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(54) **Equipment for introducing into ironing machines small and medium sized linen articles coming from the washing.**

(57) Equipment for introducing linen articles (A) into an ironing machine, which comprises a pair of roller brushes (2,3) rotating in opposite directions, through which the articles (A) are drawn by gripping and transport devices (4), apt to be automatically operated and released respectively in correspondence of loading and unloading stations (7,8) of the equipment itself.

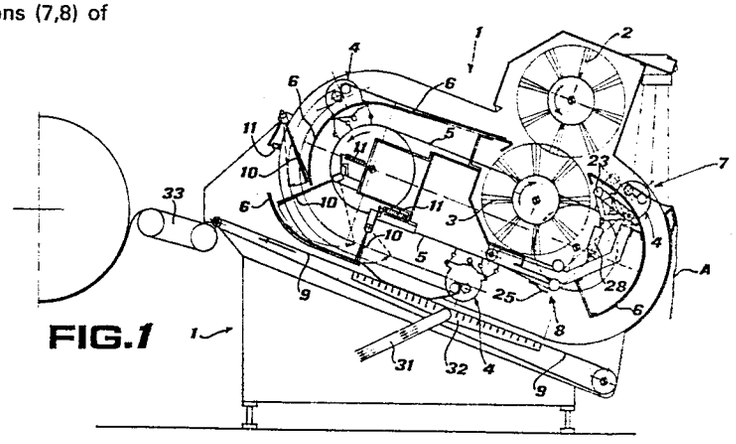

FIG.1

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"EQUIPMENT FOR INTRODUCING INTO IRONING MACHINES SMALL AND MEDIUM SIZED LINEN ARTICLES COMING FROM THE WASHING"

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The present invention relates to equipment apt to facilitate the operation of introducing into industrial ironing machines small and medium sized linen articles coming from the washing.

The machine does not eliminate labor, in that the drawing of the articles, arranged in bulk and creased, necessarily requires the presence of a person. It instead automatically performs the operation of stretching and spreading out the article, thereby eliminating creases on its surface and on the hems, without causing any deformation to the article itself.

The use of this machine therefore provides the first most important result in obtaining a high quality introduction and, consequently, a top level ironing of linen articles. On the other hand, this fundamental advantage is confirmed by the extreme simplicity of use and thanks to the working principle which, even for high production rates, constitutes a further important result. In fact, the equipment according to the invention substantially allows to obtain a top quality introduction of the articles, combined with a high productive capacity.

The equipment according to the invention is characterized in that it comprises, inside a suitable frame: a pair of roller brushes, slightly interpenetrating and rotating in opposite directions; at least one gripping and transport device, caused to jog by closed cycle control chains in order to let said articles, one at a time, through said pair of brushes; a loading station, upstream of said brushes, comprising means for controlling the automatic gripping of said articles by said gripping and transport device; and an unloading station, downstream of said brushes, comprising means for the automatic release of said gripping and transport device, as well as a conveyor for delivering said articles towards an ironing machine.

Preferably, said equipment also comprises means for guiding the articles and controlling their turnover, arranged between said loading and unloading stations.

Said pair of roller brushes rotating in opposite directions comprises two slightly interpenetrating brushes, the flexible elements of which are arranged like a twin-screw, symmetrical in respect of the centre of said brushes, while said gripping and transport device comprises a pair of transversal cylinders, mounted on end supports connected to the control chains, the first of said cylinders being fixed to the supports and the second cylinder being rotatable and movable in respect of the first, to move from a position spaced therefrom to a gripping position adhering thereto.

A preferred gripping and transport device for the equipment according to the invention provides for the second (movable) cylinder thereof to be mounted, rotating against the action of first spring means, into end seats of arms carried by said supports and urged by second spring means to oscillate towards said first cylinder, said arms being kept in a position, whereby said first and second cylinder are mutually spaced, by stop means axially projecting from the ends of said second cylinder and cooperating with said supports, such an engagement being removable by rotation of said second cylinder. Three of said devices, evenly spaced, will be conveniently mounted on the equipment.

Preferably, the delivery conveyor forming part of the equipment comprises a plurality of belts provided with holes and is associated to a suction device.

