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(72) Inventors:  
• **Scortegagna, Bruno**  
**36015, SCHIO (VI) (IT)**  
• **Panozzo, Antonio**  
**36030, VILLAVERLA (VI) (IT)**

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(74) Representative: **Petraz, Gilberto Luigi**  
**GLP S.r.l.**  
**Piazzale Cavedalis 6/2**  
**33100 Udine (IT)**

(71) Applicant: **LAFER SpA**  
**36015 Schio (Vicenza) (IT)**

(54) **Widening device for a tubular fabric**

(57) Widening device (10) for a tubular fabric (11) comprising a supporting frame (12), a pair of mobile arms (13) associated with the supporting frame (12), and on which the tubular fabric (11) is inserted and made to advance, and movement members (19, 20, 21, 22, 23) which feed the tubular fabric (11) along the mobile arms (13). On the length of each of the mobile arms (13)

there are three distinct magnetic groups (25, 26, 27), able to exert respective forces of attraction in distinct and separate zones in order to keep the relative mobile arms (13) in a desired position with respect to the supporting frame (12). Each magnetic group (25, 26, 27) includes a pair of mating magnets (29, 30) suitable to exert a force of attraction between relative mobile arm (13) and supporting frame (12).

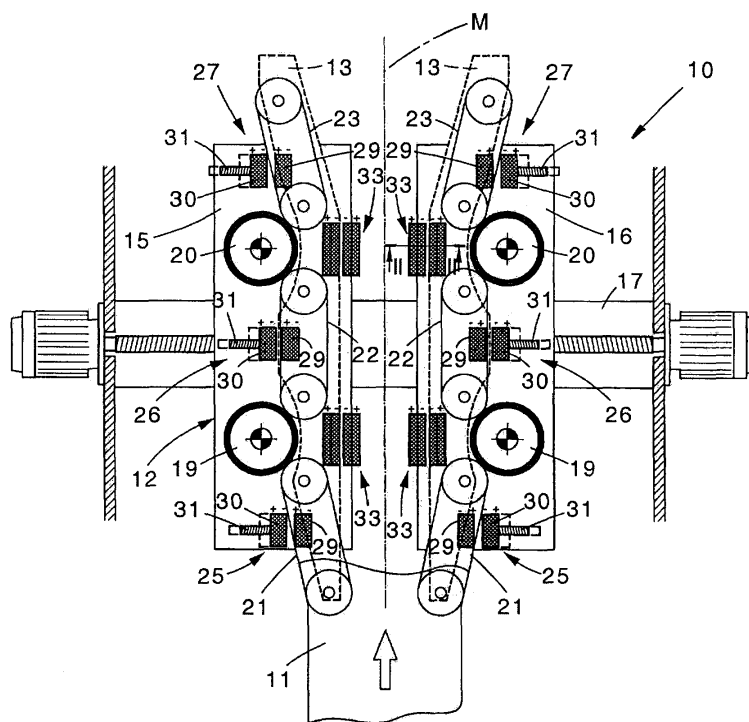


fig. 1

## Description

### FIELD OF THE INVENTION

**[0001]** The present invention refers to a widening device for a tubular fabric.

**[0002]** The device according to the invention is preferably but not exclusively used at inlet to textile machines such as calenders, grinding machines, brushing machines, steaming machines or other, suitable to perform finishing treatments on fabrics or hosiery made of cotton, wool, silk or other.

### BACKGROUND OF THE INVENTION

**[0003]** It is known to use widening devices located at inlet to textile machines and suitable to stretch and dilate a tubular fabric before it is sent to a finishing treatment, in order to facilitate the working thereof, and make it uniform.

**[0004]** Among the plurality of widening devices used, those are known which comprise two supporting frames arranged at a certain distance from each other and reciprocally able to slide on opposite sides with respect to a linear guide, each of which is associated with a relative mobile arm.

