

(12)

EUROPEAN PATENT APPLICATION

(43)

Date of publication:
17.06.2009 Bulletin 2009/25

(51)

Int Cl.:
B65H 23/02 (2006.01)

(21)

Application number: 08171084.0

(22)

Date of filing: 09.12.2008

(84) Designated Contracting States: AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR Designated Extension States: AL BA MK RS (30) Priority: 10.12.2007 IT FI20070278	(71) Applicant: Fait Group S.P.A. 59013 Oste Montemurlo (IT) (72) Inventor: Bassi, Agostino 59100, PRATO (IT) (74) Representative: Gervasi, Gemma et al Notarbartolo & Gervasi S.p.A. Corso di Porta Vittoria, 9 20122 Milano (IT)
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Cylinder for guiding and centering ribbon-like material and control device associated thereto

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A cylinder for guiding and centering ribbon-like material, comprising a revolving axis on which rings free to rotate about said shaft are arranged, and the control device associated thereto are described.

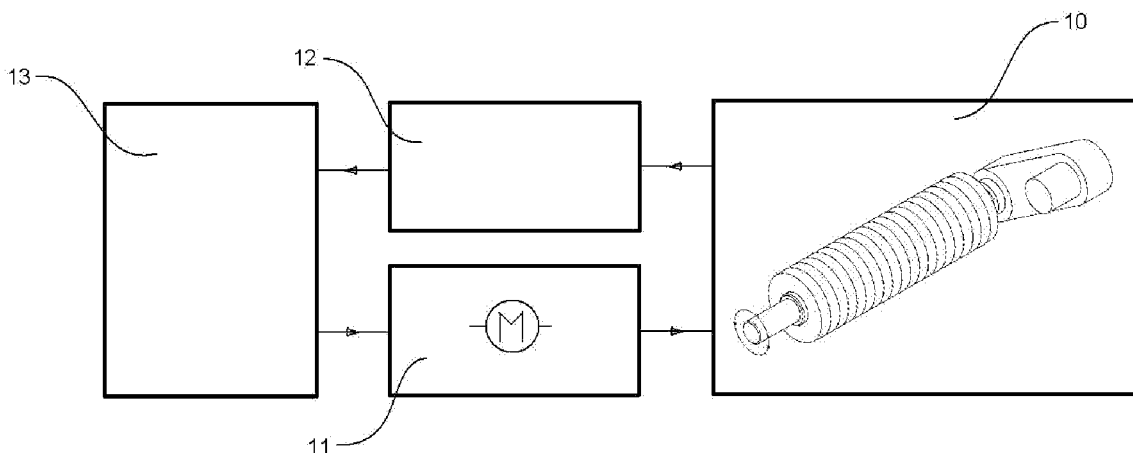


Fig. 1

Description

Field of the invention

[0001] The present invention relates to the field of industrial machine accessories.

State of the art

[0002] As known, during the steps of machining ribbon-like materials (e.g. fabrics, paper, films, woven material, leather, etc.), said materials are transferred by unwinding or winding from one cylinder to another.

[0003] During these steps of machining, the material must be unwound and rewound remaining as centered as possible on the guiding rollers to prevent the external edges from going beyond the end of the rollers themselves, thus compromising the winding/rewinding operations and causing damages to the material itself.

[0004] The object of the present invention allows to solve the described problem by ensuring at the same time, in a simple and effective manner, the transmission of ribbon-like material to be processed under optimal centering conditions with respect to the guiding rollers which are used for such a purpose, and reaches such an object by means of a specifically made guiding cylinder and corresponding actuating and control means associated thereto.

Brief description of the drawings

[0005]

Fig. 1 shows a general block diagram of the apparatus according to the present invention.

Fig. 2 shows a preferred embodiment of the cylinder for guiding and centering the ribbon-like material according to the invention.

Fig. 3 shows a detail of a preferred embodiment of the cylinder for guiding and centering the ribbon-like material according to the invention.

Fig. 4 shows a preferred embodiment of the connecting bushing between discoid elements and the shaft of the cylinder for guiding and centering the ribbon-like material according to the invention.

Fig. 5 shows a detail for the cylinder for guiding and centering the ribbon-like material according to the invention with reference to two different moments of operation thereof.