The invention will now be described in further detail, by mere way of example, with reference to the accompanying drawings, which illustrate a preferred embodiment thereof, and in which:

Fig. 1 is a diagrammatic lateral section view of the equipment according to the invention, during the step of manual feeding of an article to the equipment;

Fig. 2 is a section view similar to that of figure 1, but during the step in which the article is released from the equipment, for its introduction into the ironing machine;

Fig. 3 is an enlarged view of the interpenetrating arrangement of the flexible elements of the brushes of the equipment, rotating in opposite directions;

Fig. 4 shows the configuration with holes of the belts of the conveyor delivering the articles;

Figs. 5 and 6 are external views of a gripping and transport device of the equipment, showing the two positions thereof;

Fig. 7 is a detailed inner side view of the gripping and transport device of figures 5 and 6;

Fig. 8 is a diagram illustrating the working of the gripping and transport device of figures 5 to 7; and

Fig. 9 is a cross section view of the movable cylinder of the device of figures 5 to 7, illustrating also the mounting thereof.

With reference to the drawings, figures 1 and 2 illustrate the equipment according to the invention comprising, mounted inside a suitable frame 1, two roller brushes 2 and 3, rotating in opposite directions, for spreading out the articles A, which are moved through said brushes by means of gripping and transport devices 4, mounted at regular intervals on advancement chains 5. The equipment furthermore comprises inlet, intermediate and outlet guides 6 for the articles A, obtained in the form of flat and curved surfaces and designed to guide said articles and control their turnover as they move through the equipment, as well as a loading station 7 for manually loading the articles, an unloading station 8 to unload said articles onto a conveyor 9 which delivers them to an ironing machine, and flat brushes 10 applied in various points of the equipment and subjected to the action of springs 11.

The brushes 2 and 3 are formed with flexible elements arranged like a twin-screw, symmetrical in respect of the centre of such

brushes (see figure 3), and they are mounted in such a manner that normally, when the articles are not moving through, the flexible elements of the two brushes do not touch one another. The two brushes rotate in opposite directions and they have a slight reciprocal interpenetration.

The gripping and transport devices 4 - three, in the embodiment illustrated, mounted equally spaced on the chains 5 - each comprise (see figures 5 to 8) two cylinders 12 and 13, mounted on lateral supports 14 and 15 which are in turn connected, by means of connecting rods 14a and 15a, to the two chains 5. The cylinder 12 (or rear cylinder) is rigidly fixed to the supports 14 and 15 and it is lined with material providing a high friction with the wet fabric, in correspondence of the generating lines contacting the movable cylinder 13; said cylinder 12 is moreover machined so as to interrupt the continuity of its surface, thereby favouring the release of the wet fabric when the latter has to take place.

The cylinder 13 (or front cylinder) has a metal surface, partly machined with suitable knurls to make it less slippery in respect of the fabric, and it is mounted on the supports 14 and 15 so as to be allowed to perform a rotation R about its axis and a translation S to move in contact with the rear cylinder 12, such contact being then kept - as seen hereinafter - by two springs 16, housed in the two supports 14 and 15. The cylinder 13 is furthermore provided with two lateral inserts 13a of resilient material.

More precisely, the cylinder 13 is mounted on the body 17 of the supports 14 and 15 by means of an arm 18, fulcrumed in 19 on said body 17, a roller 20 apt to engage into an arc-shaped groove 21 of the body 17 being mounted projecting from said cylinder 13 (figure 9).

A torsion spring 22 (figure 9) normally keeps the roller 20 of the cylinder 13 housed in the upper end of the groove 21, so that the arm 18 normally stays in the position shown by a continuous line

in figure 7, being prevented to rotate in spite of the action of the spring 16 which would tend to draw it close to the cylinder 12. The cylinder 13 can however be caused to rotate, against the action of the spring 22, in the loading station 7 of the equipment, by a rotating control belt 23 (figures 1, 2 and 5). When this happens, the rotation R of the cylinder 13, produced by the belt 23, combines - once the roller 20 has exceeded the dead point position in the groove 21 - with the translation S (see diagram of figure 8). The arm 18 carrying the cylinder 13 then oscillates up to taking the position shown in dashed lines in figure 7, the cylinder 13 thereby pressing - under the action of the springs 16 - against the cylinder 12, while the roller 20 freely moves into the groove 21.

The equipment is completed by a lever 24, fulcrumed in 24a on the body 17 and controlled in the unloading station 8 by a cam 25 fixed to the frame 1, onto which cam said lever 24 bears with a wheel 24b. The lever 24 carries an elastic projection 26, apt to engage with a corresponding stiff projection 27 of the arm 18 in order to bring this latter back to a position such as to cause the roller 20 to again exceed the dead point position in the groove 21, whereupon - once the effect of the spring 16 is neutralized - the action of the spring 22 carries the roller 20, and thus the cylinder 13, back to the starting position.

