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(54) **A method and a device for fibre parallelisation and specifically for cotton fibres and synthetics.**

(57) Cotton or synthetic-blended fibres are thrown from a feeder into the area of a self-maintaining electrostatic field (Figure 1, 2) thus changing direction from vertical to horizontal, they pass through a slot (7) and accumulate in parallel in a perforated groove (5) assisted by air-suction.

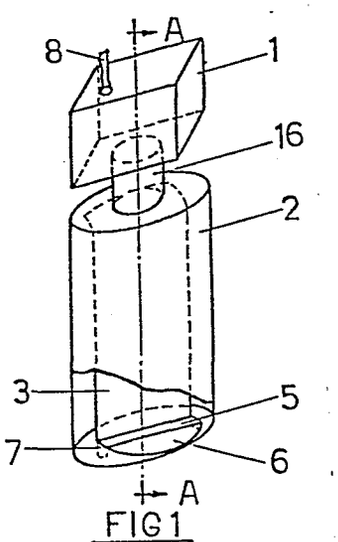

FIG 1

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A method and a device for fibre parallelisation and specifically for cotton fibres and synthetics

Introductory remarks

The above mentioned invention regards a method and a device for the parallelisation of fibres which being fed rectilinearly are changing direction and placed one on top of the other in parallel form.

Aiming to obtain a parallelisation of fibres moving rectilinearly, we devised a system based on a simple geometric model without moving parts and complex mechanisms and employing the principles and properties of electrostatic fields. Accordingly, we invented a simple practical arrangement which can be useful for further applications.

Below is a description of the method and of the embodiments of the device according to the invention on the basis of the attached set of drawings. Figure 1

shows in perspective the method of fibre parallelisation. Separated fibres (for instance cotton fibres) are fed through the feeder (1) into the semicylindrical area which is formed by a concave cylinder (2) made from insulating material, (for instance plexiglass) and the metallic semicylindrical strip (3) which is formed in the upper part in such a way as to allow the fibres to enter freely without being obstructed.

The fibres, with the help of an air suction device (4) descend in parallel to axis AA gradually changing their direction to one perpendicular to the above axis because of forces generated by an electrostatic field which is formed from the friction of the body of the device and by means of the metallic strip (3) inside the device. Thus, fibres are accumulated in parallel form at the groove at the bottom of the metallic strip (5) and with the aid

of air suction are drawn through the slot (7) at the bottom of the groove of the above mentioned strip. What happens thereafter depends on the specific applications that the fibres will be used for.

The semicircular metallic washer (6) exists for the purpose of creating the appropriate conditions of the electrostatic field required for the parallelisation of the fibres.

Figure 2 shows a section (through axis AA) with the semicylindrical metallic strip (3), the cylindrical shell (2) made of insulating material, the groove at bottom of the strip (5), the semicircular washer (6), the slot (7), the air suction device (4) and the fibre feeder (1).

Description and explanation of the phenomenon

As it is known, the insulating properties of the fibres, cellulose in the case of cotton, give to them the behavior of a bipole. (polarization of a dielectric material)

That is, during their movement inside the device shown in figs. 1 and 2, the fibres, because of friction with the immediate environment develop at their ends electrostatic loads and therefore behave like bipoles.As the fibres move through the electrical field which is formed by the surface of the metallic strip (3) and the inside surface of the cylinder (2) made of insulating material, they are reoriented by the influence of forces of electrical repulsion and attraction and thus assume the desired direction which is perpendicular to the one they originally had when they entered the interior of the device.

Certainly, the length and the type of the fibre, the type of insulating material, the relative humidity of the interior and exterior environments and the properties of the air suction system compose the variables and parameters of the invention.

APPLICATIONS

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1. Ring spinning process :

This application of the invention is shown in Figure 3 attatched hereto. As shown, the fibres from the card sliver (8) are separated and thrown by the fibre feeder (1) into the fibre parallelisation system AM1.

A suction system (4) which is installed on a perforated drum (9) causes the fibres to cohere on its external surface in a continuous and parallel form.

