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(54) **A drawing frame for webs of textile fibres provided with a rotary comb head.**

(57) A drawing frame for webs of textile fibres having a rotary comb head defining two sets of needles intersecting in the zone of treatment of the web of textile fibres, is provided with a cleaning device for cleaning the combs of the two sets of needles, which comprises a source of compressed air (52), means (46, 50) for supplying the compressed air to the interior of each set of needles (24), and means (14, 30) for directing the compressed air between the combs (20) of each set of needles (24) in the form of an elongate jet directed outwardly in a substantially radial direction (A), preferably parallel to the direction of displacement (A) of the web to be treated.

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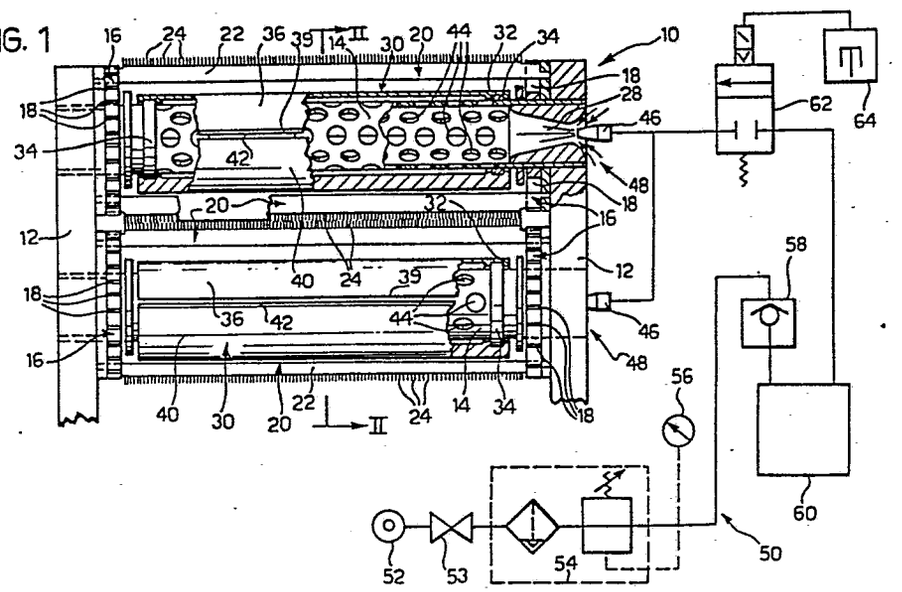
FIG. 1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"A drawing frame for webs of textile fibres provided with a rotary comb head".

The present invention relates to a drawing frame for webs of textile fibres provided with a rotary comb head, including a base and a pair of counter-rotating shafts with horizontal axes supported by the base in a superimposed arrangement, each of the said two shafts rotatably driving a pair of axially-spaced comb-carrier discs provided with substantially radial slots in which are slidably engaged a circumferential series of needle-carrier bars or axial combs the ends of which engage in corresponding shaped guide tracks rigidly connected to the base, the combs associated with the two shafts defining two sets of needles intersecting in the treatment region for the web of textile fibres, the head further being provided with a cleaner device for cleaning the combs of the two sets of needles.

Drawing frames of the type indicated above have recently come into widespread use due to the fact that, compared with conventional machines provided with comb heads with

intersecting needles controlled by worm screws or "augers" they have the advantage of a greater working speed, of reduced mechanical wear and of facilitating and limiting maintenance, while achieving the same quality of work typical of the conventional machines. In order to obtain these results it is absolutely necessary to ensure that the zone of operation of the rotary head of the machine and the mechanical members of the head itself, particularly the combs, are completely clean. Indeed, while in conventional machines with auger heads, cleaning of the combs is achieved directly due to the movement of the combs themselves, in machines with rotary comb heads, it is necessary to provide a cleaning device which is able to remove waste material which is deposited between the needles of the combs during working.

In machines having rotary comb heads at present in use, mechanical cleaning devices have been provided which consist, for example, of rotary brushes entrained with the combs, of rotary brushes controlled mechanically, or of rotary brushes controlled mechanically and cleaned by mechanical cleaners and suction nozzles. These devices have a series of disadvantages among which may be cited:

- difficulty of adjustment and of maintaining the adjustment over a period of time,

- wear and tear on the brushes and their respective control members,

- difficulty of access to the working zone of the rotary comb head to allow normal intervention by the operator during working,

- geometric impossibility of cleaning the combs completely due to the prevalence of a tangential effect in the relative movement between the cleaning brushes and the needles of the combs, which results in the impossibility of achieving complete removal of the waste material from the combs and compaction of material at the roots attaching the needles to the combs,

- constant removal, during working, of textile fibres which are held by the combs in the return phase and which should, instead, be returned to the web or mat of material during the working phase of the combs.

