March 5, 1957 E. KÄLIN 2,784,130

CONVEYOR BAND FOR FILM PRINTING MACHINES

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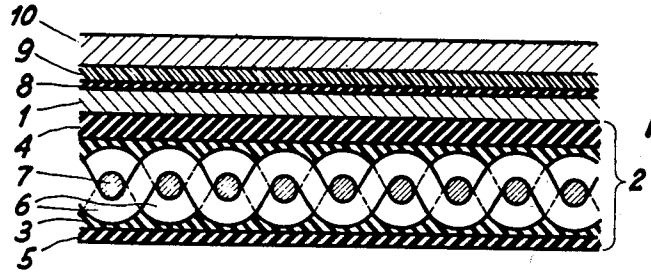


Fig. 1

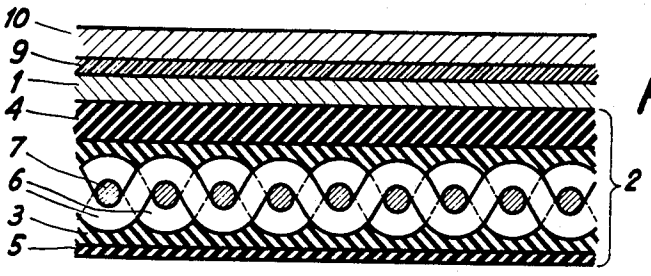


Fig. 2

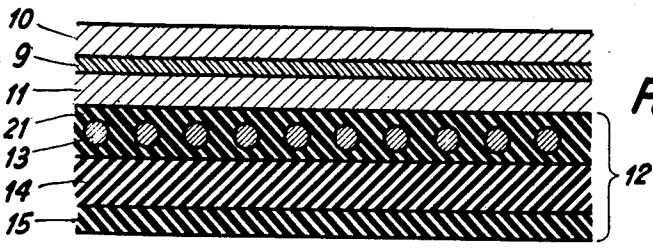


Fig. 3

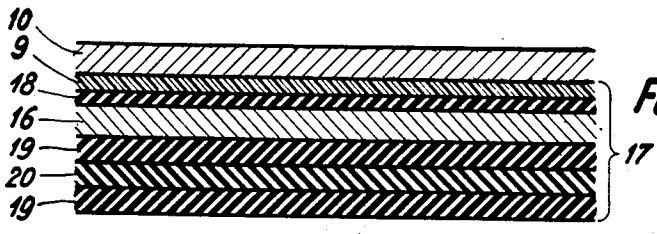


Fig. 4

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CONVEYOR BAND FOR FILM PRINTING MACHINES

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11 Claims. (Cl. 154—52.1)

In some film printing machines the web to be printed must be glued to an endless conveyor band because one must be sure that the web be not drawn wrong since it is very important that the successive imprints made on one definite repeat length of the web coincide with one another exactly. Film printing machines are known in which the web must perform several revolutions together with the conveyor band onto which it has been glued, in order that the several printing operations may be carried out. In these machines one definite repeat length which has received an imprint travels in a closed path back to the same printing station several times and during each such travel passes in a drying chamber over a great number of rolls and of drums each of which deflects the running path by 180°. The diameter of these rolls and drums is chosen as small as possible to keep the dimensions of the drying chamber as small as possible.

Tests have shown that in order to avoid the web from being drawn wrong the main element of the conveyor band must be a very thin flexible steel band. However, such steel bands are only available on the market in widths not exceeding 30 cm. whilst the webs to be printed have often a width exceeding 100 cm. Therefore, I was compelled to use for the construction of the conveyor band several steel bands and to assemble the latter by an appropriate flexible material.

In the first compound conveyor bands which I have constructed, I put the steel bands on the inside and the layer of assembling material on the outside. The web to be printed was then glued onto this material. However, since this layer which consisted mainly of a web and of rubber had a thickness equal to several times that of the steel bands and a modulus of elasticity about a hundred times smaller than that of steel bands, the material located next to the outside surface of the conveyor band and the web glued to this surface were alternatively compressed and stretched on running over the deflecting rolls and drums located alternatively on the outside and inside of the conveyor band, whereby the web to be printed soon loosened at several places from the conveyor bands and could no longer be printed exactly and orderly.