The control belt 23 is positioned, as said, in the loading station 7 of the equipment. This belt is in continuous movement and it is normally out of the trajectory of the cylinders 12 and 13 of the gripping and transport devices 4, but it is brought in contact with the cylinder 13 by a pneumatic control at the moment in which such devices have to carry out the gripping of an article. This happens thanks to a cylinder 28, preferably operated automatically, for instance through a photoelectric control.

The delivery conveyor 9 has a plurality of belts 29 provided with holes 30 and it is associated to a suction device, of which the

suction duct 31 and the suction hood 32 can be seen in figures 1 and 2.

The equipment according to the invention is shown, in figures 1 and 2, associated to an ironing machine by way of an intermediate conveyor 33.

A few lines will be sufficient to illustrate the working of the heretofore described equipment.

The first step is to lay by hand a linen article A in the loading station 7 of the equipment, onto the two cylinders 12 and 13 - drawn apart - of one of the gripping and transport devices 4 halting in said station. A photoelectric cell (or other similar device) controls the working of the cylinder 28, which moves the control belt 23 in contact with the cylinder 13. As the belt 23 is rotating, it causes the rotation of the cylinder 13 against the action of the springs 22, thereby starting the combined movement R + S of said cylinder, which presses against the cylinder 12 under the action of the springs 16. When performing the rotation R and the translation S (figures 5 and 8), the cylinder 13 draws along - between itself and the cylinder 12 - the front edge of the article A in order to grip the same. At the end of said movement (figure 6), the article finds itself properly gripped, so as to be efficiently conveyed. The drawing and gripping of the article are performed with great safety, thanks to the materials used for the cylinders 12 and 13 and to the machining of their surface, as well as to the presence of the inserts 13a on the cylinder 13. Thanks to the wide angle allowed for folding the article around the cylinder 12 (approx. 90° - see figures 2 and 6) and again to the superficial configuration of the cylinders 12 and 13, a modest pressure between the two cylinders is furthermore sufficient to clamp the article A in a very safe and efficient manner and, above all, evenly throughout its width. The clamping essentially takes place in two stages. Once the article is laid on the cylinders, with its edge practically at the height of the axis of the cylinder

13, this latter, starting to rotate, drops the edge of the article between the two cylinders and then, continuing to rotate and shifting, it carries the edge in contact with the cylinder 12 causing it to be clamped therebetween.

The gripping of the article A into the gripping device is hence very simple and fast and it guarantees quality and productive capacity, also because the operator is merely asked to lay the article on the two cylinders, repeating substantially the same conventional operation of arranging the article onto a conveyor belt, without any problems of searching for a lead-in.

Once the gripping has been accomplished, the control chains 5 start moving forward and cause the article A, gripped by the device 4, to move through the two brushes 2 and 3 rotating in opposite directions, so as to spread it out and eliminate any undesired creases. The operation is shown in figure 2 and it takes place, as seen, with the article - drawn by the device 4 - moving in the direction opposite to the direction of rotation of the brushes 2 and 3.

Once the device 4 has passed between the brushes 2 and 3, the article A finds itself subjected (see again figures 2 and 6) to the contrasting actions of the gripping device which draws it, and of the friction created by the brushes opposing the movement. This determines the main stretching action, while the spreading out is determined by the twin-screw arrangement of the elements of the brushes 2 and 3, which generate balanced forces from the centre towards the periphery.

It is important to note how, thanks to the type of gripping and to the combined actions to which it is subjected (rotation of the brushes and gripper movement), the article A gets by no means deformed.

The chains 5 now move the article A forward until the second gripping and transport device 4 reaches the loading station 7. There

is now a stop, to allow the loading of a second article A, and then a new forward movement to carry the third device 4 into the loading station 7. At the same time, the article A which has been drawn by the first device 4 follows the intermediate guide 6, having a partly cylindrical shape, and is overturned (as clearly illustrated in figures 1 and 2) while being held in its stretched and outspreaded condition by the flat brushes 10. When also the third device 4 has been operated to grip a further article A, and the chains 5 again move forward the devices 4, the first of said devices is released by engagement of its lever 24 with the cam 25, and the article A is abandoned spreaded out onto the conveyor 9. The article adheres to the conveyor also thanks to the sucking action transmitted through the holes 30 of the belts 29 forming said conveyor, so preparing in the most appropriate position for its subsequent feeding - through said delivery conveyor 9 and through the intermediate conveyor 33 - to the ironing machine. The suction also helps to increase the outspreading action by friction which the article, still gripped, undergoes in the last stretch of its journey through the equipment (figure 1), and to guarantee the positive disengagement of the article A from the device 4, in the event that it should get caught therein or stick thereto after release of said device.