The object of the present invention is to obviate these disadvantages.

In order to achieve this object, the present invention provides a drawing frame for webs of textile fibres, characterised in that the cleaner device for the rotary comb head comprises a source of compressed air, means for supplying the compressed air to the interior of each set of needles, and means for directing the compressed air between the combs of each set of needles in the form of an elongate jet directed outwardly in a substantially radial, predetermined direction so that, during the rotation of the shaft, the said jet of compressed air flows tangentially

and successively over the surfaces of the combs of the set of needles.

Thanks to the characteristic the following important advantages are obtained:

- greater simplicity of manufacture, assembly and maintenance of the machine,

- long working life of the cleaning device due to the absence of moving mechanical parts,

- smaller bulk of the machine head and easier access to the working zone due to the fact that the active part of the cleaning device is disposed within the set of needles,

- greater functional efficiency due to the fact that the comb-cleaning phase is carried out in short time intervals, thus avoiding the removal of textile fibres taken up by the combs themselves during the working phase.

According to the invention each jet of compressed air is directed substantially parallel to the direction of displacement of the web of textile fibres to be treated and faces towards the output zone of the web. As a result of this characteristic, the web of textile fibres at the inlet to the rotary comb head is not disturbed by the jet of compressed air of the cleaning device.

Preferably the jets of compressed air extend parallel to

the axes of the respective shafts of the head over a length substantially equal to the length of the parts of combs lying between the said comb-carrier discs. Thus the jets of compressed air act uniformly along the entire active part of each comb.

According to a further characteristic of the invention, the means for supplying compressed air to the interior of each set of needles include valve means and programmable timer means for controlling the said valve means.

This characteristic makes it possible to regulate the operation of the cleaning device in dependence on the type of material treated by the machine.

According to a preferred embodiment of the invention, each of the rotary shafts of the head is hollow and has an axial passage at one end adapted to put its hollow interior into communication with the said means for supplying compressed air; the portion of each shaft between the respective comb-carrier discs supports a freely-rotatable, cylindrical, tubular casing interposed between the shaft and the combs and provided with a pair of annular, end heads provided with plain bearings in hermetically-sealed contact with the surface of the shaft; the said casing has an axial slit formed along its lateral wall and communicating with the hollow interior of the shaft through apertures formed in the wall of the said shaft; positioning means are provided for maintaining the said tubular casing, during the rotation of the shaft, in a

fixed angular position in which the said axial slit is disposed in a substantially horizontal plane passing through the axis of the shaft. The said positioning means are, to advantage, constituted by a ballast weight carried by the tubular casing.

Further advantages and characteristics of the invention will become clear during the course of the detailed description which follows, with reference to the appended drawings, provided purely by way of non-limiting example, in which:

Figure 1 is a partially-sectioned, front elevational view of one part of the drawing frame according to the invention, in which the pneumatic circuit for feeding the cleaning device is also illustrated schematically,

Figure 2 is a cross-sectional view, on an enlarged scale, taken on line II-II of Figure 1, and

Figure 3 illustrates a detail of Figure 1 on an enlarged scale.

With reference to the drawings, by 10 is indicated in its entirety a rotary comb head of a drawing frame for the treatment of webs of textile fibres. The head 10 comprises essentially a pair of vertical support pillars 12 which serve to support a pair of superimposed shafts 14 for rotation about horizontal axes. The shafts 14 are rotated in opposite senses by means of a motor and a con-

ventional transmission not shown in the drawings.