**[0005]** One end of the tubular fabric is inserted on the two mobile arms, while the two supporting frames are arranged outside the tubular fabric; by adjusting the distance between the two supporting frames the tubular fabric is widened to the desired value compatible with its characteristics of width, elasticity, compactness, etc.

**[0006]** EP-A-900,872 shows a solution wherein each mobile arm is associated with the relative supporting frame by means of magnets arranged in a single position, substantially central, on the length of the arms; the magnets determine an action of attraction between arm and frame which tends to keep them in a pre-determined reciprocal position.

**[0007]** Since only one position is provided wherein arm and frame are attracted to each other, the magnets have to exert a force of attraction of a very high value, because it is necessary to prevent the reciprocal detachment which can be caused by the elastic force of the fabric, which tends to bring the mobile arms together, moving them away from the relative frames.

**[0008]** The use of magnets having a high force of attraction entails a considerable friction between the gripped segments of the tubular fabric and the relative movement members, such as wheels, belts or chains; very often, this high friction ruins and marks the fabric, lowering the quality of the product emerging from the finishing treatment.

**[0009]** EP-A-1,138,816 discloses a widening device wherein, apart from the magnetic means that exert the attraction between frames and relative arms, there are also contrasting wheels that function as stabilizing elements in order to prevent the arm from detaching from

the frame in the event that the elastic tension of the fabric exceeds the force of attraction imparted by the magnets. This solution allows to reduce the value of the force of attraction of the magnets, and consequently the friction on the fabric, but entails the disadvantage of introducing another element of friction, represented by the wheels themselves.

**[0010]** Moreover, both the aforesaid known solutions do not provide the possibility of adjusting the intensity of the magnetic field generated according to the characteristics of the tubular fabric being worked.

**[0011]** One purpose of the present invention is to achieve a widening device which allows to exert an effective action of lateral traction on the fabric without any risk of the fabric coming off, or the widening elements becoming detached, and without inducing high friction on the fabric that can compromise the quality thereof and the characteristics of feel.

**[0012]** Another purpose is to achieve a widening device that is simple and economical to make and that allows to adjust the intensity of the magnetic field generated with maximum precision according to the characteristics of the tubular fabric being worked.

**[0013]** The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

### SUMMARY OF THE INVENTION

**[0014]** The present invention is set forth and characterized in the main claim, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

**[0015]** In accordance with the above purposes, a widening device for a tubular fabric according to the invention comprises a supporting frame, at least a pair of mobile arms associated with the supporting frame and on which the tubular fabric is able to be inserted and made to advance, and movement members able to feed the tubular fabric along the mobile arms.

**[0016]** According to a characteristic feature of the present invention, on the length of each of the mobile arms at least two distinct magnetic groups are arranged, advantageously three or more, able to exert respective forces of attraction in distinct and separate zones in order to keep the relative mobile arms in a desired position with respect to the supporting frame.

**[0017]** Each of the said magnetic groups has at least a pair of mating magnets, that is, arranged so that the two respective facing surfaces have opposite polarities generating a force of reciprocal attraction, so as to exert a force of attraction between relative mobile arm and supporting frame.

**[0018]** According to a preferential form of embodiment, wherein the members that move the fabric comprise at least a first drawing roller at inlet and a second drawing roller at outlet, the magnetic groups are respec-

tively arranged upstream of the first drawing roller, between the first roller and the second roller, and downstream of the second drawing roller.

**[0019]** Advantageously, the magnetic groups are arranged reciprocally in substantially symmetrical positions on the length of the relative mobile arm.

**[0020]** According to another feature of the invention, each of the magnetic groups comprises adjustment means that allow to move the magnets closer to/away from each other in order to adjust, independently for each magnetic group, the intensity of the force of attraction exerted in each of the distinct and separate zones of the mobile arms.

