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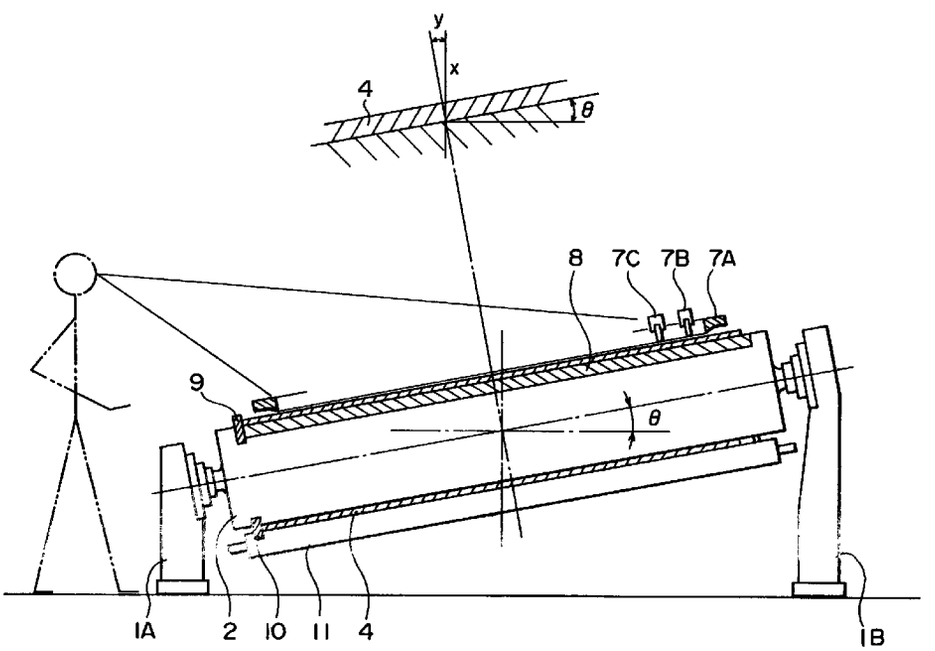
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(54) Automatic screen printing machine

(57) An automatic screen printing machine which features improved printing frame-matching precision, facilitates the printing operation, makes it easy to supervise the operation conditions, and is easy to use. The printing table (8), the pair of rollers (2;3), the endless belt (4) and the printing units (7) are all arranged being inclined by a predetermined angle Θ in the direction of width with respect to the horizontal plane, and provision is made of a belt guide (9) that comes into contact with a selvage of the upper half of the lower side of the endless belt.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

(Field of the Invention)

The present invention relates to a novel automatic screen printing machine. More particularly, the invention relates to an automatic screen printing machine which features improved printing frame-matching precision, facilitates the printing operation, makes it easy to supervise the operation conditions, and is easy to use.

(Description of the Prior Art)

The automatic screen printing machines have been used since old times in wide field of applications and in all of them, the upper surface of the endless belt that serves as the printing surface is maintained horizontal. This is the most natural form for automatically and intermittently driving the endless belt and for driving a squeegee device that effects the printing via a screen, and has generally been accepted and used.

In the automatic screen printing machine of the above-mentioned conventional type in which the endless belt is horizontally supported on a printing table and is conveyed, however, there inevitably occurs fine deviation in position toward the right and left in the direction of width of the endless belt (in the direction at right angles with the travelling direction) due to a cause mentioned below. Therefore, even though the frame-matching precision is good in the direction in which the endless belt is fed, frame mismatching occurs to a small degree in the direction of width of the fabric making it difficult to maintain a complete printing precision.

The above-mentioned cause stems from the endless belt itself. The fabric tissue that serves as a core of the endless belt is constituted by a synthetic fiber having a large tensile strength. In the core fabric, the density of the fabric and the tension of the yarns become inevitably nonuniform at least partly. In particular, there occurs the phenomenon of zig-zag travelling caused by a difference in the tension of the endless belt in the direction of width thereof.