As the perforated drum rotates, it moves the web of parallel fibres towards the contact point with the pressure roll (10).The spinning of the yarn is thus effected by the well-known ring spinning process (11).

2. Open End spinning process

Another application of this invention is shown in Fig 4 and is the result of research for yarn production by open end methods to obtain the same, perhaps, better characteristics, strengh, and uniformity from those achieved with the ring spinning method.

The fibres of the card sliver (8) are separated and thrown by the fibre feeder (1) into the fibre parallelisation system AM1. Thus, with the aid of the air suction hole (4) the fibres cohere in parallel form in a perforated groove (7).

Initially, the sliver must be positioned on to the contact point of the delivery rollers (12) passing through a hole (13) and subsequently the system (AM1) is put in rotary motion (in such a direction as to obtain an S or Z yarn configuration as required).

Thus, as AM1 rotates and as the delivery rollers (12) pull the sliver we obtain a twisting of fibres that produces the yarn. This yarn is wound (14) into either cheese or cone form.

The form and the inclination of groove (7) towards hole (13) and the air suction characteristics, give the required friction on the area (15) for the twist and yarn production

3. Open End spinning process with double parallelisation of fibres

The third application of the invention is explained in fig. 5 and is the result of research to obtain improvements in mixing parallelised fibres during the spinning process.

Description of the process

The fibres from the card sliver (8) are separated and thrown by the fibre feeder (1) into the system (AM3) for double fibre parallelisation. The air-suction device (4) through the fixed protective shell (17) and the small holes of the double groove (7) forces the fibres to descend and be separated in two groups under the influence of the selfmaintaining electrostatic field, which is formed by the surfaces (2) and (18) of the insulating material, e.g. plexiglass, the two similar metal plates (19) and (20) of appropriate width and the metallic semicircular washer (6), located at the bottom.

When the fibres enter into the two grooves (7) and the system (AM3) rotates, and as the delivery rollers (12) pull the sliver which originates from the two groups of parallelised fibres into the grooves (7), yarn is produced and wound (14) into either cheese or cone form.

The form and inclination of the two grooves, the air-suction as well as the friction of the fibres on the grooves, lead to the twisting and the production of Z or S type-yarn with the appropriate rotation of the system.Finally, the yarn produced is wound on a bobbin with the use of an appropriate system (14).

4. Open-End spinning process employing a special rotor

The fourth application of the invention is explained in fig. 6 and consists of the fiber paralleliser (AM1), the rotor (21) the delivery system (12) and the cone formation (14).

Description of the yarn production process :

As the fibres are positioned in parallel form by the selfmaintaining electrostatic field of the fibre parallelisation system (AM1) into the groove (7) aided by the air-suction device (4), they are lead through the tube (23) to the special rotor (21), which is constructed as illustrated in cross-section (fig.6). During the rotation of the rotor and due to the centrifugal force that is developed, the wound web touches the inner surface (24) of the steady friction cylender (22).
Accordingly, the friction of the fibres in area (24) forces them to twist. As the fibres are twisted together, on the one hand to the left in the groove, the twist slides and is loosened and on the other hand to the right towards the exit of the rotor, the twist remains, forming by the pulling of the delivery cylinders a yarn of Z or S type depending on the direction of rotation of the rotor.

5. Open-End spinning system with two deliveries of yarn

The fifth application of the invention is explained in fig. 7 and consists of the fibre paralleliser (AM1) which on its bottom has a thin slot (28) and under it a pair of perforated cylinders (25), both rotating in the same direction. In addition, to the left and right of these and on the same axis XX' the two pairs of cylinders (26) bearing the spinning equaliser-discs (27) rotate in the same direction as well.

Description of the process

As the fibres change direction while descending because of the selfmaintaining electrostatic field of the system (AM1), they pass through the thin slot (28) which is parallel to the axis XX' and accumulate, by the means of the air-suction device (4), in the area of the longitudinal slots (29) of the suction, on the outer surface of the perforated cylinders (25).