**[0021]** In this way, the widening device according to the invention can provide magnetic groups whose individual forces of attraction generated are of a relatively low value, and can be adjusted in differentiated manner according to the characteristics of the fabric and its specific position with respect to the length of the arms. This greatly reduces the friction and hence the risks of marking the fabric.

**[0022]** According to another characteristic of the invention, the widening device comprises contrasting and stabilizing means able to act on the opposite side of the mobile arms with respect to that on which the magnetic means act, in order to contrast the force that brings the mobile arms reciprocally closer as exerted thereon by the elastic tension of the advancing tubular fabric.

**[0023]** Said contrasting and stabilizing means consist, in a preferential embodiment, of at least two pairs of second magnetic means arranged one with respect to the other in an angled configuration with respect to the axis of feed of the tubular fabric. Said angle is advantageously about 45°. The two respective facing surfaces of the second magnetic means have the same polarity, so as to generate a force of reciprocal repulsion.

**[0024]** According to a variant, the contrasting and stabilizing means consist of pairs of mechanical means such as wheels, pads or suchlike arranged angled with respect to the axis of feed of the fabric.

**[0025]** According to another characteristic of the invention, the movement members that move the fabric comprise drawing belts arranged over the whole length of the mobile arms, so as to constantly accompany the tubular fabric along the whole length of the widening device from inlet to outlet.

**[0026]** Advantageously, both the first and the second magnetic means consist of permanent magnetic materials taken from minerals called rare earths, such as neodymium, samarium, cobalt or suchlike.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0027]** These and other characteristics of the present invention will become apparent from the following description of some preferential forms of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a plane, schematic view of the widening device for a tubular fabric according to the present invention;
- fig. 2 shows a section from II to II of fig. 1;
- fig. 3 is a plane, schematic view of a variant of the widening device in fig. 1;
- fig. 4 shows a section from III to III of fig. 3.

#### DETAILED DESCRIPTION OF SOME PREFERENTIAL FORMS OF EMBODIMENTS

**[0028]** With reference to the attached drawings, a widening device 10 for a tubular fabric 11 according to the present invention is arranged upstream of a textile machine, such as for example a calender, a brushing machine, a grinding machine, a steamer or other.

**[0029]** The widening device 10 according to the invention comprises a supporting frame 12, divided substantially into two parts 15 and 16 symmetrical with respect to a median axis M, and a pair of mobile arms 13 on which the tubular fabric 11 to be widened is able to be inserted.

**[0030]** The two parts 15 and 16 of the supporting frame 12 are able to slide reciprocally on opposite sides with respect to a fixed bench 17.

**[0031]** Each of said first 15 and second 16 parts of the supporting frame 12 supports a first drawing roller 19 arranged at inlet to the widening device 10 and a second drawing roller 20 arranged at outlet, which are able to feed the tubular fabric 11 along the widening device 10.

**[0032]** In cooperation with the drawing rollers 19 and 20, there are three drawing belts, respectively lower 21, central 22 and upper 23, mounted on the respective mobile arms 13, and able to accompany and support the tubular fabric 11 along the whole length of the widening device 10, so as to prevent the possible formation of creases or blockages of the tubular fabric 11 itself.

**[0033]** The two parts 15 and 16 of the supporting frame 12 are connected to the respective mobile arms 13 by means of three magnetic groups 25, 26 and 27, each consisting of two magnets 29 and 30, arranged with opposite poles facing each other, so as to exert a reciprocal force of attraction that draws the two magnets 29, 30 closer to each other.

**[0034]** The magnetic groups 25, 26 and 27 are respectively arranged upstream of the first drawing roller 19, in an intermediate position between the first 19 and the second 20 drawing roller, and downstream of the second drawing roller 20, and are able to exert their force of reciprocal attraction in distinct and separate zones of the respective mobile arms 13.

