

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) Publication number:

0 520 570 A1

(12)

EUROPEAN PATENT APPLICATION(21) Application number: **92201835.3**(51) Int. Cl.⁵: **B41F 17/00, B41F 15/28**(22) Date of filing: **22.06.92**(30) Priority: **28.06.91 NL 9101124**(43) Date of publication of application:
30.12.92 Bulletin 92/53(84) Designated Contracting States:
AT BE CH DE ES FR GB IT LI NL(71) Applicant: **STORK BRABANT B.V.**
Wim de Körverstraat 43a
NL-5831 AN Boxmeer(NL)(72) Inventor: **Teeuwen, Henricus Johannes**
1, Pastoor Deckersstraat
NL-6003 MA Weert(NL)
Inventor: **Van Akkeren, Fransiscus Johannes**
Jacobus
16, Klemmenstraat
NL-6039 GT Stramproy(NL)
Inventor: **Van Sas, Carolus Theodorus**
Johannes Allegonda
20, Van Riebeeckstraat
NL-5703 XK Helmond(NL)(74) Representative: **van der Kloet-Dorleijn,**
Geertruida W.F., Drs. et al
EXTERPATENT B.V. P.O. Box 3241
NL-2280 GE Rijswijk(NL)(54) **Rotary screen printing machine.**

(57) The invention relates to a rotary screen printing machine, comprising at least one cylindrical stencil (1) and a counterpressure roller (1a) interacting therewith, and also a printing belt (10) made of a reinforced elastic material, to be attached temporarily to material (8) to be printed. The printing belt (10) used here is of high rigidity, more particularly a rigidity which leads to a stretch of less than 0.05%, preferably less than 0.01%, expediently less than 0.005%, at an applied force of 1 N per mm belt width. According to a preferred embodiment, the printing belt (10) is formed from a synthetic rubber reinforced with synthetic polymer fibres, with good adhesive and washing properties. The invention also relates to a method for printing material (8) with such a rotary screen printing machine.

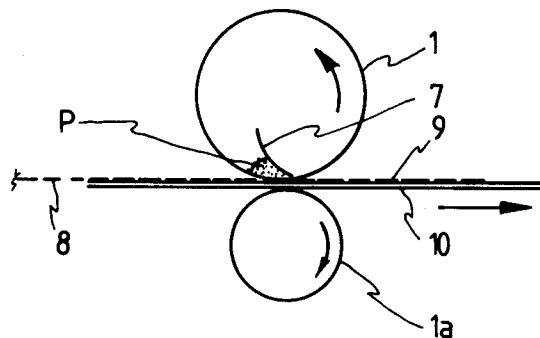


Fig. 1

EP 0 520 570 A1

The invention relates to a rotary screen printing machine, comprising at least one cylindrical stencil and a counterpressure roller interacting therewith, and also a printing belt made of a reinforced elastic material, to be attached temporarily to material to be printed.

With rotary printing machines the pattern to be printed is applied to a seamless cylindrical screen (the stencil) and the printing paste is applied from the inside by means of a squeegee through the screen openings to the material to be printed, for example textiles. The great advantage of such machines compared with flat screen printing is that the process is continuous, which means that a considerable cost saving can be obtained.

In screen printing a pattern is separated into colour components. In the rotary screen printing technique this means in practice that a pattern is divided into up to a maximum of about 24 different colours. A stencil is needed for each colour here. For the application of the pattern, the material to be printed is guided between the various stencils and the counterpressure rollers interacting therewith. It is pointed out that the various stencils are also known as printing positions.

Since the material, such as textiles, to be printed is generally not stiff enough itself to pass through the process with good results, a so-called printing belt is used.

The material to be printed is attached to the printing belt prior to printing, generally using an adhesive, which adhesive must have such properties that, while the two layers do not slip relative to each other during the printing, the printed material can still be separated easily from the printing belt after printing.