Detailed description of the invention

[0006] With reference to the accompanying block diagram shown in the attached Fig. 1, the present invention allows to overcome the aforesaid problems in virtue of an apparatus comprising:

- at least one cylinder 10 for guiding and centering

ribbon-like material, hereinafter simply named centering cylinder 10, the shaft 21 of which is associated to

- appropriate actuating means 11, adapted to provide said shaft 21 with a revolving motion about to its axis;
- a detection device 12 for the displacement of the edge of the material which is wound about said centering cylinder 10 and
- a control device 13 adapted to process data from said detection device 12 and drive said actuating means 11 associated to said shaft and adapted to rotate it about its axis.

[0007] With reference to Figs. 2 and 3, said centering cylinder 10 comprises a plurality of discoid elements 20, each of which is free to rotate about its axis which is slightly inclined as compared to the axis of said shaft 21. This is possible in virtue of the fact that said discoid elements are associated to the shaft 21 by means of bushings 22 having an offset hole with respect to the external surface. Said bushings are arranged on the shaft 21 and are adapted to accommodate, on the outermost edge thereof, either bearings or a layer of appropriate material adapted to favour sliding, e.g. Teflon™, on which said discoid elements 20 are free to rotate about their axis. With reference to Fig. 4, a preferred embodiment of said bushings is shown in detail. The bushings are substantially shaped as a hollow cylinder, in which the internal surface adapted to engage said shaft 21 is offset with respect to the external surface which is provided with a seat for bearings 23, or similar friction reducing means, and has a tooth 24 and a seat 25 adapted to accommodate said tooth 24, so as to facilitate the fitting with the adjacent bushings and allow to assemble each of them in phase with others.

[0008] Advantageously, the two discoid elements 20 placed close to the right and left ends of said centering cylinder 10 will be associated to appropriate blocking means adapted to keep all discoid elements 20 forming said centering cylinder 10 joined together.

[0009] Preferably, said discoid elements 20 may be made of plastic or metal materials and their external surface, in contact with the ribbon to be processed, will be coated with a material which allows a slight friction in contact with said ribbon.

[0010] Again with reference to the accompanying Fig. 1, said actuating means preferably comprise an electric motor connected to said shaft, said motor being for example of the brushless or stepper type, complete with corresponding electronic driving circuitry. The motor is further connected to said control device 13, connected in turn to said detection device 12 for the displacement of the edge of the material which is wound on said centering cylinder 10 and preferably comprising an edge guiding sensor arranged along the path of the ribbon, which is able to detect possible displacements of the external edge of the ribbon with respect to the ideal sliding line, which are the consequence of irregularities in the trans-

versal extension of the ribbon itself.

[0011] If said detection device 12 detects a displacement of the aforesaid type, it sends an appropriate error signal to said control unit 13, to which said control unit 13 reacts so as to impress a variable rotation of up to a maximum of 180° - clockwise or counterclockwise - to the shaft 21 in order to facilitate the flattening of the ribbon, by means of the action of the centering cylinder according to the present invention, thus returning the edge thereof to the ideal sliding position through the progressive reduction of said error signal.

[0012] According to a preferred embodiment of the present invention, said control unit 13 further comprises an input unit, adapted to read the error signal from said detection device 12, an error amplifier adapted to compare said error signal with a reference value, and an output unit adapted to generate the signals required to drive said actuating means so as to cancel the error and thus flatten the fabric which slides on the centering cylinder.