The endless belt is mounted on the automatic screen printing machine and is adjusted being applied with the tension of from 12 kg to 16 kg per a centimeter of the width prior to being used. This helps guarantee the precision in the direction of intermittent feeding but permitting selvage portions to be partly curved due to a difference in the tension in the direction of width of the belt. Usually, both selvages of the endless belt are provided with guide plates over the whole length of the printing zone to limit the phenomenon of zig-zag travelling of the belt. However, a small gap must be maintained for permitting the curved portions to pass through, which makes it difficult to completely prevent the phenomenon of zig-zag travelling and permits defective frame matching to occur in the direction of width.

Moreover, since the printing operation is carried out on a horizontal surface, inconvenience is involved in supervising the whole printing surface and in carrying out the printing operation. This tendency becomes conspicuous as the width of the printing increases.

Many printing plates of the hand printing type have been designed in an inclined manner since old times to facilitate the operation which, however, has not yet been put into practice in the case of the automatic screen printing machines.

SUMMARY OF THE INVENTION

The object of the present invention therefore is to provide an automatic screen printing machine which features improved printing frame-matching precision, facilitates the printing operation, makes it easy to supervise the operation conditions, and is easy to use.

The present invention is concerned with an automatic screen printing machine comprising a printing table, a pair of rollers which are arranged in front of and at the back of the printing table, at least either one of which being driven, an endless belt for supporting a material to be printed, the endless belt being supported by said rollers and the upper half of which being permitted to move on the printing table, and printing units provided on the upper half of the endless belt, wherein the printing table, the pair of rollers, the endless belt and the printing units are all arranged being inclined by a predetermined angle in the direction of width relative to the horizontal plane, and provision is made of a belt guide that comes into contact with a selvage portion of the upper half of the lower side of the endless belt.

It is desired that the printing table, the pair of rollers, the endless belt and the printing unit are all inclined at an angle (θ) of from 5 to 15 degrees and, particularly, from 8 to 12 degrees with respect to the horizontal plane.

It is further allowable to provide a second belt guide that comes into contact with the selvage of the lower half of the endless belt of the lower side, as well as to provide a member for polishing the selvage of the endless belt on a surface of the second belt guide with which the selvage of the endless belt comes into contact.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view of an automatic screen printing machine of the present invention (X-X section in Fig. 2); and

Fig. 2 is a side view of the automatic screen printing machine of Fig. 1.

DETAILED DESCRIPTION OF THE INVENTION

In the automatic screen printing machine of the present invention as will be described later in detail and as shown in Fig. 1, the surface of the upper half of the endless belt 4 that serves as the printing surface is inclined by an angle of θ degrees in the direction of width

with respect to the horizontal plane. Therefore, a front roller 2, a rear roller 3 and a printing table 8 are all inclined by the angle of θ degrees, and an the endless belt 4 is conveyed along therewith.

Therefore, though the gravity x of the endless belt 4 acts vertically, a component of force y thereof acts toward the left lower direction in Fig. 1 along the inclination angle θ.

An upper belt guide 9 is provided at the left upper portion in Fig. 1 over the whole length of the printing zone as also shown in Fig. 2, and receives the component of force y of the endless belt 4 that acts along the inclination.

Accordingly, the endless belt 4 is pushed toward a predetermined direction (leftwards in Fig. 1) at all times, and is conveyed stably and intermittently. Therefore, unlike in the conventional machine in which the endless belt is supported and is conveyed horizontally, there does not occur a phenomenon in which the endless belt 4 travels in a zig-zag manner, and the frame-matching precision is completely maintained in the direction of width of the fabric.

Lower belt guides 10 are provided even on the left side of the lower half of the endless belt 4. The endless belt is brought into contact therewith at its lower half, and is properly conveyed.

In this case, a polishing member is provided on the surfaces of the lower belt guides 10 with which the belt comes into contact, such as by applying an antifriction composition or by sticking a sand-paper or the like. Then, curvature at the selvage of the endless belt 4 is spontaneously polished during the operation, and straightness is maintained contributing to improving the precision.

Moreover, by inclining the surface of the endless belt by an angle of θ degrees with respect to the horizontal plane, the operation surface can be watched well by an operator as shown in Fig. 1, enabling the whole printing surface to be supervised and the operation efficiency to be improved.