Thus, a way had to be found to reduce to a minimum extent the several compressions and stretchings. The ideal would be to have the neutral zone of the bent cross section located right in the web to be printed. In practice this cannot be realised since the conveyor band must be very much stronger than the cloth to be printed to avoid the latter from being drawn wrong. However, my invention brings a solution which approaches the ideal very closely.

The endless conveyor band according to the invention is characterized in that it comprises several very thin steel bands extending side by side and an assembling layer of uniform thickness irremovably joined to the inside of the steel bands, this assembling layer extending over the whole width of conveyor band and having at least with regard to flexion in the longitudinal direction

of the conveyor band a modulus of elasticity which is considerably smaller than that of the steel bands.

I have found in the course of the development and testing of the new conveyor bands that one or several of the several steel bands incorporated to it can be enabled to fulfil the task of a control tape responsible for repeatedly starting and stopping the band driving mechanism so that the repeat lengths following one another on the band or web come to be located exactly beneath the stencil or stencils of the film printing machine. This is obtained by having one or several of the steels provided with magnetic control signals as is well known for sound recording tapes.

The accompanying drawings represent, by way of example, four embodiments of the invention.

Figs. 1 to 4 show longitudinal section views of each of these embodiments together with the web to be printed and the layer of glue by which the web is fixed thereto. The dimensions are enlarged approximately 50 times.

In the embodiment of Fig. 1 the endless conveyor band comprises several steel bands **1** extending side by side and having a thickness of only about $\frac{1}{10}$ mm. These steel bands **1** are vulcanized onto a compound assembling layer **2** having a uniform thickness, extending over the whole width of the conveyor band and comprising a special tissue embedded in soft rubber **3** and layers **4**, **5** of hard rubber. In the mentioned tissue, the warp threads **6** extending in the longitudinal direction of the conveyor band are made of a material having a low modulus of elasticity, e. g. of cotton or of an appropriate synthetic material. The weft threads **7**, however, are made of a material having a high modulus of elasticity, e. g. of glass or steel. A very thin layer of hard rubber **8** has been deposited onto the outside of the steel bands **1**.

A conveyor band so constructed has, when flexion in the longitudinal direction is considered, which occurs when the band runs over the deflecting rolls and drums, a neutral zone which is located about in the midst of the thickness of the steel bands **1**. Since the latter are located at the outside of the conveyor band, the web to be printed, indicated at **10** and fixed by a layer of glue **9**, is only subjected to weak compression and stretching effects. The deformations so caused would be several times greater if the steel bands were located on the inside of the conveyor band.

The second embodiment which is represented in Fig. 2 differs from that which has been described only by the fact that the layer of hard rubber **4** is somewhat thicker and in that the layer of hard rubber **8** has been omitted.

In the third embodiment which is represented in Fig. 3, the steel bands **11** located at the outside of the endless conveyor band are vulcanised side by side onto an assembling layer **12** which is constituted by a layer of hard rubber **21** located immediately below the steel bands and in which reinforcing wires **13** extending in the transversal direction of the conveyor band are embedded, and furthermore by a layer of soft rubber **14** and by a layer of hard rubber **15**.

The special tissue **6**, **7** in the embodiments of Figs. 1 and 2 and the wires **13** in the embodiment of Fig. 3 constitute reinforcements which act as such only in the transversal direction of the conveyor band and thereby hold together very closely the steel bands **1** and **11**, respectively.

In some cases such reinforcement may be dispensed with. An embodiment without such reinforcement is shown in Fig. 4 in which the reference numeral **16** indicates the steel bands, **17** a compound layer for assembling them and **18** a very thin layer of hard rubber at the outside of the steel bands. The assembling layer **17** consists of two layers of hard rubber **19** and of a layer of soft rubber **20** located between the layers **19**.