Claims

1. An apparatus for guiding and centering ribbon-like material comprising: at least one centering cylinder (10) for guiding and centering ribbon-like material; appropriate actuating means (11) adapted to provide the shaft (21) of said cylinder with a revolving motion for guiding and centering ribbon-like material about its axis; a detection device (12) for the displacement of the edge of the material which is wound about said centering cylinder (10); a control device (13) adapted to process data from said detection device (12) and drive said actuating means (11) associated to said shaft and adapted to rotate it about its axis, **characterized in that** said centering cylinder (10) comprises a plurality of discoid elements (20), each of which is free to rotate about its axis which is slightly inclined with respect to the axis of said shaft (21).
2. An apparatus according to claim 1, **characterized in that** said discoid elements (20) are associated to said shaft (21) by means of bushings (22) having an offset hole with respect to the external surface.
3. An apparatus according to claim 1-2, **characterized in that** said bushings (22) are adapted to accommodate, on their outermost edge, sliding means on which said discoid elements (20) are free to rotate about their axis.
4. An apparatus according to claim 3, **characterized in that** said sliding means are chosen from the group comprising: bearings and layers of a material adapted to facilitate sliding.
5. An apparatus according to claim 4, **characterized in that** said material adapted to facilitate the sliding comprises Teflon™.
6. An apparatus according to claims 1-5, **characterized in that** said bushings (22) have: a tooth (24) and a seat (25) adapted to accommodate said tooth (24), so as to facilitate the fitting thereof with the adjacent bushings and allow to assemble each of them in phase with the others.
7. An apparatus according to claims 1-6, **characterized in that** the two discoid elements (20) placed close to the right and left ends of said centering cylinder (10) will be associated to appropriate blocking means adapted to keep the discoid elements (20) forming said centering cylinder (10) joined together.
8. An apparatus according to claims 1-7, **characterized in that** said discoid elements (20) are made of plastic or metal materials, and their external surface, in contact with the ribbon to be processed, is coated with a material which allows a slight friction in contact with said ribbon to be processed.
9. An apparatus according to claims 1-8, **characterized in that** said actuating means (11) associated to said shaft (21) comprise an electric motor complete with the corresponding electronic driving circuitry and connected to said shaft (21).
10. An apparatus according to claim 9, **characterized in that** said electric motor is chosen from the group comprising brushless type motors and stepper type motors.
11. An apparatus according to claim 1-10, **characterized in that** said detection device (12) for the displacement of the edge of the ribbon which is wound on said centering cylinders (10) comprises an edge guiding sensor arranged along the path of the ribbon and capable of detecting possible displacements of the external edge of the ribbon with respect to the ideal sliding line, which are the consequence of irregularities in the transversal extension of the ribbon itself.
12. An apparatus according to claims 1-11, **characterized in that** said control unit (13) is adapted to impress a variable rotation up to a maximum of 180° either clockwise or counterclockwise to said shaft (21).
13. An apparatus according to claims 1-12, **characterized in that** said control unit (13) further comprises an input unit, adapted to read the error signal from said detection device (12), an error amplifier adapted to compare said error signal with a reference value and an output unit adapted to generate the signals required to drive said actuating means (11) so as to

cancel the error and thus flatten the fabric which slides on the centering cylinder.

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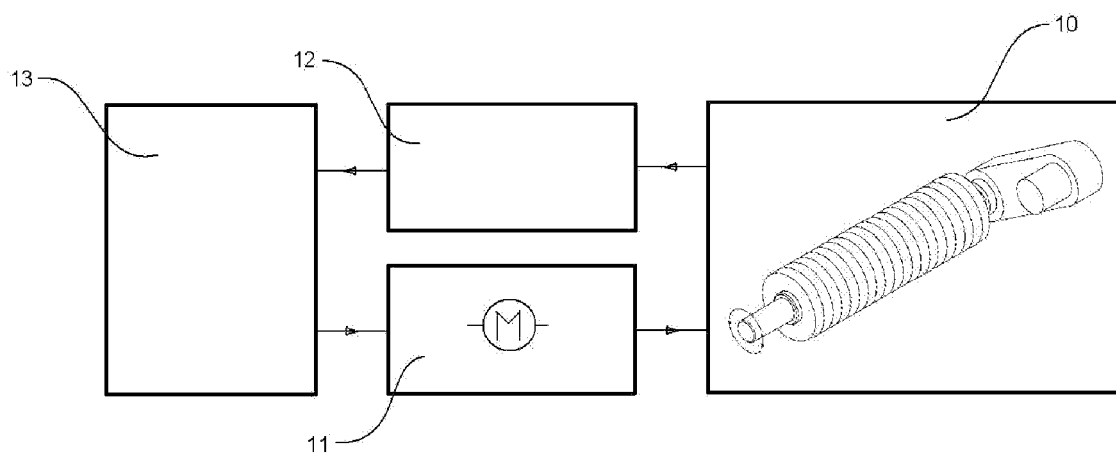