Each of the shafts 14 supports, adjacent the pillars 12, a pair of comb-carrier discs 16 provided with corresponding, circumferential sets of substantially radial slots 18. In the slots 18 of the discs 16 associated with each shaft 14 are slidably engaged a plurality of needle-carrier bars, or combs, 20 disposed parallel to the axis of the shaft 14. As shown in detail in Figure 2, each comb 20 is constituted by a support bar 22 carrying, at is outer edge, a plurality of needles 24 which are slightly inclined to the plane of the bar 22. The ends of the bar 22 of each comb 20 project outwardly of the comb-carrier discs 16 and engage slidably in corresponding shaped guide tracks 26 formed in the support pillars 12. In this manner, during rotation of the shafts 14, the combs 20 are entrained for rotation with the discs 16 and, as a result of the shaped tracks 26, are guided along partially eccentric paths with respect to the axes of the respective shafts 14. These paths, which are clearly visible in Figure 2, effect mutual approaching of the combs 20 entrained by the two shafts 14 in the zone of treatment of the web, indicated by F, and a sharp displacement of these combs away from each other on leaving the treatment zone of the web. The combs 20 carried by the two shafts 14 thus define two sets of needles which intersect in the zone of working of the head 10.

Each shaft is hollow and has an axial passage 28 at one end, shaped as a convergent-divergent venturi opening

externally of the head 10. On that portion of each shaft 14 lying between the respective comb-carrier discs 16 is mounted, for free rotation, a tubular, cylindrical casing 30 interposed between the shaft 14 and the support bar 22 of the combs 20. Each casing 30 has a pair of annular heads 32 at its ends, each head bearing an annulus of thermoplastics material 34 in contact with the surface of the shaft 14. The annuli 34 constitute plain bearings for supporting the casing 30 and are, moreover, adapted to achieve hermetic sealing of the hollow interior of the casing 30 with respect to the surface of the shaft 14.

As is clearly seen in Figure 2, each casing 30 has a semi-cylindrical upper portion 36 provided along its axial edges with edge flanges 38,39 bent outwardly and substantially aligned in a horizontal plane. The flange 38 which faces inwardly of the machine is coupled to one of the axial edges of a semi-cylindrical, lower portion 40 which completes the tubular casing 30. The lower portion 40 is considerably thicker and, hence, considerably heavier than the upper portion 36. The other axial edge of the lower portion 40 ends a short distance from the flange 39 of the upper portion 36 so as to define an axial slit 42 which extends for the entire length of the casing 30. As a result of the conformation of the casing 30 described above, the axial slit 42 is maintained constantly in a fixed angular position, in which it is disposed in a substantially horizontal plane passing through the axis of the shaft 14, by gravity, even during rotation of the shaft 14. The axial slit 42, on the basis of what has

been said above, faces outwardly of the textile machine.

The hollow interior of each casing 30 communicates with the interior of the respective shaft 14 through a series of holes 44 formed in the lateral wall of the shaft 14.

As illustrated in figure 1, the venturi-shaped outer portion 28 of the axial passage of each shaft 14 is associated with a nozzle 46 disposed so as to form an injector 48 with the passage 28. The nozzles 46 are connected to a compressed-air supply circuit indicated in its entirety by 50. The circuit 50 includes a source 52 of compressed air connected, through a monitoring valve 53, to a filter and regulator device 54 associated with a manometer 56. The filter-regulator device 54 is connected, through a non-return valve 58, to an air accumulator 60. The accumulator 60 is connected to the two nozzles 46 with the interposition of a solenoid valve 62 controllable by means of a programmable timer 64.

Adjacent the working zone of the head 10, on the input side for the textile fibre web F, is an entrainment assembly 68. The entrainment assembly 68 includes a pair of rotary cylinders 70 associated with a pressure roller 72, and has the function of improving the control of the web of fibres F in the feed.

During operation of the head 10, the web of fibres F is fed in a substantially horizontal direction in the direction of arrow A, through the zone between the shafts 14 and the respective combs 20. The shafts 14 are rotated in the senses indicated by the arrows B and drive the combs 20 which thus move along the paths defined by the shapes of the guide tracks 26. The rotary combs 20 thus define two sets of needles which intersect in the zone of passage of the web of textile fibres F and penetrate the web F successively, effecting, in combination with a drawing assembly 100 at the outlet, a drawing action.