It should finally be noted that - as seen in figures 1 and 2 - the article A is introduced in the ironing machine by its edge opposite to that by which the article itself is gripped.

It is understood that there may be other practical embodiments of the equipment - differing from that heretofore described and illustrated - falling within the scope of the present invention: for instance, the stationary cylinder of the gripping and transport devices could instead be a rotary cylinder, to favour the release of the gripped article on the part of said devices.

CLAIMS

1) Equipment for introducing into industrial ironing machines small and medium sized linen articles coming from the washing, characterized in that it comprises, inside a suitable frame: a pair of roller brushes, slightly interpenetrating and rotating in opposite directions; at least one gripping and transport device, caused to jog by closed cycle control chains in order to let said articles, one at a time, through said pair of brushes; a loading station, upstream of said brushes, comprising means for controlling the automatic gripping of said articles by said gripping and transport device; and an unloading station, downstream of said brushes, comprising means for the automatic release of said gripping and transport device, as well as a conveyor for delivering said articles towards an ironing machine.

2) Equipment as in claim 1), also comprising means for guiding the articles and controlling their turnover, arranged between said loading and unloading stations.

3) Equipment as in claims 1) and 2), wherein said pair of roller brushes rotating in opposite directions comprises two slightly interpenetrating brushes, the flexible elements of which are arranged like a twin-screw, symmetrical in respect of the centre of said brushes.

4) Equipment as in claims 1) to 3), wherein said gripping and transport device comprises a pair of transversal cylinders, mounted on end supports connected to the control chains, the first of said cylinders being fixed to the supports and the second cylinder being rotatable and movable in respect of the first, to move from a position spaced therefrom to a gripping position adhering thereto.

5) Equipment as in claim 4), wherein said second cylinder of the gripping and transport device is mounted, rotating against the action of first spring means, into end seats of arms carried by said supports and urged by second spring means to oscillate towards said first cylinder, said arms being kept in a position, whereby said

first and second cylinder are mutually spaced, by stop means axially projecting from the ends of said second cylinder and cooperating with said supports, such an engagement being removable by rotation of said second cylinder.

6) Equipment as in claim 5), wherein said stop means projecting from the second cylinder consist of rollers, housing into profiled grooves of the supports and held in engagement with an end of said supports by said first spring means, such an engagement being removable by rotation of said second cylinder in order to release the stopping function of said rollers when they are led to exceed a dead point in said grooves.

7) Equipment as in claims 1) to 6), wherein three gripping and transport devices are provided, carried - at equal mutual distances - by a pair of closed cycle control chains.

8) Equipment as in claims 1) to 7), wherein the means for controlling the automatic gripping of the articles by the gripping and transport devices, consist of a continuously rotating control belt, apt to be shifted under control in order to engage said second cylinder and cause the rotation thereof.

9) Equipment as in claims 1) to 8), wherein the means for the automatic release of the gripping devices consist of an oscillating lever, carried by said supports and apt to cause said arms for the second cylinder to oscillate beyond a dead point position, from which they move back to the initial position wherein the first and second cylinder are mutually spaced.

10) Equipment as in claims 1) to 9), wherein said lever is controlled by a cam, fixed to the frame of the equipment in its unloading station.

11) Equipment as in claims 1) to 10), wherein said cylinders have a lined and/or machined surface, so as to provide a high friction with wet fabrics and, at the same time, do not prevent their disengagement.

12) Equipment as in claims 1) to 11), wherein said second cylinder comprises two projecting inserts of resilient material.

13) Equipment as in claims 1) to 12), wherein the delivery conveyor comprises a plurality of belts provided with holes and is associated to a suction device.