If the fibres to are led the pairs of cylinders (26), which rotate in the same direction, production of yarn will be obtained, as the delivery cylinders (12) will pull the yarn.It is evident that the fibers will be allotted to both sides, developing a resistance (restraint) which depends on the difference in the rotation speed of the pairs (25) and (26).The holes of the perforated cylinders (25) are cleaned by an external suction system which cannot be seen in figure (7).

As mentioned above, the equilliser-discs (27) are intended for the regulation of the spinning process. With the change in the direction of rotation of the pairs of cylinders (25) and (26), a Z or S type yarn is produced which after passing through the delivery cylinders (12) is wound on a bobbin (14).

Claims

1. A method generally intended for bipole parallelisation, and specifically for parallelisation of cotton fibres and synthetics, characterized by following steps:
   a) feeding fibres through a fibre feeder;
   b) generating a force perpendicular to the feeding direction of the fibres by means of a self-maintaining electrostatic field which is formed from the friction of the fibres with an insulating body and a metallic strip inside the body;
   c) changing direction of the fibres in the direction of the force generated in step b); and
   d) mutually aligning the fibres in parallel influenced by the selfmaintaining electrostatic field.

2. A device (AM1) for bipole parallelisation for carrying out the method according to claim 1, characterized by
   a cylindrical shell (2) made from insulating material, e.g. plexiglass,
   a metallic semicylindrical strip (3) provided inside of the shell (2) from the upper part of the shell to the bottom of the shell,
   a feeder (1) in the upper part of the shell (2) where the entrance of fibres is located,
   a metallic surface (3) formed in the upper part of the strip to allow the fibres to enter freely without obstruction,
   a semicircular metallic washer (6) on the bottom of the shell and connected to the metallic strip (3) to create together with the strip (3) an appropriate electrostatic field,

a longitudinal groove (5) on the bottom of the strip (3) and across the inner diameter of the shell (2) and
a perforated slot (7) where the fibres are accumulated in parallel form and drawn through the slot (7) with the aid of an air-suction device (4). (Figs. 1 and 2)

3. A device (AM1) for bipole parallelisation according to claim 2,
characterized in that
the selfmaintaining electrostatic field created by the friction of the fibres with the internal surfaces of the shell (2) by the metallic strip (3) and by the washer (6) changes the original direction of the fibres from an axis parallel to an axis (AA) to another axis which is perpendicular to the axis (AA) because of the repulsive and attractive electrical forces that are developed. (Figs. 1 and 2)

4. A device (AM3) for double-parallelisation for carrying out the method according to claim 1,
characterized by
separately delivered fibres being thrown by the fibre feeder (1) into an area of a selfmaintaining electrostatic field formed by
the inner surface of a cylindrical shell (2) consisting of insulating material,
two similar metal plates (19 and 20) and
a metallic semicircular washer at the bottom (6) of the shell (2),
whereby
such fibres descend aided by an air-suction device (4) are separated in two groups and after changing orientation enter into two perforated slots (7) in parallel form. (Fig. 5)

5. An application of the device (AM1) for bipole parallelisation according to claims 2 and 3, characterized in that
fibres from a card sliver (8) are separated and thrown by the fibre feeder (1) into the device (AM1) and after passing through the groove (5) reallign in parallel form and with the aid of the air suction device (4) cohere on the external surface of a rotating perforated drum (9) which moves the web of parallel fibres towards the contact point with a pressure roller (10) where the spinning is effected by a well known ring spinning device (11). (Fig. 3)

6. An application of the device (AM1) for bipole parallelisation according to claims 2 and 3, characterized in that
fibres from a card sliver (8) are separated by the fibre feeder (1) and thrown into the device (AM1) and with the aid of the air-suction hole (4) cohere in parallel form in the perforated slot (7) and that the device rotates and as delivery rollers (12) pull the sliver a twisting of fibres is obtained with yarn being produced and wound in either cheese or cone form. (Fig. 4)