Fig. 1

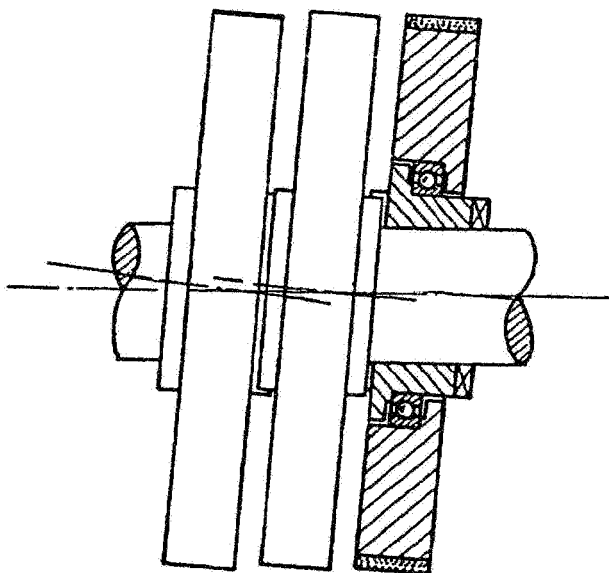


Fig. 2

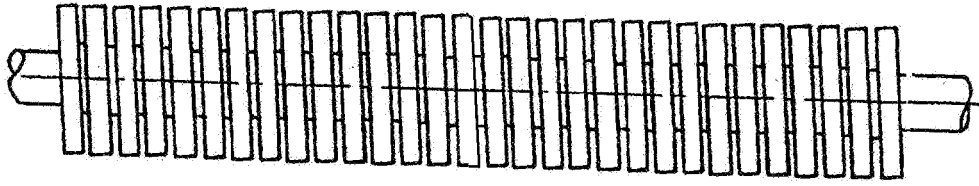