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FIG.1

FIG.3

FIG.4

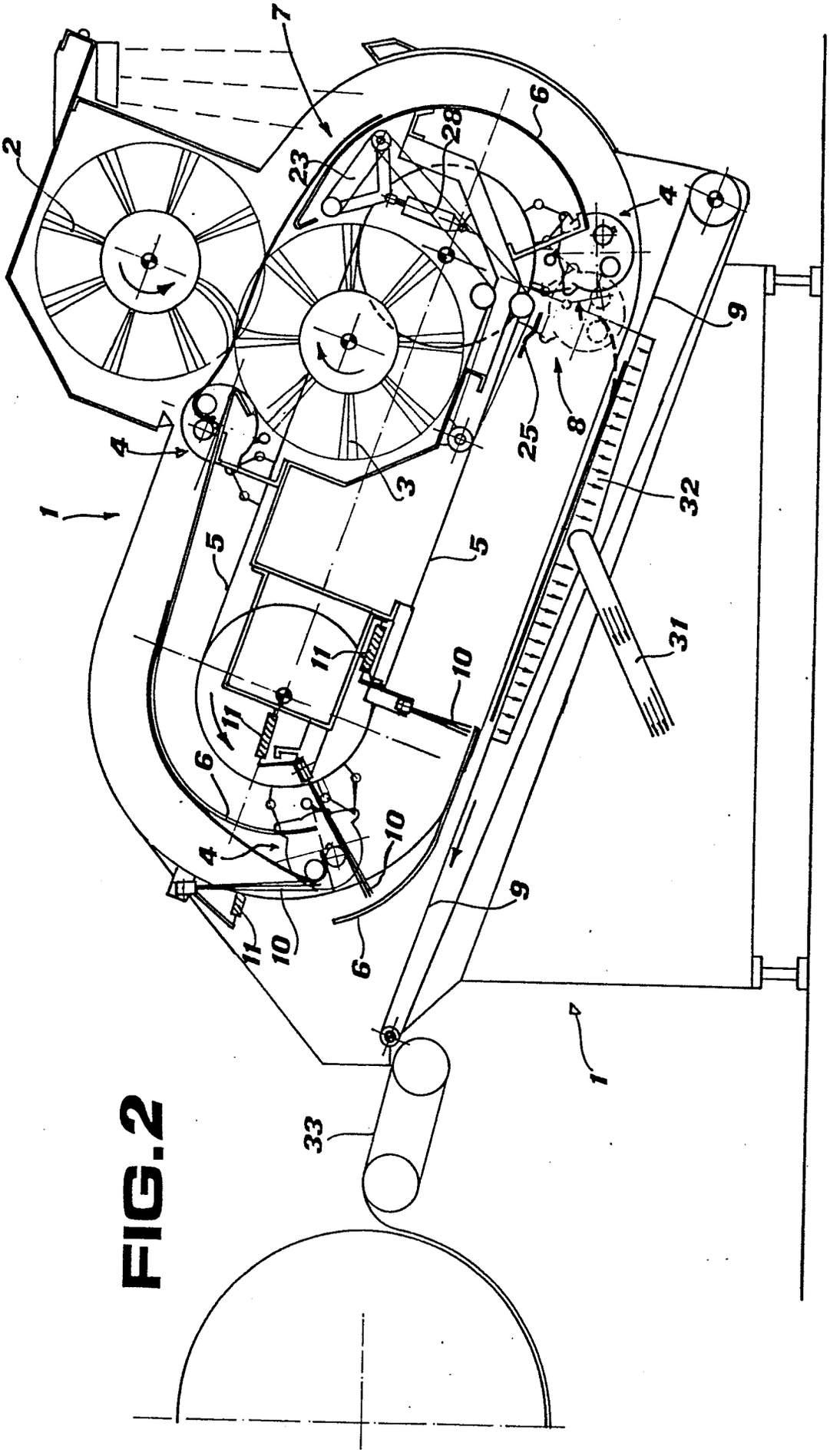