**[0035]** Since the magnetic groups 25, 26 and 27 are distributed in several zones, and advantageously in a symmetric manner, over the whole length of the mobile arms 13, the intensity of the respective individual forces of magnetic attraction can be considerably reduced; this allows to keep the friction between the drawing rollers 19 and 20 and the tubular fabric 11 passing through to

very low values, and consequently the risk of ruining the tubular fabric 11 is reduced.

[0036] Each of said magnetic groups 25, 26 or 27 comprises a first magnet 29, mounted on the mobile arm 13, and a second magnet 30 mounted on the supporting frame 12, which, by performing an action of attraction, tend to keep the mobile arm 13 attracted to the supporting frame 12.

[0037] The at least lateral position of the second magnet 30 can be adjusted inside a certain travel (shown by a line of dashes), in an independent manner for each assembly 25, 26, 27, by means of an adjustment screw 31, in order to move it closer to/away from the relative first magnet 29; this allows to vary, also in a differentiated manner over the length of the arms 13, the intensity of the force of attraction exerted by each magnetic group 25, 26, 27.

[0038] Each part 15 or 16 of the supporting frame 12 comprises a fork element 32 (fig. 2) inside which the relative mobile arm 13 is arranged, and at the end of which two pairs of magnets 33 and 35 are inserted, advantageously arranged at 45° with respect to each other.

[0039] The pairs of magnets 33, 35 are arranged so as to have the same polarities on the respective facing surfaces, so as to exert a force of repulsion between the supporting frame 12 and a relative segment of the mobile arm 13 along its opposite edge with respect to the position of the magnetic groups 25, 26 and 27. This force of repulsion ensures that the mobile arm 13 remains in a position such as to guarantee that the action of attraction exerted by the magnetic groups 25, 26, 27 is maintained, to prevent the fabric coming off, or the widening elements becoming detached.

[0040] According to the form of embodiment shown in figs. 3 and 4, wherein equal or equivalent components have the same numbers as those cited for figs. 1 and 2, instead of the magnetic elements 33 and 35 there are two contrasting rollers 36, solid with the supporting frame 12 and able to act against a respective counter-roller 37 mounted on the relative mobile arm 13.

[0041] It is clear, however, that modifications and/or additions of parts may be made to the widening device 10 as described heretofore, without departing from the scope of the present invention.

[0042] For example, according to a variant, instead of the magnets 33 and 35 or the rollers 36 and 37, other types of contrasting means can be provided, such as for example known devices of an electronic, pneumatic type or other.

[0043] According to another variant, the drawing rollers 19 and 20 can be replaced by strips, belts or other movement members suitable to move the tubular fabric 11.

[0044] It is also clear that, although the present invention has been described with reference to specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of widening device for a tubular fabric, all of which shall come within

the scope of the present invention.

## Claims

1. Widening device for a tubular fabric (11) comprising a supporting frame (12), at least a pair of mobile arms (13) associated with said supporting frame (12) and on which said tubular fabric (11) is able to be inserted and made to advance, and movement members (19, 20, 21, 22, 23) able to feed said tubular fabric (11) along said mobile arms (13), **characterized in that** on the length of each of said mobile arms (13) there are at least two distinct magnetic groups (25, 26, 27) able to exert respective forces of attraction in distinct and separate zones in order to keep the relative mobile arms (13) in a desired position with respect to the supporting frame (12), each of said magnetic groups (25, 26, 27) including at least a pair of mating magnets (29, 30) suitable to exert a force of attraction between a relative mobile arm (13) and said supporting frame (12).
2. Widening device as in claim 1, wherein said movement members comprise at least a first drawing roller (19) at inlet and a second drawing roller (20) at outlet, **characterized in that** there are three of said magnetic groups (25, 26, 27), which are arranged respectively upstream of said first drawing roller (19), between said first roller (19) and said second roller (20) and downstream of said second drawing roller (20).
3. Widening device as in claim 1 or 2, **characterized in that** each of said magnetic groups (25, 26, 27) comprises adjustment means (31) able to allow to move closer to/away from each other the relative magnets (29, 30) in order to adjust, in independent manner for each magnetic group (25, 26, 27), the intensity of the force of attraction exerted in each of said distinct and separate zones of said mobile arms (13).
4. Widening device as in any claim hereinbefore, **characterized in that** it comprises contrasting and stabilizing means (33, 35, 36, 37) able to act on the opposite side of said mobile arms (13) with respect to that on which said magnetic groups (25, 26, 27) act, in order to contrast the force of reciprocal approach exerted thereon by the elastic tension of said tubular fabric (11) and to keep said mobile arms (13) in a desired position with respect to the supporting frame (12).
5. Widening device as in claim 4, **characterized in that** said contrasting and stabilizing means comprise at least two pairs of second magnetic groups