Fig 3

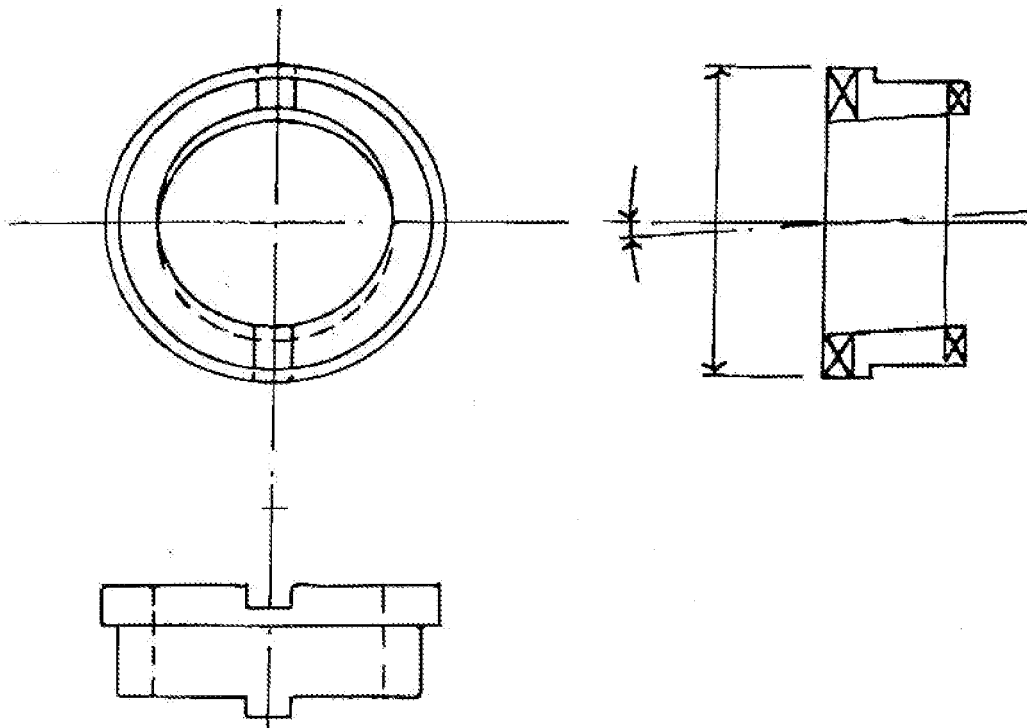


Fig. 4

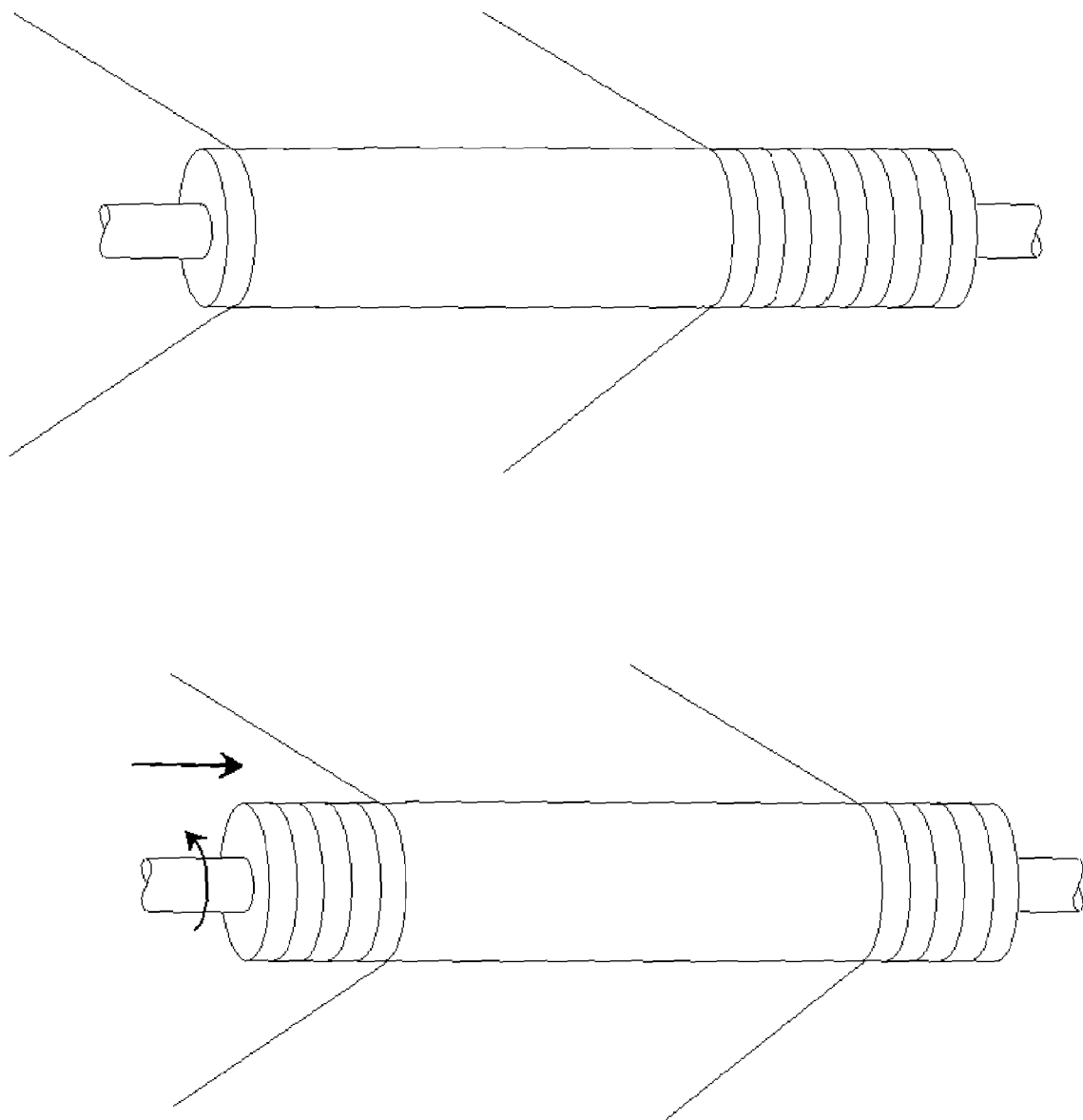


Fig. 5