An important quality parameter for a good printed result is the fact of whether the different colours of a pattern fit well together, in other words match properly. This matching is determined by coordinating the individual printing positions (therefore the various stencils) and the position accuracy of the material for printing with these positions. The accuracy of the different patterns on the material to be printed can be seen immediately and is easily fixed.

Until now the best result which could be achieved has been a deviation of a few millimetres between the first and last printing position (stencil) in a machine with 24 stencils, i.e. 2 - 3 mm over a length of approximately 18 metres.

For this reason, printing is always carried out from light to dark colours with overlap. This means that the light colours are printed at the first positions, and the pattern is designed in such a way that the dark colours partially overlap the light colours. Position inaccuracies are therefore almost invisible for the consumer, but in the trade they

lead to second grade batches.

It has been found that a major cause of this position inaccuracy lies in the printing belt used. The printing belt is subjected to various, changing forces in the rotary screen printing machine, such as the drive, process forces (i.e. the printing itself), the washing device (for removal of the adhesive layer used), the adhesive device for applying an adhesive layer for attaching the material for printing to the printing belt, and the belt drive. Each of these forces causes a local or general stretching of the printing belt, which reduces the position accuracy of the material to be printed. The temperature also has its effect, due to the fact that it can result in a length variation.

In rotary screen printing machines of the type mentioned in the preamble, printing belts made of a reinforced rubber-like material are used in order to deal with the position inaccuracy. More particularly, these printing belts are made of a cotton or polyester fabric which is embedded in a nitrile butadiene rubber or urethane rubber. Such rubbers are found to have good adhesive and washing properties, which makes them excellent for use in at least the surface layer of a printing belt.

The rigidity of these known printing belts, expressed as the resistance to stretching in the lengthwise direction, is however relatively low.

It has now been found, surprisingly, that the above problems resulting from the position inaccuracy can be eliminated with a printing belt with a high rigidity.

The invention is therefore characterised in that the material of the printing belt possesses high rigidity.

It is pointed out that for the present purpose the rigidity of the belt is understood to signify the resistance to stretching in the lengthwise direction which is measured as the relative length change of the belt expressed in a percentage at an applied force of 1 N per mm belt width.

The printing belt preferably has a rigidity which is such that the stretch is less than 0.05%, more particularly less than 0.01%, at an applied force of 1 N per mm belt width.

Increasing the rigidity leading to a stretch of 0.05% to less than 0.01% means that it is possible to reduce the deviation between the first and last printing position in a rotary screen printing machine with 24 positions from 2 to 3 mm to approx. 0.2 mm. In practice, this also means that significantly less 2nd grade material is produced with such a rotary screen printing machine, which means an essential improvement over the known rotary screen printing machines.

The printing belt according to the invention preferably also has a rigidity leading to a stretch of less than 0.005% at an applied force of 1 N per

mm belt width.

It is pointed out that printing belts for use in rotary screen printing machines are of the endless type, and are a width of up to about 3.20 m and a length of 12 to 40 m.

It has now been found that the problems relating to the stretch mentioned earlier can be eliminated with a printing belt formed from a synthetic rubber reinforced with synthetic polymer fibres, in particular nitrile butadiene or polyurethane rubber reinforced with aramide fibres, while this printing belt, of course, meets the requirement that the stretch should be less than 0.05%, preferably less than 0.01%, at an applied force of 1 N per mm belt width.

It is pointed out that no specific weaving pattern is required for the synthetic polymer fibres used as the reinforcement, in particular aramide fibres. However, for the present a good choice for the weaving pattern of these fibres appears to be: a strand of cord fabric or a straight warp fabric; on the other hand, other weaving patterns can also be used.

The invention also relates to the use of a printing belt with high rigidity, suitable for use in a rotary screen printing machine.

The material of the printing belt preferably has a rigidity leading to a stretch of less than 0.05%, in particular less than 0.01%, expediently less than 0.005%, at an applied force of 1 N per mm belt width.