(33, 35) acting in repulsion and arranged one with respect to the other according to an angled configuration, advantageously about  $45^\circ$ , with respect to the axis (M) of feed of said tubular fabric (11).

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6. Widening device as in claim 4, **characterized in that** said contrasting and stabilizing means comprise at least two pairs of mechanical members (36, 37) arranged one with respect to the other according to an angled configuration with respect to the axis (M) of feed of said tubular fabric (11). 10
7. Widening device as in claim 6, **characterized in that** said mechanical members consist of wheels (36, 37), rollers, pads or suchlike. 15
8. Widening device as in any claim hereinbefore, **characterized in that** said supporting frame (12) comprises a first part (15) and a second part (16) able to slide reciprocally on opposite sides with respect to a fixed bench (17) and cooperating with said mobile arms (13) by means of said magnetic groups (25, 26, 27). 20
9. Widening device as in claim 2, **characterized in that** in cooperation with said drawing rollers (19, 20) a plurality of drawing belts (21, 22, 23) are provided, mounted on said mobile arms (13) and able to accompany said tubular fabric (11) along the whole length of said supporting frame (12), so as to prevent the formation of creases or blockages in said tubular fabric (11). 25 30
10. Widening device as in claims 3 and 5, **characterized in that** said first magnetic groups (25, 26, 27) and said second magnetic groups (33, 35) consist of minerals called rare earths, such as neodymium, samarium, cobalt or suchlike. 35

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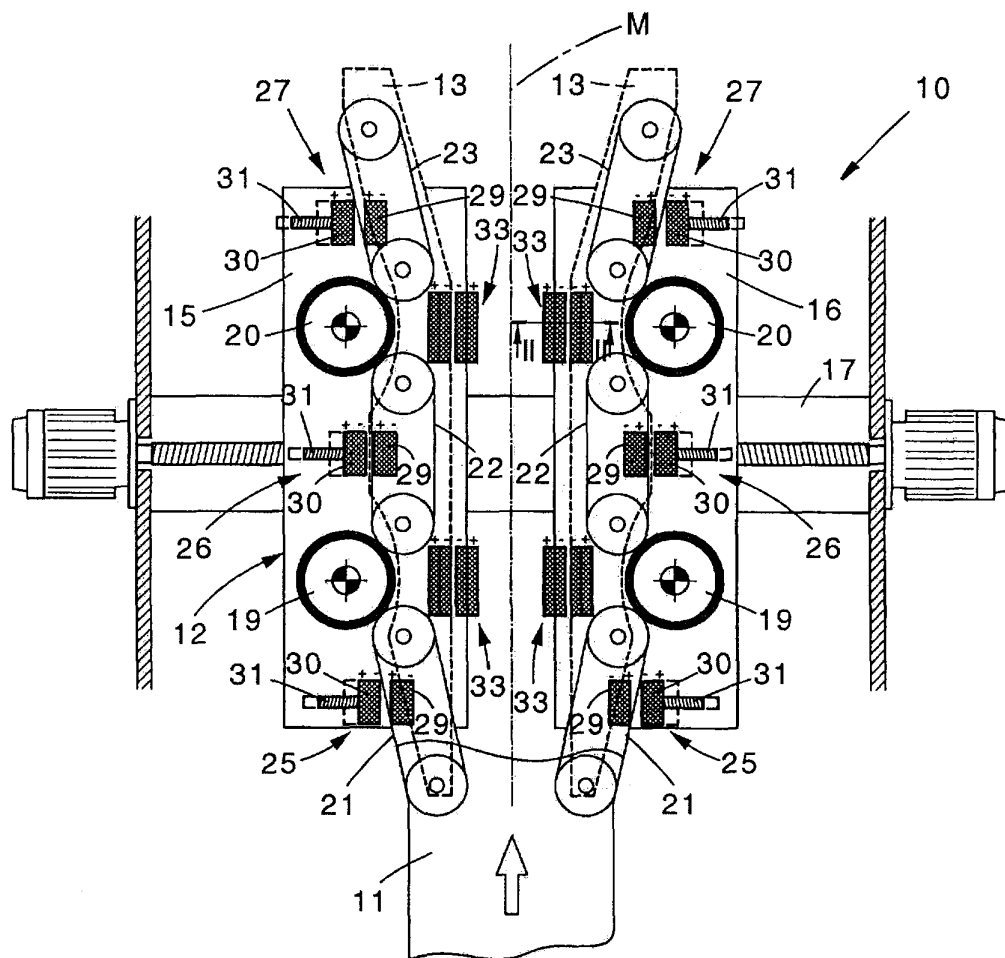