Simultaneously, the pneumatic circuit 50 supplies compressed air to the two nozzles 46 through the solenoid valve 62. According to the type of material to be treated, the solenoid valve 62 may be maintained constantly in an open position or may be controlled to open and close in a predetermined cycle by means of the programmable timer 64. The compressed air leaving each nozzle 46 passes through the axial passage 28 into the hollow interior of the respective shaft 14. Thanks to the conformation of the axial passages 28 and the disposition of the nozzles 46, the compressed air leaving each nozzle draws a current of air from the external environment into the interior of the respective shaft 14. The air then passes through the holes 44 in the wall of the shaft 14 and into the tubular casing 30. The air then leaves

the casing 30 through the axial slit 42, thus creating an elongate, laminar jet directed radially outwardly. During the rotation of the shaft 14, the casing 30, and hence the axial slit 42, are maintained in a fixed angular position due to the presence of the ballast constituted by the lower cylindrical portion 40 of the casing. Thus the jet of air flows tangentially over the combs 20 which are located successively in correspondence with the slit 42 and detaches and separates waste material which accumulates at the base of the needles 24. An integral suction system, known per se and not illustrated in the drawings, collects this material and discharges it outside the machine.

The conformation of the axial slits 42 and their positioning with respect to the rotary combs 20 allows an efficient cleaning action to be achieved with the minimum consumption of compressed air. The consumption of air is further reduced by the presence of the injectors 48 constituted by the axial passages 28 and the respective nozzles 46. Moreover, the jets of air which, as indicated previously, are directed parallel to the direction of displacement A of the web of textile fibres F and face towards the output zone of the web, do not disturb the web of fibres F at the inlet to and at the exit from the head 10 to any extent.

Naturally, the principle of the invention remaining

the same, the details of construction and the embodiments may be varied widely with respect to what has been described and illustrated, without thereby departing from the scope of the present invention.

CLAIMS:

1. A drawing frame for webs of textile fibres provided with a rotary comb head (10) including a base (12) and a pair of counter-rotating shafts (14) with horizontal axes supported by the base in a superimposed arrangement, each of the said two shafts rotatably driving a pair of axially spaced comb carrier discs (16) provided with substantially radial slots (18) into which are engaged, in a slidable manner, a circumferential series of needle carrier bars or axial combs (20) the ends of which engage in corresponding shaped guide tracks (26) rigidly connected to the base, the combs associated with the two shafts defining two sets of needles intersecting in the treatment region for the web of textile fibres; the head (10) being moreover provided with a cleaner device for cleaning the combs (20) of the two sets of needles, characterised by the fact that the cleaner device comprises a source of compressed air (52), means (46, 50) supplying the compressed air to the interior of each set of needles (24), and means (14, 30) for directing between the combs (20) or each set of needles (24) the compressed air in the form of an elongate jet directed outwardly in a substantially radial predetermined direction (A) so that during the rotation of the shaft (14) the said jet of compressed air brushes tangentially and successively the surfaces of the combs (20) of the set of needles (24).

2. A drawing frame according to Claim 1, characterised by the fact that the jets of compressed air are directed substantially parallel to the direction of displacement

(A) of the web (F) of textile fibres to be treated, and faces towards the output zone of the web (F).

3. A drawing frame according to Claim 1, characterised by the fact that the jets of compressed air extend parallel to the axes of the shafts (14) of the head (10) for a length substantially equal to the length of the parts of the combs (20) lying between the said comb-carrier discs (16).

4. A drawing frame according to Claim 1, characterised by the fact that the means (46, 50) for supplying compressed air to the interior of each set of needles (24) comprises valve means (62) and programmable timer means (64) for the control of the said valve means (62).

5. A drawing frame according to Claims 1 to 3, characterised by the fact that each of the rotating shafts (14) of the head (10) is hollow and has at one end an axial passage (28) able to put into communication the hollow interior of the shaft with the said means (46, 50) for supplying compressed air; a portion of each shaft (14) lying between the respective comb-carrier discs (16) supporting a freely rotatable cylindrical tubular casing (30) interposed between the shaft (14) and the combs (20) and provided with a pair of annular end heads (32) provided with plain bearings (34) hermetically sealed in contact with the surface of the shaft (14); the said casing (30) having an axial slit (42) formed along its lateral wall and communicating with the hollow interior of the shaft

(14) through aperture (44) formed in the wall of the said shaft (14); positioning means (40) being provided for maintaining, during the rotation of the shaft (14), the said tubular casing (30) in a fixed angular position in which the said axial slit (42) is disposed in a substantially horizontal plane passing through the axis of the shaft (14).

6. A draw frame according to Claim 5, characterised by the fact that the said positioning means are constituted by a ballast weight (40) carried by the tubular casing (30).

7. A drawing frame according to Claim 6, characterised by the fact that the lateral wall of the tubular casing (30) has a substantially semi-cylindrical lower portion (40) which extends substantially from the said axial slit (42) up to a position in correspondence with the region of the casing (30) diametrically opposite the slit (42), and has a weight significantly greater than that of the remaining portion (36) of the casing (30).