In all of these embodiments the steel bands **1**, **11** and **16**, respectively (or one or some of them) may be made of such an alloy and be so treated that magnetic control signals may be recorded thereon the utility of which has been mentioned hereabove.

What I claim is:

1. An endless conveyor band for film printing machines comprising, in combination, a plurality of very thin steel strips extending longitudinally of the band in side by side relationship, and a laminated assembling layer of uniform thickness irremovably joined to the radially inner side only of the steel strips, the radially outer side of said steel strips being free from said assembling layer, said assembling layer extending over the entire width of the conveyor band and having with respect to flexion in the longitudinal direction of the conveyor band a modulus of elasticity which is substantially smaller than that of the steel strips.

2. An endless conveyor band as defined in claim 1, wherein said assembling layer includes transversely-extending reinforcing means.

3. An endless conveyor band as defined in claim 2, wherein said reinforcing means comprises metallic wires extending in the transversal direction of the conveyor band.

4. An endless conveyor band as defined in claim 2, wherein said reinforcing means consists of a fabric having weft threads formed from metallic wires which extend in the transversal direction of the conveyor band.

5. An endless conveyor band as defined in claim 2, wherein said reinforcing means consists of a fabric having weft threads formed from glass which extend in the transversal direction of the conveyor band.

6. An endless conveyor band as defined in claim 1, wherein said assembling layer includes a first layer of rubber and at least one second layer of rubber having a hardness greater than the first layer of rubber.

7. An endless conveyor band as defined in claim 1, wherein said assembling layer includes a first layer of rubber and at least one second layer of rubber having a hardness greater than the first layer of rubber, said first layer of rubber having embedded therein a transversely extending reinforcing means.

8. An endless conveyor band as defined in claim 1, wherein said assembling layer includes a first layer of rubber and two second layers of rubber having a hardness greater than the first layer of rubber, said second layers of rubber overlying the faces of the first layer of rubber.

9. An endless conveyor band for film printing machines comprising, in combination, a plurality of very thin steel strips extending longitudinally of the band in side by side relationship, and a laminated assembling layer of uniform thickness irremovably joined to the radially inner side only of the steel strips, the radially outer side of said steel strips being free from said assembling layer, said assembling layer extending over the entire width of the conveyor band and having with respect to flexion in the longitudinal direction of the conveyor band a modulus of elasticity which is substantially smaller than that of the steel strips, said assembling layer including a first layer of rubber and at least one second layer of rubber having a hardness greater than the first layer of rubber, said second layer of rubber directly underlying said thin steel strips and said first layer of rubber underlying said second layer.

10. An endless conveyor band for film printing machines comprising, in combination, a plurality of very thin steel strips extending longitudinally of the band in side by side relationship, and a laminated assembling layer of uniform thickness irremovably joined to the radially inner side only of the steel strips, the radially outer side of said steel strips being free from said assembling layer, said assembling layer extending over the entire width of the conveyor band and having with respect to flexion in the longitudinal direction of the conveyor band a modulus of elasticity which is substantially smaller than that of the steel strips, said assembling layer including a first layer of rubber and at least one second layer of rubber having a hardness greater than the first layer of rubber, said second layer of rubber directly underlying said thin steel strips and said first layer of rubber underlying said second layer, and said first layer of rubber having embedded therein a transversely-extending reinforcing means.

11. An endless conveyor band for film printing machines comprising, in combination, a plurality of very thin steel strips extending longitudinally of the band in side by side relationship, and a laminated assembling layer of uniform thickness irremovably joined to the radially inner side only of the steel strips, the radially outer side of said steel strips being free from said assembling layer, said assembling layer extending over the entire width of the conveyor band and having with respect to flexion in the longitudinal direction of the conveyor band a modulus of elasticity which is substantially smaller than that of the steel strips, said assembling layer including a first layer of rubber and two second layers of rubber having a hardness greater than the first layer of rubber, said second layers of rubber overlying the faces of the first layer of rubber and one of said second layers directly underlying said thin steel strips.

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