fig. 1

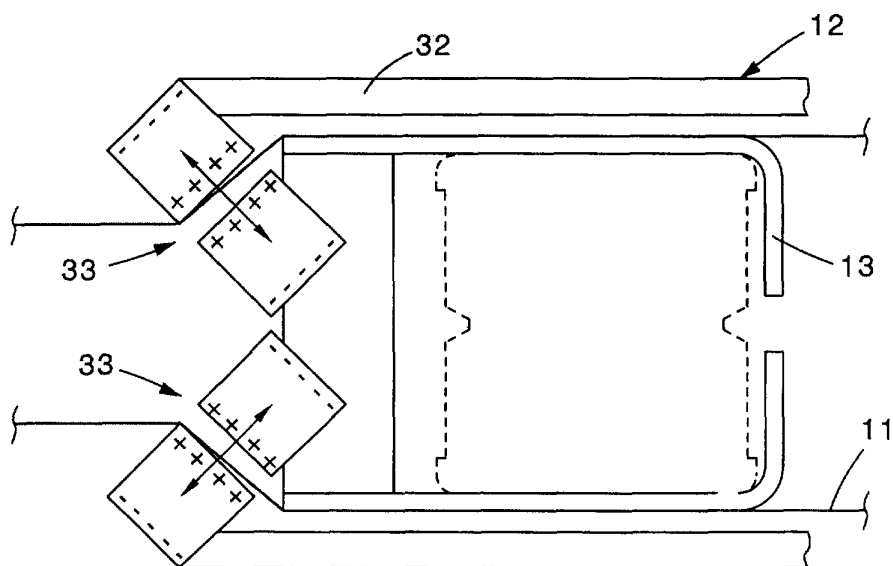


fig. 2

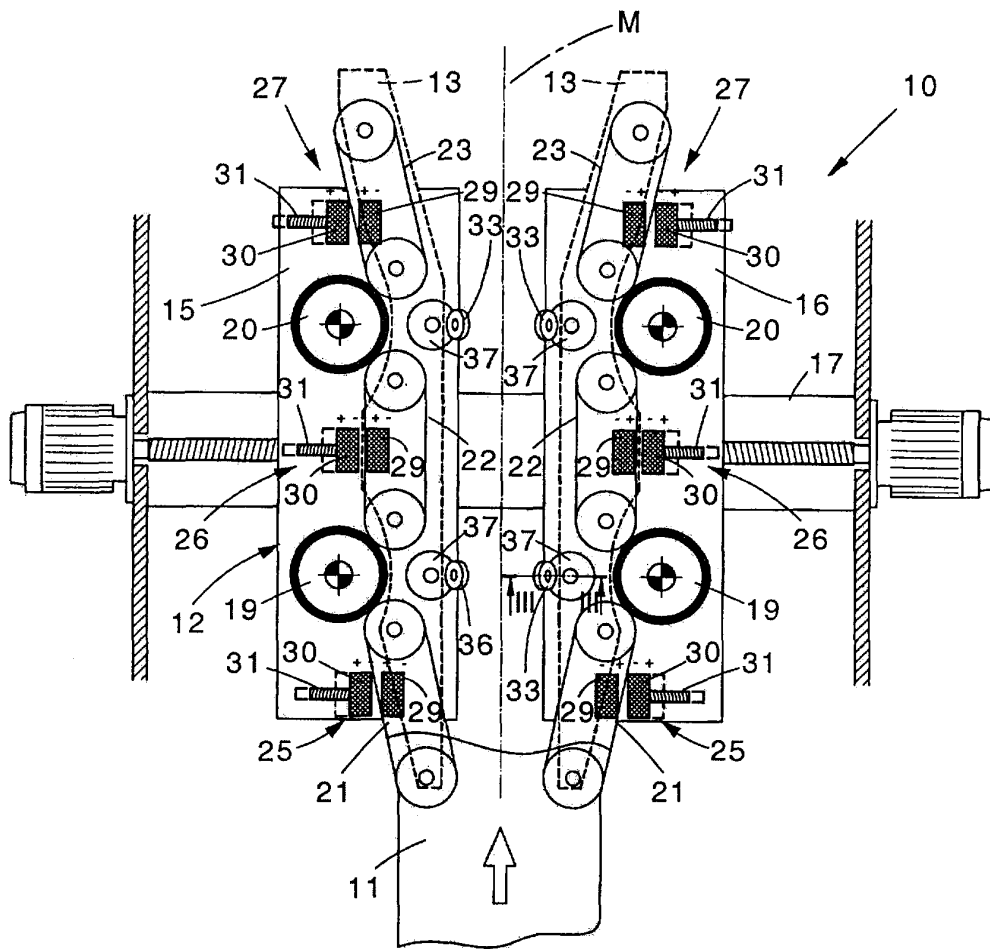