FIG.2

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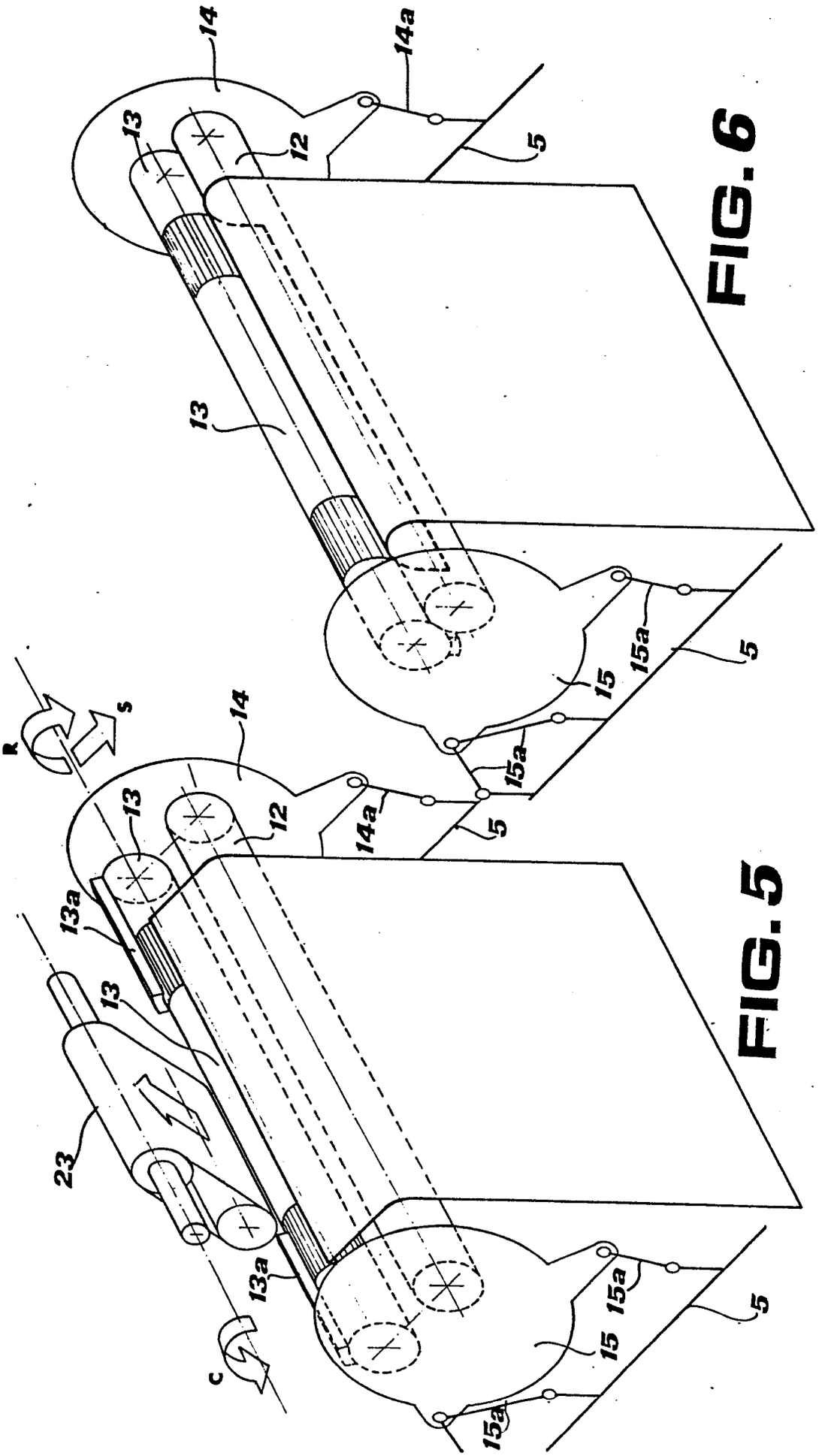