The invention also relates to a method for printing material, in particular textiles, using a rotary screen printing machine, in which the material to be printed is temporarily attached to a printing belt, which is characterised in that a printing belt of high rigidity is used.

As a result of such a method, it is possible to obtain printed fabrics in which the different colours of the pattern match up well, i.e. they have a position inaccuracy of maximum about 0.2 mm when a rotary screen printing machine with 24 rotary screens and a printing belt about 18 metres in length are used.

The printing belt to be used in the method according to the invention in particular has a rigidity which leads to a stretch of less than 0.05%, preferably less than 0.01%, at an applied force of 1 N per mm belt width, and is preferably made of nitrile butadiene or polyurethane rubber reinforced with synthetic fibres, in particular with aramide fibres.

The invention will be explained below with reference to an example of an embodiment and the appended drawing, in which:

Fig. 1 shows the principle of rotary screen printing; and

Fig. 2 shows a simplified sketch of a textile

printing machine.

Fig. 1 shows the principle of rotary screen printing. In this technology the pattern to be printed is applied to a stencil, such as cylinder 1, and paste (p) is pressed by means of squeegee element 7 from the inside out through the stencil 1 onto the fabric (or material to be printed) 8, forming a printed fabric 9. Since the fabric itself is not rigid enough to pass through the process with a good result, this material is temporarily attached to a printing belt 10, usually by means of an adhesive layer, which can be washed off when the printing process has been completed. Roller 1a is a counterpressure roller which interacts with stencil 1.

Fig. 2 shows schematically a textile printing machine with 4 printing positions in the form of 4 stencils 1, 2, 3 and 4 with counterpressure rollers 1a, 2a, 3a and 4a respectively. As can be seen from this schematic illustration, the printing belt 10 is of the endless type, and this belt is guided along the printing positions by means of the reversing rollers 5 and 6.

According to the invention, in such a device use is made of a printing belt of high rigidity, preferably a rigidity leading to a stretch of less than 0.01% at an applied force of 1 N per mm belt width. This belt is expediently formed by a woven fabric of aramide fibres to be embedded in nitrile butadiene or in polyurethane. These polymers have good adhesive and washing properties, which is necessary for temporarily attaching the material to be printed to the printing belt. Of course, the invention is not limited to these materials, but other materials can also be used, provided that they meet the specifications set above.

On account of its use in a rotary screen printing machine, the belt must be made endless; for this the person skilled in the art has various techniques at his disposal, which will not be discussed any further here. The choice of a specific technique will, however, depend partly on the type of woven fabric.

Claims

1. Rotary screen printing machine, comprising at least one cylindrical stencil (1) and a counterpressure roller (1a) interacting therewith, and also a printing belt (10) made of a reinforced elastic material, to be attached temporarily to material (8) to be printed, characterised in that the printing belt (10) has a high rigidity.
2. Rotary screen printing machine according to claim 1, characterised in that the printing belt (10) has a rigidity which leads to a stretch of less than 0.05% at an applied force of 1 N per mm belt width.

3. Rotary screen printing machine according to claims 1 or 2, characterised in that the printing belt (10) has a rigidity which leads to a stretch of less than 0.01% at an applied force of 1 N per mm belt width. 5
4. Rotary screen printing machine according to claims 1 to 3, characterised in that the printing belt (10) has a rigidity which leads to a stretch of less than 0.005% at an applied force of 1 N per mm belt width. 10
5. Rotary screen printing machine according to claims 1 to 4, characterised in that the printing belt (10) is formed from a synthetic rubber reinforced with synthetic polymer fibres, in particular a nitrile butadiene or polyurethane rubber in which aramide fibres are embedded. 15
6. Use of a printing belt (10) with high rigidity, suitable for use in a rotary screen printing machine. 20
7. Use according to claim 6, characterised in that the printing belt (10) has a rigidity which leads to a stretch of less than 0.05%, preferably less than 0.01%, expediently less than 0.005%, at an applied force of 1 N per mm belt width. 25
8. Method for printing material (8), in particular textiles, using a rotary screen printing machine, in which the material (8) to be printed is temporarily attached to a printing belt (10), characterised in that a printing belt (10) with a high rigidity is used. 30
35
9. Method according to claim 8, characterised in that use is made of a printing belt (10) which has a rigidity which leads to a stretch of less than 0.05%, preferably less than 0.01%, expediently less than 0.005%, at an applied force of 1 N per mm belt width. 40
10. Method according to claims 8 or 9, characterised in that use is made of a printing belt (10) made from a nitrile butadiene or polyurethane rubber reinforced with synthetic fibres, in particular with aramide fibres. 45