fig. 3

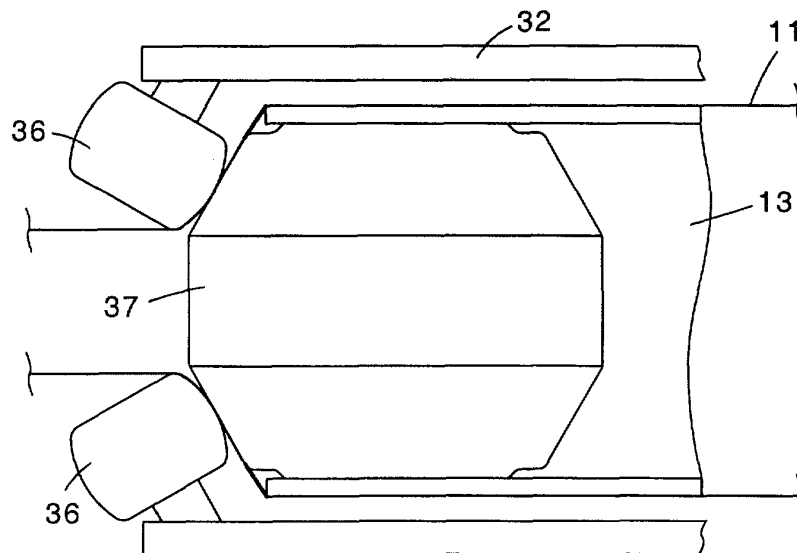


fig. 4