The angle θ of inclination with respect to the horizontal plane is determined by taking into consideration the intermittent conveyance of the endless belt 4 and stability in the squeeging operation, and is selected to lie over a range of from 5 to 15 degrees and, particularly, over a range of from 8 to 12 degrees from the practical point of view. When the angle is smaller than the above-mentioned range, the effect for preventing the zig-zag travelling and the effect for improving the operation efficiency are little exhibited. When the angle is larger than the above-mentioned range, on the other hand, there develop adverse effects such as a decrease in the operation efficiency and dropping of a color paste.

EMBODIMENT

Fig. 1 is a sectional view of the automatic screen printing machine of the present invention (X-X cross section in Fig. 2), and Fig. 2 is a side view thereof.

In Fig. 2, the front roller 2 and the rear roller 3 are provided on both sides of machine frames 1A and 1B, and the endless belt 4 is stretched therebetween. The endless belt 4 is intermittently conveyed by a drive device that is not shown in the direction of arrow by a repeat length P in a manner that is widely known.

On the upper surface of the endless belt 4 are mounted a plurality of printing units 7 each made up of a screen 7A, a print squeegee 7B and a flood squeegee 7C. A printing roller 6 effects the printing in a known manner onto a fabric 5 to be printed adhered to the surface of the endless belt 4.

The invention up to this point is the same as that of the conventional automatic screen printing machine. As shown in Fig. 1 and as described above, however, the feature of the present invention resides in that the upper surface of the endless belt 4 that serves as the printing surface is inclined by θ degrees toward the operation side (left side in Fig. 1) with respect to the horizontal plane.

In Fig. 1, the front roller 2 and the rear roller 3 are supported between the machine frames 1A and 1B of both sides, and on which is wrapped the endless belt 4. A printing table 8 is provided under the endless belt 4 that serves as the printing surface, both of which being arranged inclined by θ degrees with respect to the horizontal plane.

On the upper left side of the endless belt 4 is provided an upper belt guide 9 over the whole length of the printing zone as shown in Fig. 2, and on the lower left side thereof are provided lower belt guides 10. These guides support the gravity of the endless belt 4 that acts along the inclination, and work to guide straight the conveyance of the endless belt 4.

As described above, the endless belt 4 is conveyed straight and properly in one direction while keeping contact with the belt guides 9 and 10 at all times, and does not undergo zig-zag travelling unlike in the conventional machines.

The lower part of the endless belt 4 is supported by guide rollers 11 that are provided maintaining a predetermined distance, and a plurality of lower belt guides 10 are provided among them to correct the passage of the lower part of the endless belt 4.

As described earlier, furthermore, an antifriction composition is applied or a sand-paper is stuck to the surfaces of the lower belt guides 10 with which the endless belt 4 comes in contact, such that the end surface of the endless belt 4 is spontaneously polished while the printing machine is in operation and that the endless belt 4 is properly conveyed while correcting the curvature.

In the present invention, the squeeging operation is carried out in a manner that when the screen 7A is being lowered, the printing is effected by the print squeegee 7B from the right toward the left in Fig. 1 and when the screen 7A is being ascended, the flood squeeging is effected by the flood squeegee 7C from the left toward the right to reduce the color paste.

According to the present invention, the printing table, the pair of rollers, the endless belt and the printing units

are all arranged being inclined by a predetermined angle in the direction of width with respect to the horizontal plane, and belt guides are provided to come into contact with the selvages of the endless belt of the lower side. Therefore, the endless belt is pushed in the direction of the guides at all times due to the gravity, and is conveyed stably and intermittently in a state where it is strictly specified for its position in the direction of width. Unlike the conventional machine in which the endless belt is horizontally supported and is conveyed, therefore, the endless belt does not undergo zig-zag travelling, and the frame-matching precision is completely maintained in the direction of width of fabric.

Moreover, since the surface of the endless belt is inclined by θ degrees with respect to the horizontal plane, the operation surface can be viewed well by the operator as shown in Fig. 1, enabling the whole printing surface to be supervised and the operation efficiency to be improved.

The lower belt guides are provided for the lower half of the endless belt, so that the endless belt is properly conveyed being pushed thereto on the lower side. In this case, a polishing member is provided on the surface of the lower belt guides with which the endless belt comes into contact, so that the curvature at the selvage of the endless belt is spontaneously polished during the operation, that straightness is maintained and that precision is further improved.

