a second colour in a predetermined pattern on an intermediate surface to form a second print;

(iv) bringing the transfer pad bearing the first print into engagement with the intermediate surface bearing the second print and separating the pad from the surface to take up the second print; and

(v) bringing the transfer pad bearing the first and second prints into engagement with the surface of an article and separating the pad from the article to leave the first and second prints applied to the surface of the article.

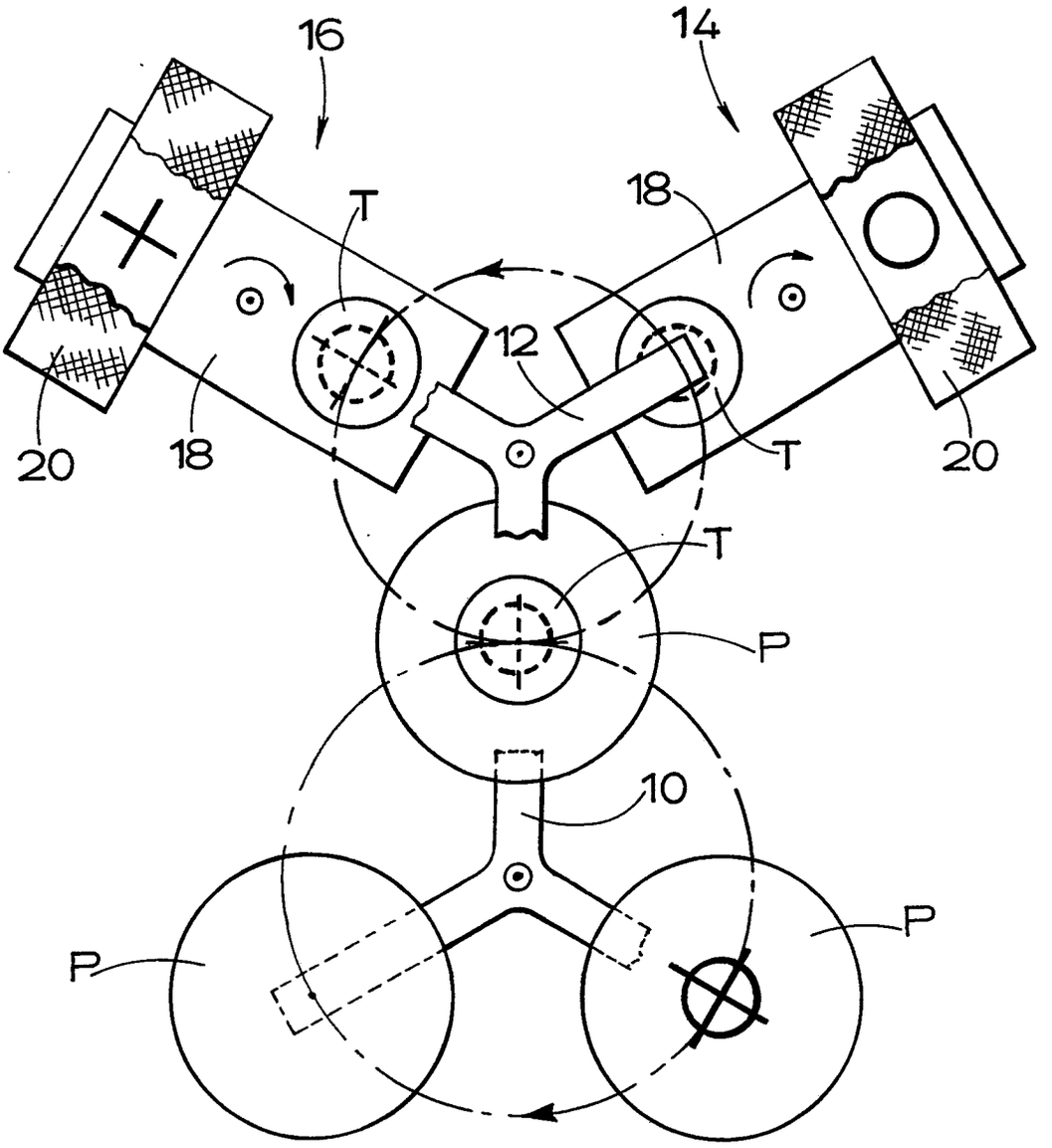
2. A process according to claim 1, in which the first print is laid down on a first intermediate surface and the second print is laid down on a second intermediate surface.

3. A process according to either of claims 1 and 2, in which the prints are formed on the intermediate surface or on the respective intermediate surfaces by screen printing.

4. Apparatus adapted to perform a process according to claim 1, the apparatus comprising (i) a plurality of print-supplying units which each comprise a printing device and a platen presenting an intermediate surface arranged to receive ink from the printing device in forming a print on the surface and (ii) a pad support arranged to carry at least one transfer pad whereby the pad can be pressed against the platens in turn to take up a plurality of prints and be pressed against on article to apply the collected prints to the article in a single impression.

5. Apparatus according to claim 4, in which the platen of each print-supplying unit is arranged to be rotated in indexing steps of 180° rotation, opposite ends of the platen so being presented alternately beneath the printing device of the unit and beneath the pad support.

6. Apparatus according to either of claims 4 and 5, in which the pad support is arranged to carry a plurality of transfer pads, the support being arranged to be rotated in uniform indexing steps to bring each pad in turn successively into registry opposite each of the platens and an article on an article support.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EUROPEAN SEARCH REPORT

Application Number

EP 89 30 9283

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y,D	EP-A-0 092 988 (THE BRITISH CERAMIC RESEARCH ASSOCIATION LTD) * Abstract * ---	1-3	B 41 M 1/40 B 41 M 1/20 B 41 M 1/34
Y	DE-A-2 435 251 (R. HILDEBRAND, MASCHINENBAU GmbH) * Claim 1 * ---	1-3	
A,D	FR-A-2 033 079 (MURRAY CURVEX PRINTING LTD) * Page 1, lines 6-11; page 2, lines 10-17,28-31 * ---	1,4	
A,D	GB-A- 804 751 (MURRAY CURVEX PRINTING LTD) * Page 1, lines 21-35; claim 1 * -----	1,4	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 41 M 1/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29-12-1989	DUPART J-M.B.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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