7. An application of the device (AM3) for double parallelisation of fibres according to claim 4, characterized in that
the fibres from the card sliver (8) are separated and thrown by the fibre feeder (1) into the area of the selfmaintaining electrostatic field which is formed by the inner surface of the shell (2), the two metal plates (19 and 20) and the metallic semi-circular washer (6) at the bottom of the shell (2) and where such fibres descend aided by the air-

suction device (4) are separated in two groups and after changing orientation enter into said two perforated slots (7) in parallel form,whereby, after the device (AM3) has been put in appropriate rotation are pulled through a hole (13) by delivery cylinders (12) and yarn is produced and wound on a bobbin (14), also aided by friction forces that are developed inside the slots (7). (Fig. 5)

8. An application of the device (AM1) for bipole parallelisation according to claims 2 and 3, characterized in that
as the fibres are positioned in parallel form by the selfmaintaining electrostatic field into the perforated slot (7) assisted by the air suction device (4) are led through a tube (23) to a special rotor (21) whereby after being set in appropriate rotary motion, the web of such fibres is forced into a twist because of the friction of such fibres on the inner surface of a fixed friction cylinder (22) and the centrifugal force that is developed, whereby after such fibres are pulled by delivery cylinders (12), a Z or S type-yarn is produced and wound on a bobbin (14), the twist sliding backwards into the slot (7) loosenes and the friction inside producing the necessary restraint for spinning, leaving the twist towards the delivery cylin (12). (Fig. 6)

9. An application of the device (AM1) for bipole parallelisation according to claims 2 and 3, characterized in that the
the fibres parallelised by the selfmaintained electrostatic field, after passing through the thin slot (28) which is parallel to the axis XX,

accumulate in the area of longitudinal slots (29) of the air-suction device (4) on the outer surface of a pair of perforated cylinders (25) where on the left and right sides of such pair another pair of cylinders (26) is located one of which is perforated and bears in its inner part a system with a fixed longitudinal slot (29), of the air-suction device (4), being also supplied with a pair of stabilizer-discs (27), for the regulation of spinning and as the fibres are led into the cylinder clearances and the pairs of such cylinders are set in rotary motion in the same direction, such fibres present a restraint appropriate for the production of yarn being developed on the basis of an appropriate difference in the rotation speed of the pairs (25) and (26) and on the basis of the friction of the fibres while sliding on both sides.

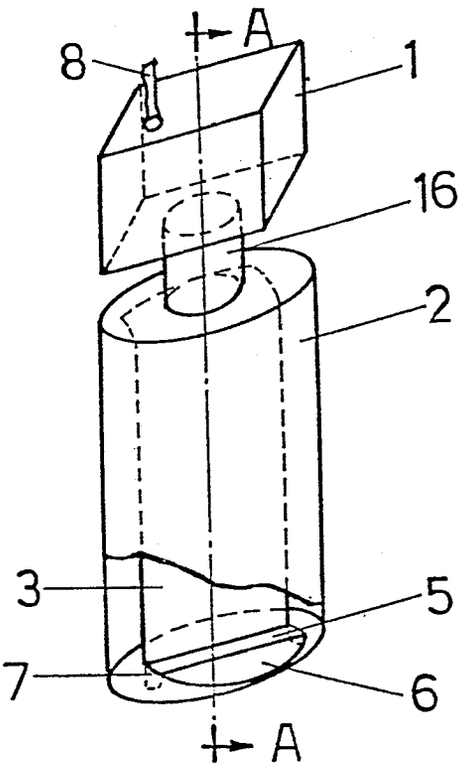
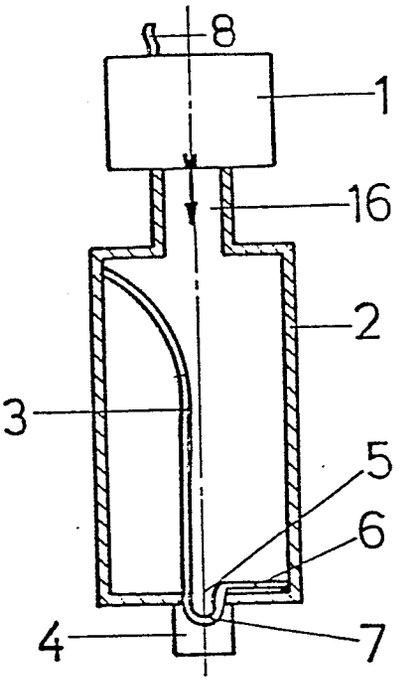