50

55

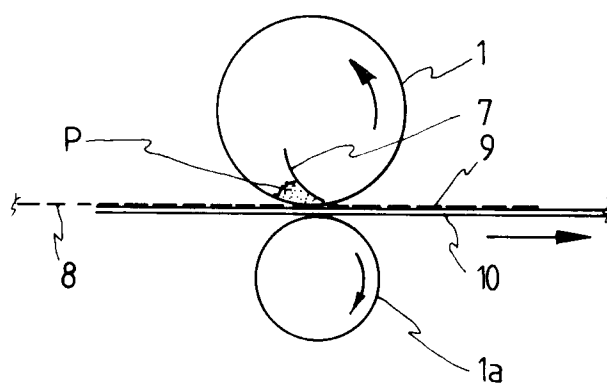


Fig. 1

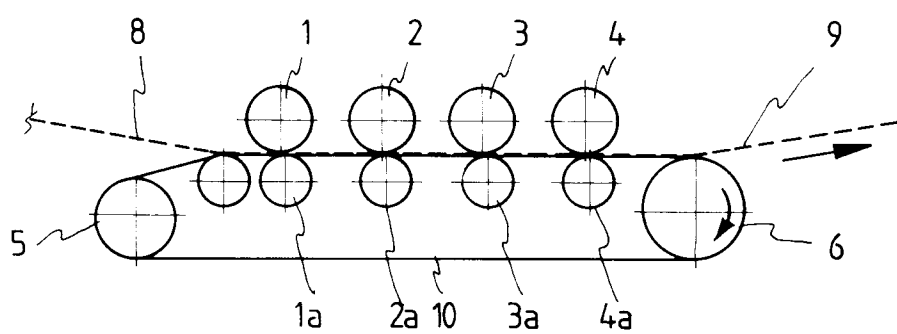


Fig. 2



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 20 1835

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)
X	FR-A-1 403 117 (W. R. GRACE & CO.) * the whole document * ---	1-10	B41F17/00 B41F15/28
X	NL-A-6 409 222 (THOMPSON-WERKE) * the whole document * ---	1-3,6,8	
A	FR-A-2 460 786 (ICHIKAWA WOOLEN TEXTLE CO. LTD.) * the whole document * ---	1,6,8	
A	CH-A-385 154 (ARTOS MASCHINENBAU DR. ING. MEIER-WINDHORST) * the whole document * ---	1,6,8	
A	FR-A-1 106 442 (STOFFEL & CØ) * the whole document * ---	1,6,8	
A	EP-A-0 293 989 (AKZO N.V.) * claims * ---	1,5,10	
A	DE-A-4 012 687 (JOY TECHNOLOGIES INC.) * column 3, line 64 - column 4, line 20 * ---	1,5,10	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	US-A-4 705 161 (GOZDIFF) * the whole document * ---	1,5,10	B41F B65G
A	FR-A-2 649 084 (DEPREUX S.A.) * the whole document * ---	1,5,10	
A	US-A-3 998 986 (WILLIAMS) * column 3, line 1 - column 8, line 36 * -----	1,5,10	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 06 OCTOBER 1992	Examiner MEULEMANS J.P.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			