8. A drawing frame according to Claim 4, characterised by the fact that the said axial end passage (28) of each shaft (14) is shaped in the form of a convergent-divergent venturi, and by the fact that the said means (46, 50) for supplying compressed air includes a pair of nozzles (46) connected to the said source of supply (52) with the interposition of a solenoid valve (62) controllable by means of a programmable timer (64) and each associated

with the axial end passage (28) of one of the shafts (14) in such a way as to form an air injector (48).

9. A drawing frame according to Claim 4, characterised by the fact that the hermetically sealed plain bearings (34) carried by the end heads (32) of the tubular casing (30) are constituted by rings of thermoplastics material.

10. A drawing frame substantially as described with reference to the attached drawings.

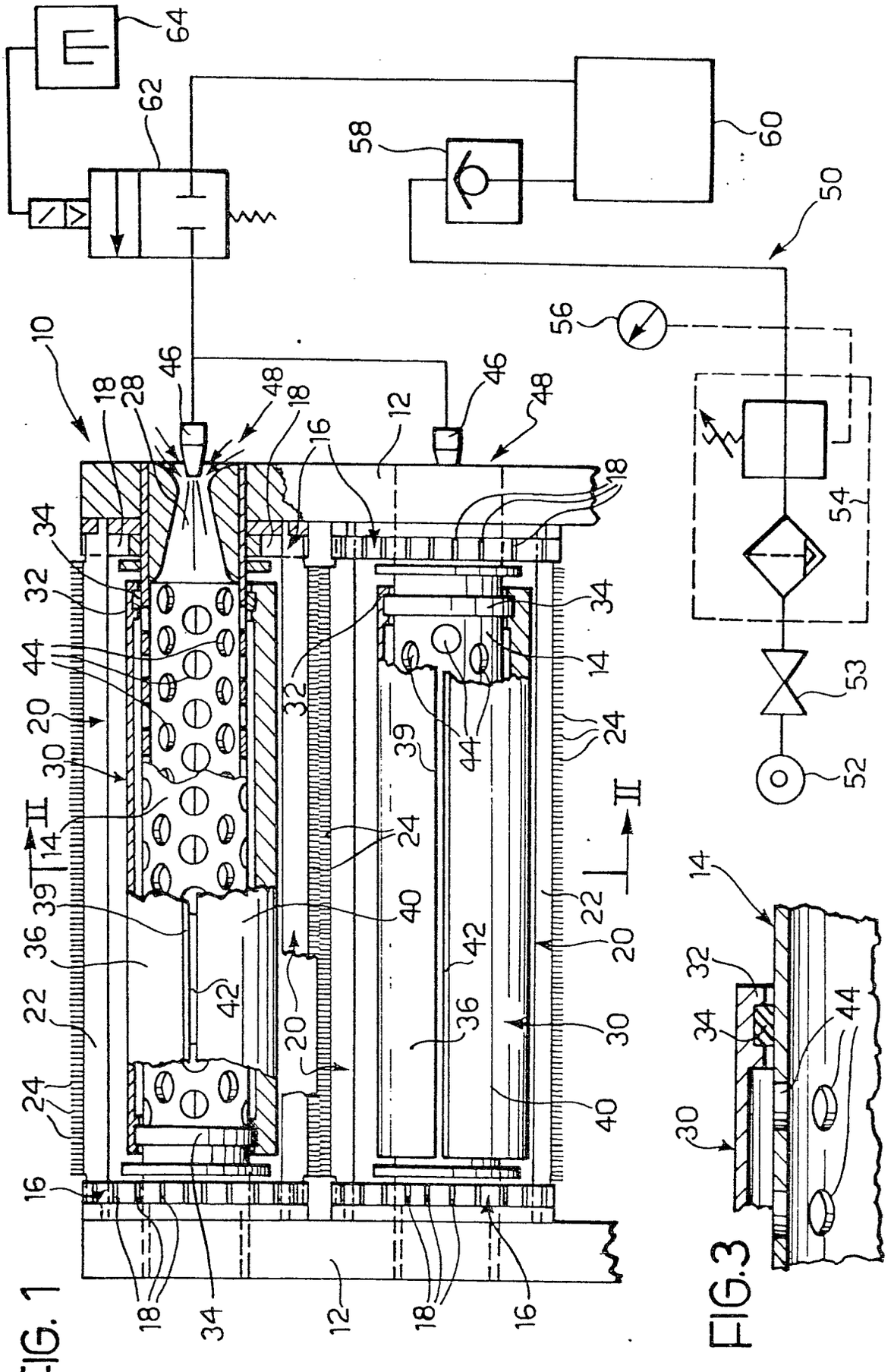
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FIG. 1