FIG 1



SECTION A-A

FIG 2

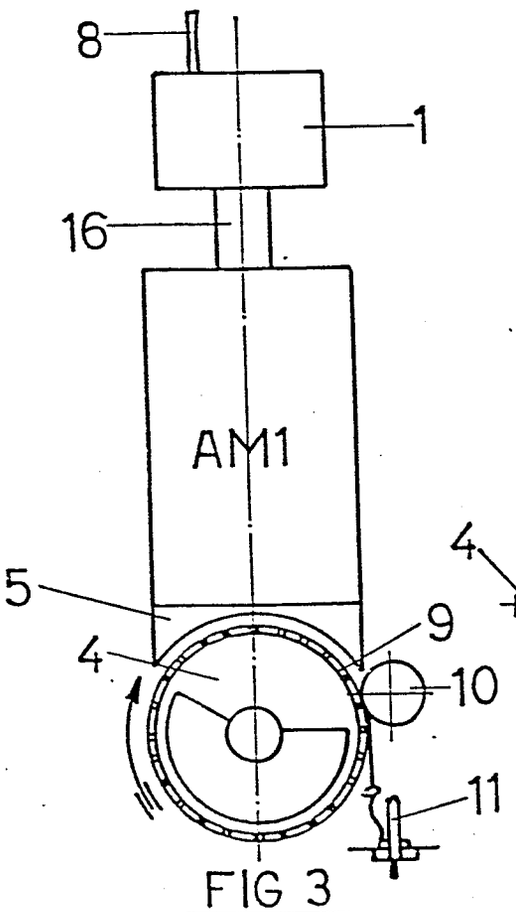


FIG 3

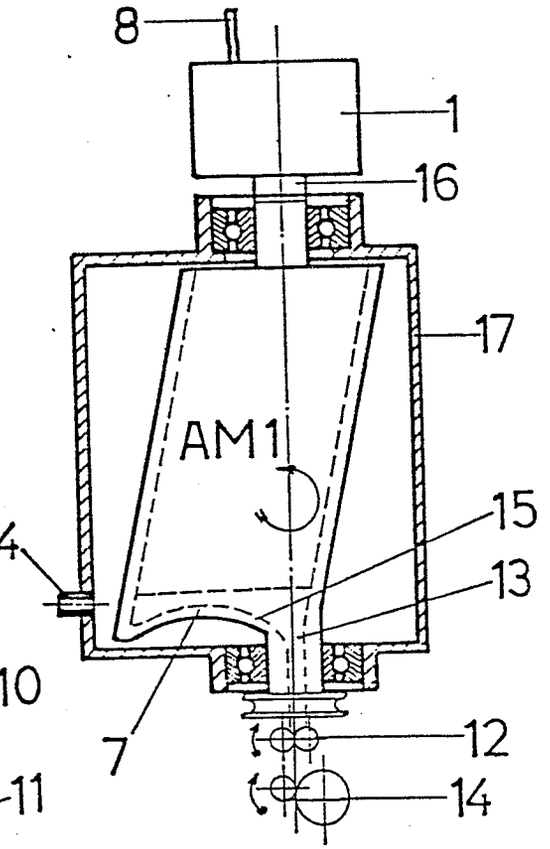


FIG 4

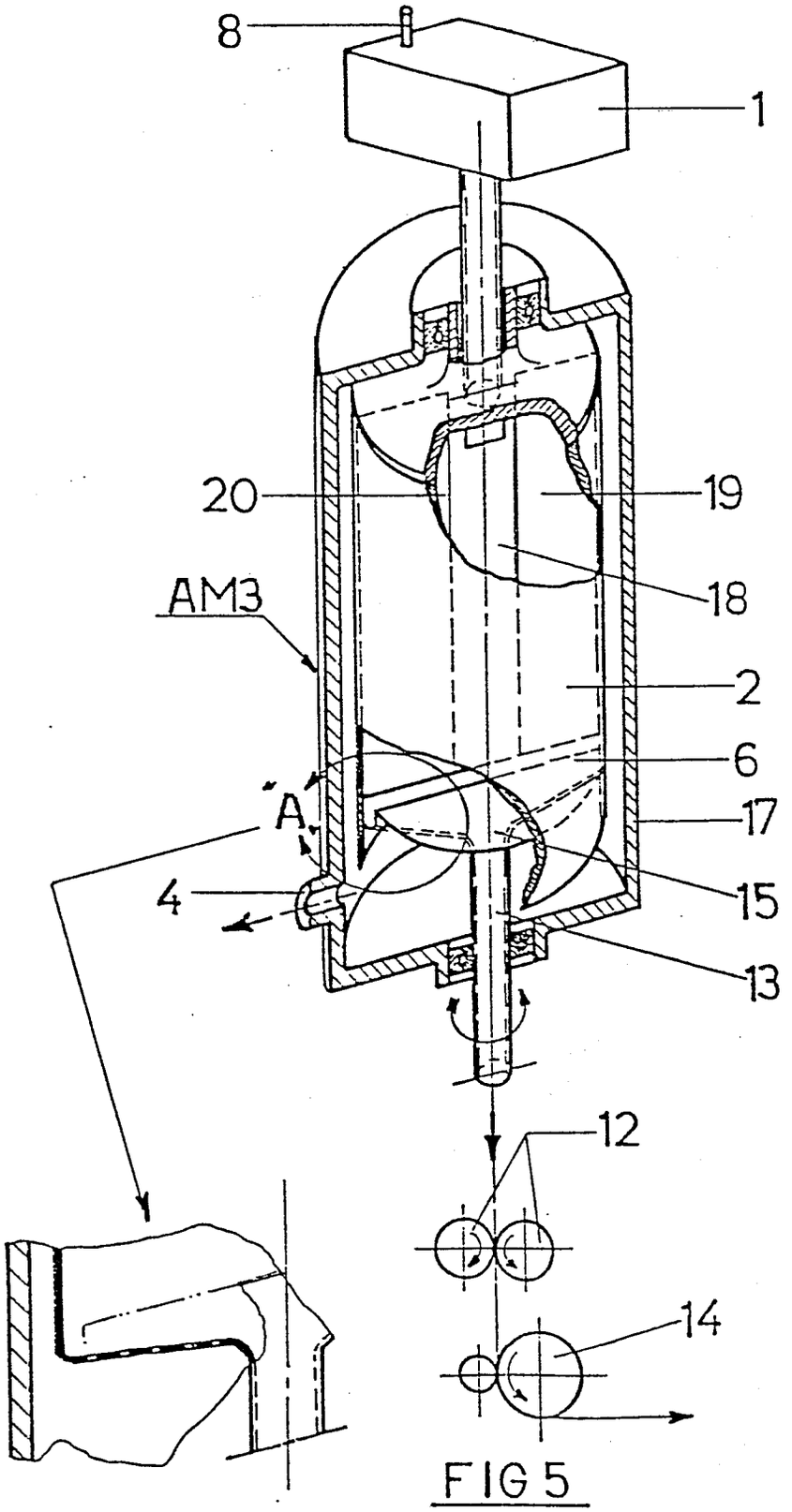


FIG 5

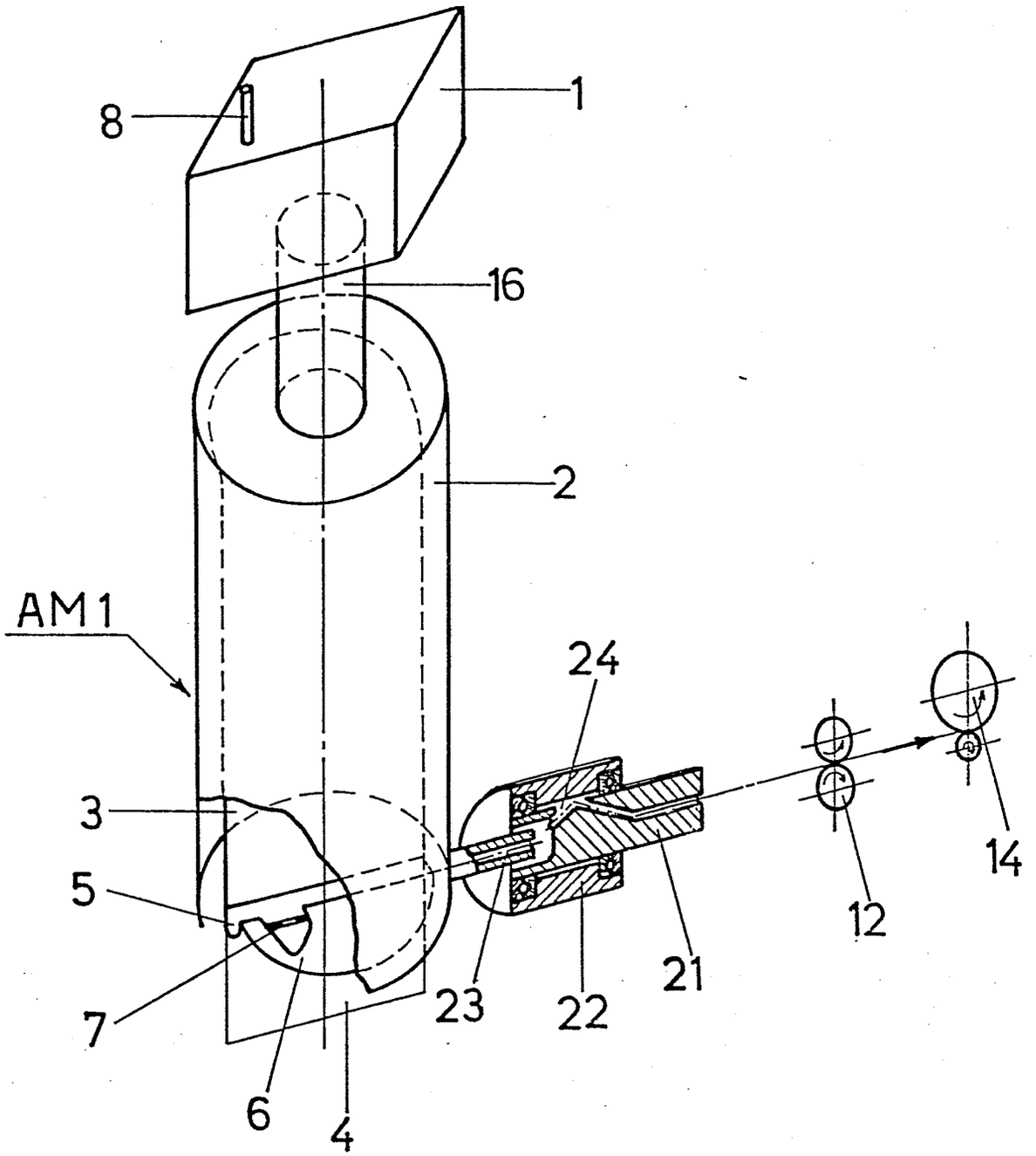