FIG. 6

FIG. 5

FIG.7

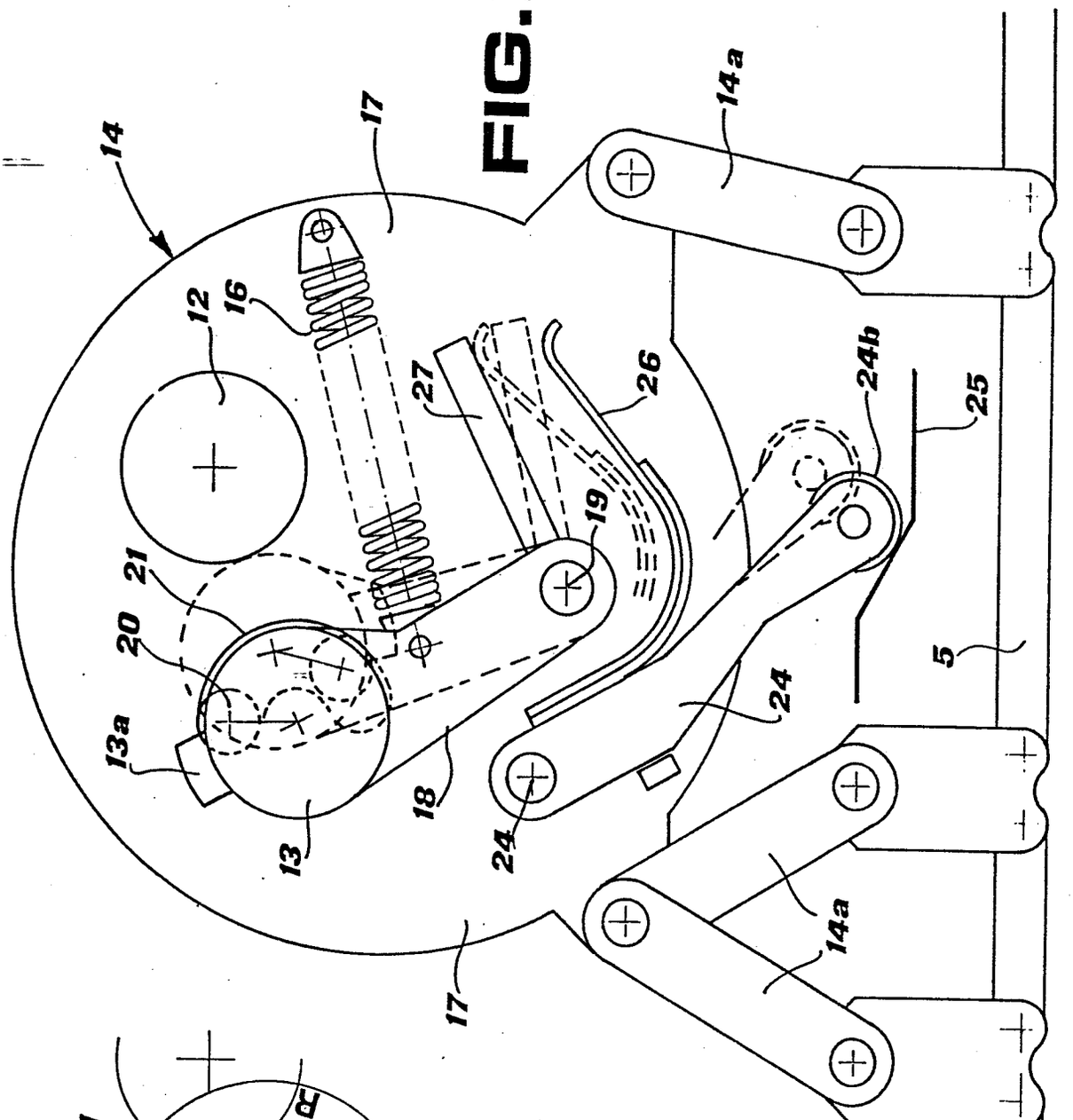
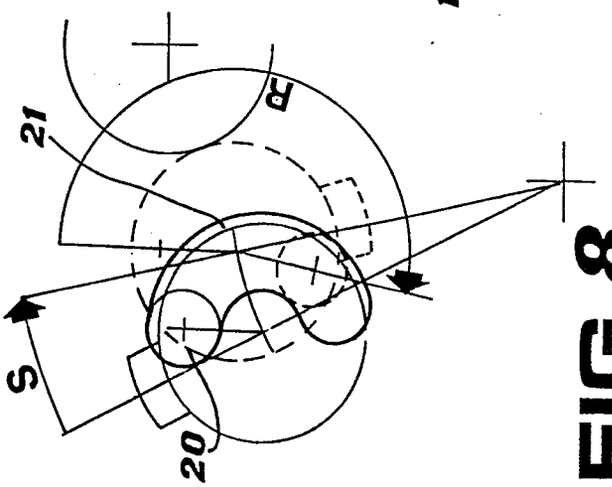