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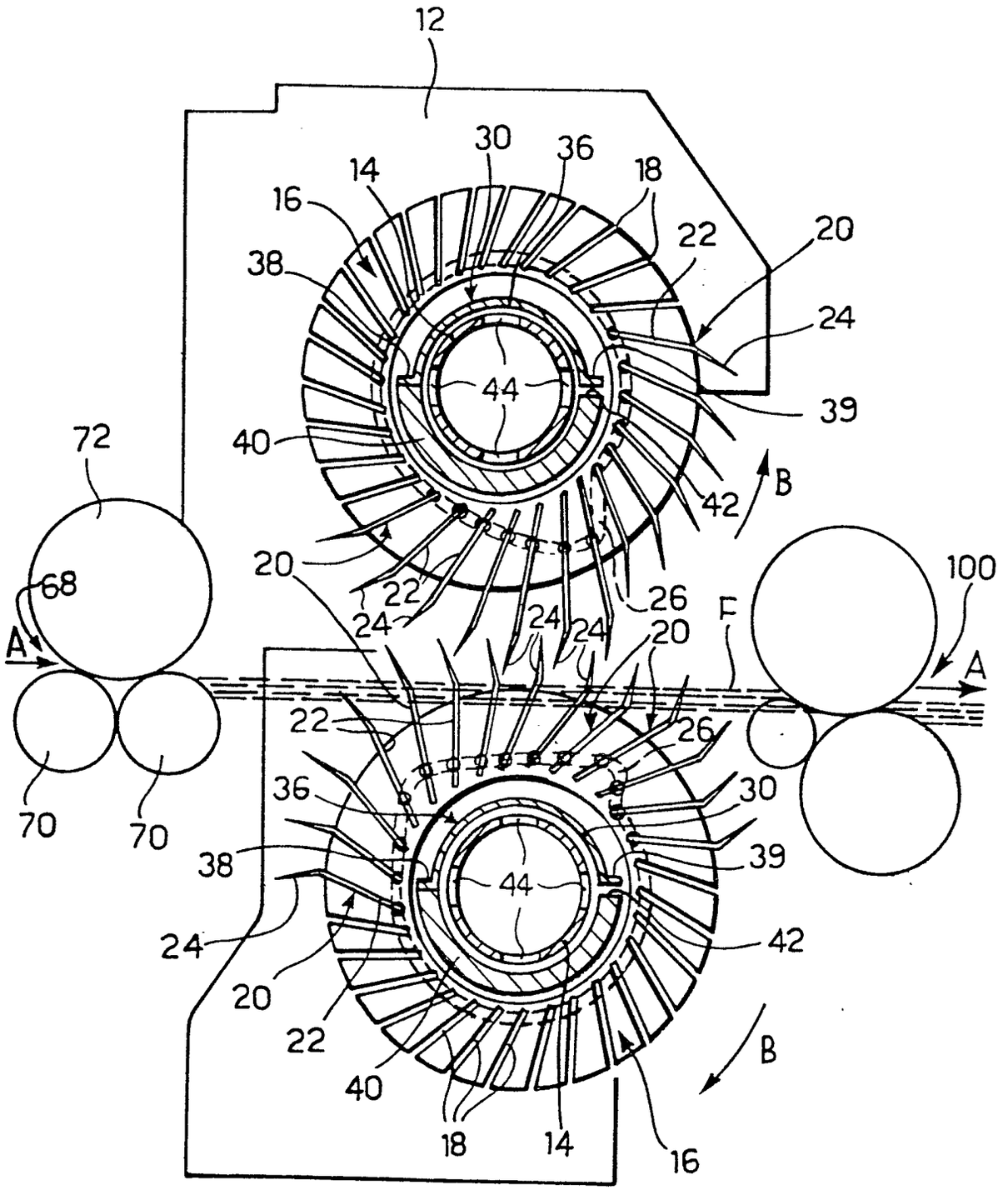
FIG.3

FIG. 2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