FIG 6

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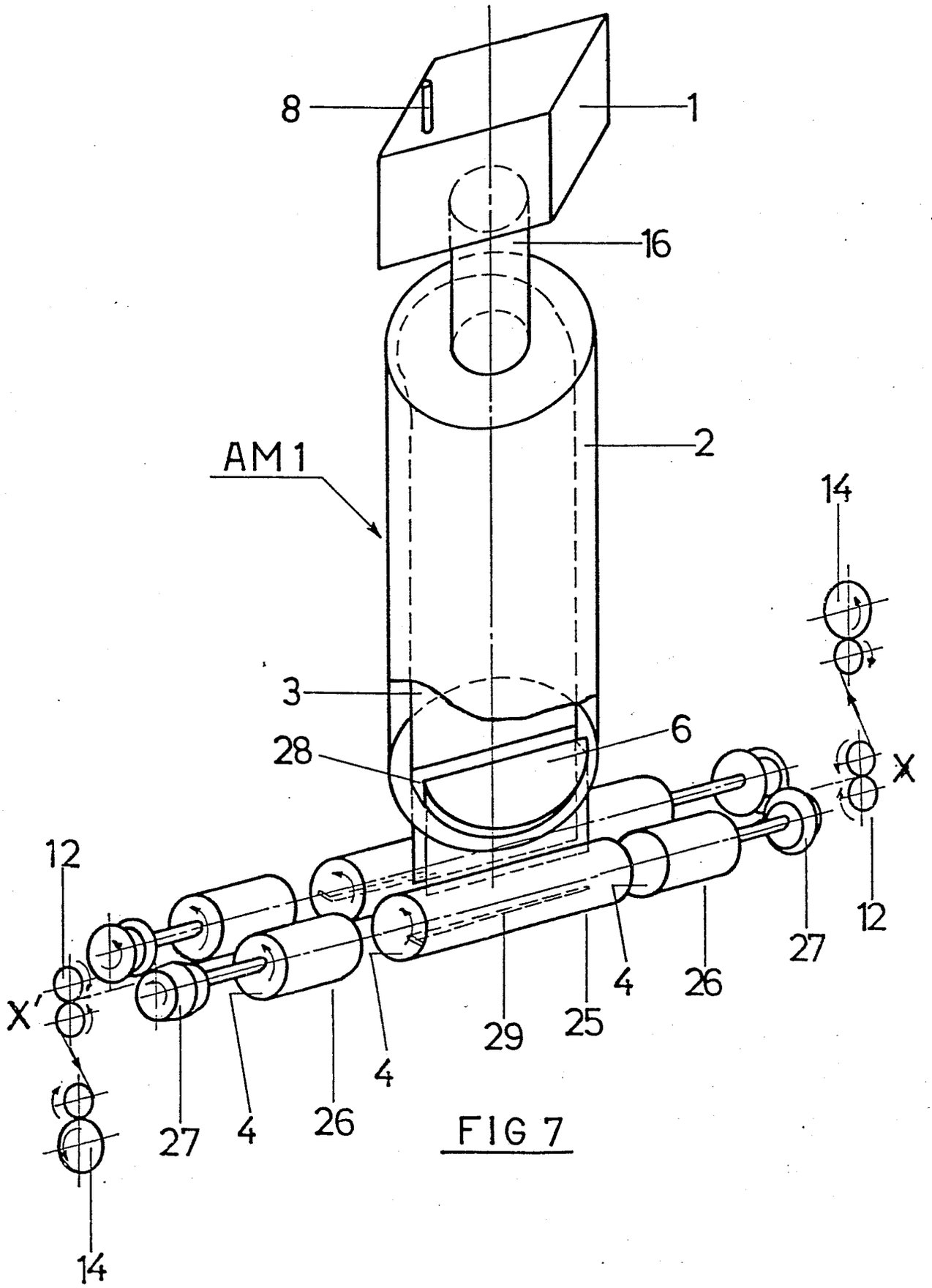

FIG 7

European Patent Office

EUROPEAN SEARCH REPORT

0118024
Application number

EP 84 10 1002

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. ³)
X	US-A-2 557 433 (F. HONIG) * Whole document; in particular column 3, lines 7-16 *	1,6,8	D 01 H 1/125
A	US-A-3 537 249 (M. MAYER Jr.)		
A	US-A-3 768 243 (R.S. BROWN et al.)		

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

D 01 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16-05-1984	DEPRUN M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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