FIG.8



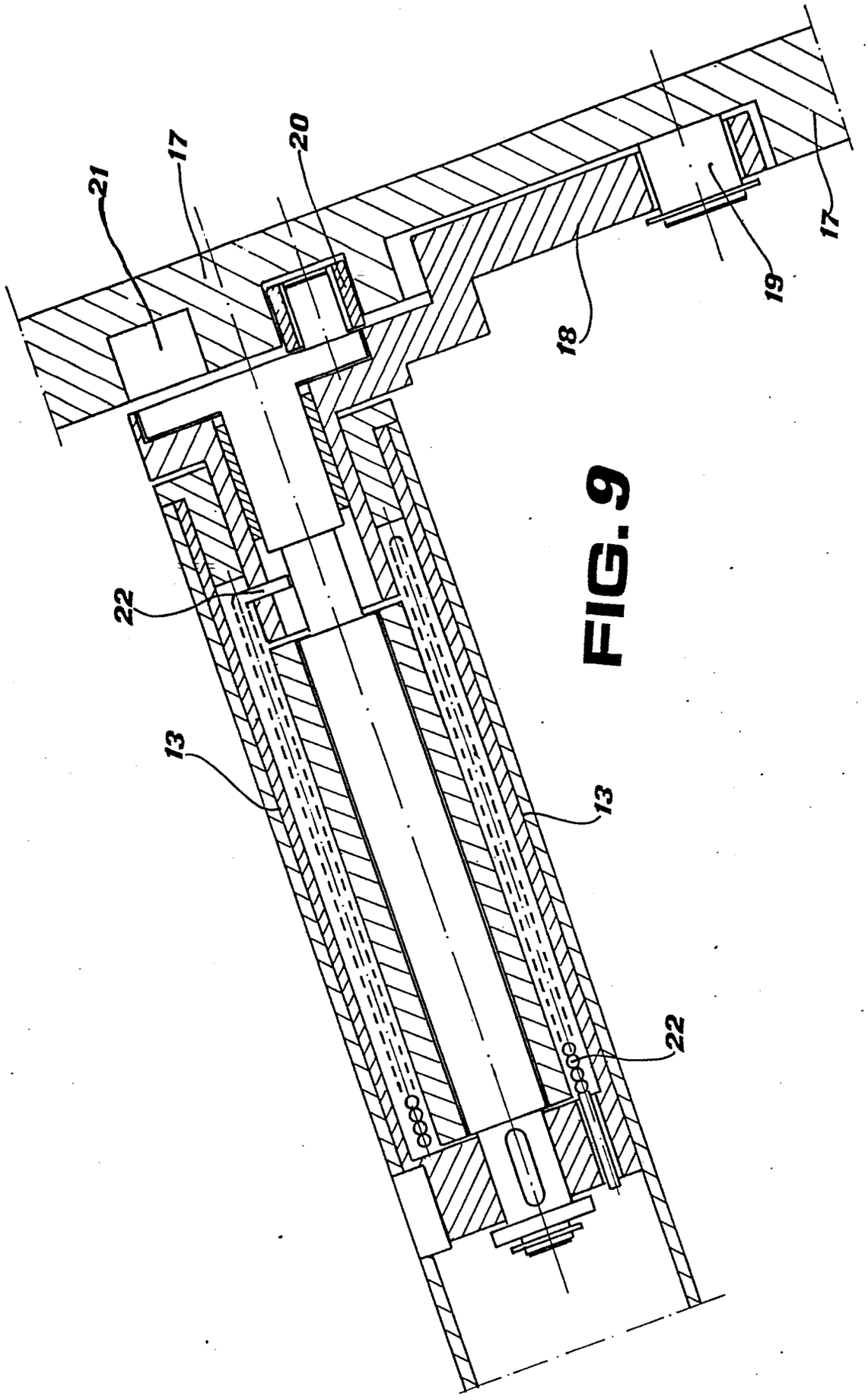


FIG. 9

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EUROPEAN SEARCH REPORT

Application number

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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)
A	FR-A-1 453 541 (KANNEGIESSER) * Page 2, left-hand column, line 50 - end, right-hand column, lines 1-47; page 3, left-hand column, line 28 - end, right-hand column, lines 1-4, 29-40 *	1,3,4, 7,9,10	D 06 F 67/04
A	FR-A-1 194 013 (BLANC) * Page 2, figures *	1,3,7, 9,10, 11	
A	GB-A- 760 103 (TOMLINS) * Figures *	2	
A	US-A-3 198 315 (LONG) * Column 4, lines 65-75; column 5, lines 1-45 *	1,11	TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
A	FR-A-1 507 896 (KANNEGIESSER) * Figures *	1,9,10	D 06 F B 65 H
A	BE-A- 646 987 (KLEINDIENST) * Figures *	1,3,9, 10	
A	FR-A-1 291 892 (NAIDEAU) * Figures *	1,3	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20-07-1983	D HULSTER E.W.F.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT

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A	FR-A-1 308 832 (NAIDEAU) * Figures *	1,3	
A	US-A-3 408 756 (MAZZOLLA) * Column 6, lines 58-75; column 7, lines 1-9 *	13	
A	US-A-3 735 512 (ROSS) * Claim 1; figures *	13	
A	US-A-3 136 081 (FREDHOLM)		TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
A	US-A-3 509 649 (ORKNEY)		

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