Claims

1. An automatic screen printing machine comprising a printing table, a pair of rollers which are arranged in front of and at the back of the printing table, at least either one of which being driven, an endless belt for supporting a material to be printed, the endless belt being supported by said rollers and the upper half of which being permitted to move on the printing table, and printing units provided on the upper half of the endless belt, wherein the printing table, the pair of rollers, the endless belt and the printing units are all arranged being inclined by a predetermined angle in the direction of width with respect to the horizontal plane, and provision is made of a belt guide that comes into contact with a selvage of the upper half of the lower side of the endless belt.

2. An automatic screen printing machine according to claim 1, wherein said printing table, said pair of rollers, said endless belt and said printing units are all arranged being inclined at an angle of from 5 to 15 degrees with respect to the horizontal plane.

3. An automatic screen printing machine according to claim 1 or 2, wherein provision is made of second belt guides that come into contact with the selvage of the lower half of the lower side of the endless belt.

4. An automatic screen printing machine according to claim 1, 2 or 3, wherein provision is made of a member for polishing the selvage of the endless belt on the surfaces of the second belt guides with which the selvage of the endless belt comes into contact.

FIG. 1

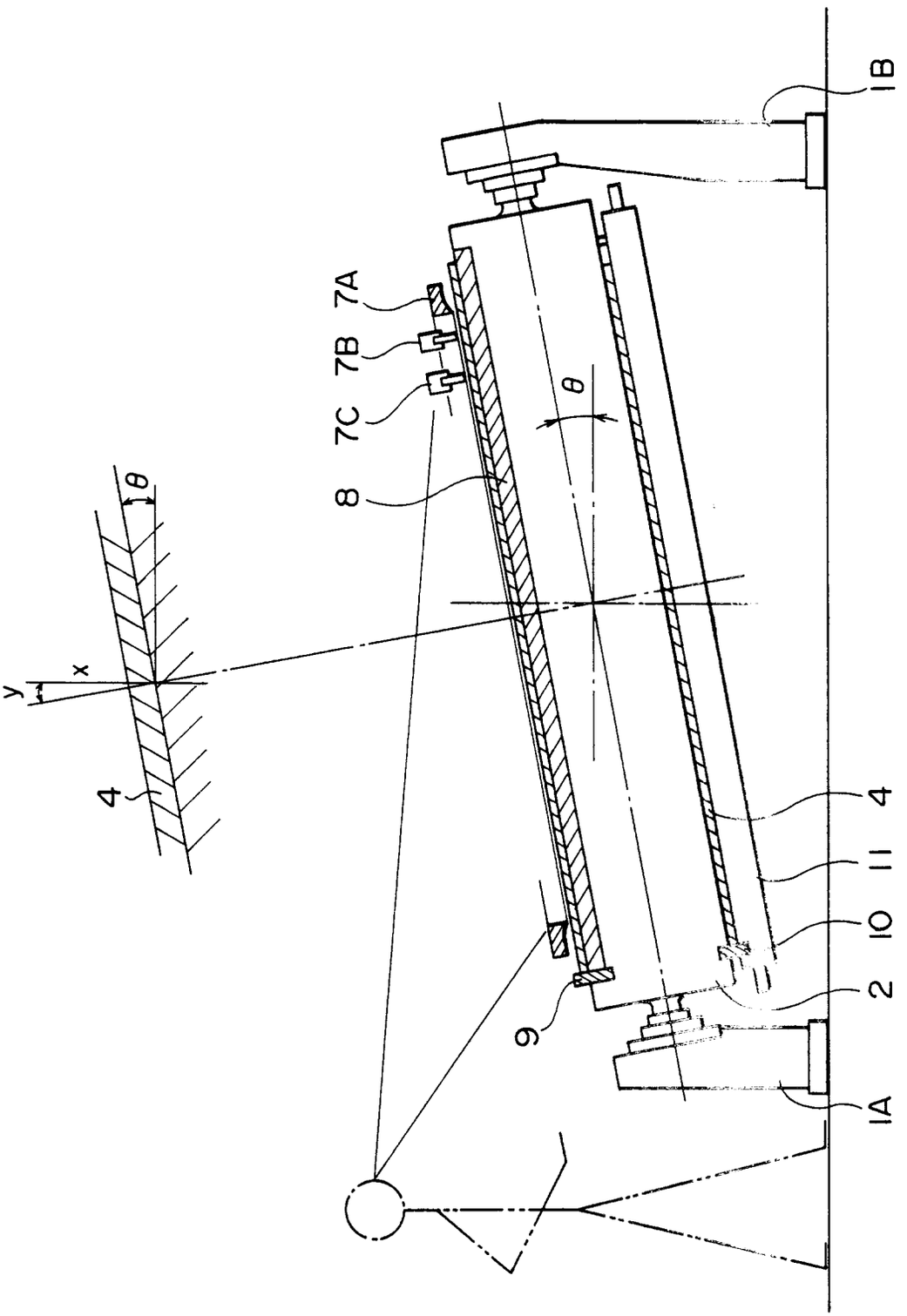
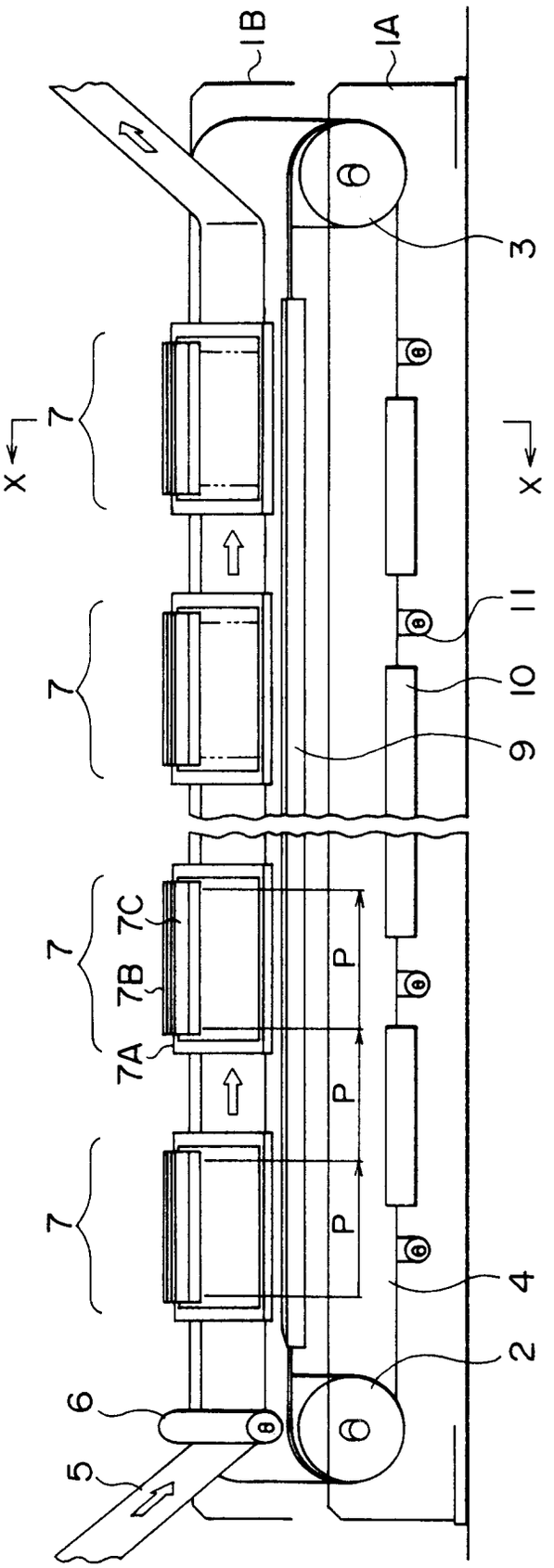


FIG. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 95 30 0659

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.6)
A	EP-A-0 579 433 (ICHINOSE INTERNATIONAL INC) 19 January 1994 * the whole document *	1-4	B41F15/16 B41F15/24
A	PATENT ABSTRACTS OF JAPAN vol. 005 no. 147 (M-088) ,17 September 1981 & JP-A-56 078978 (KANAI HIROYUKI) 29 June 1981, * abstract *	1-4	
A	DE-A-24 00 728 (MITTER & CO) 23 October 1975 * the whole document *	1-4	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B41F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	27 October 1995	Madsen, P

CATEGORY OF CITED DOCUMENTS

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