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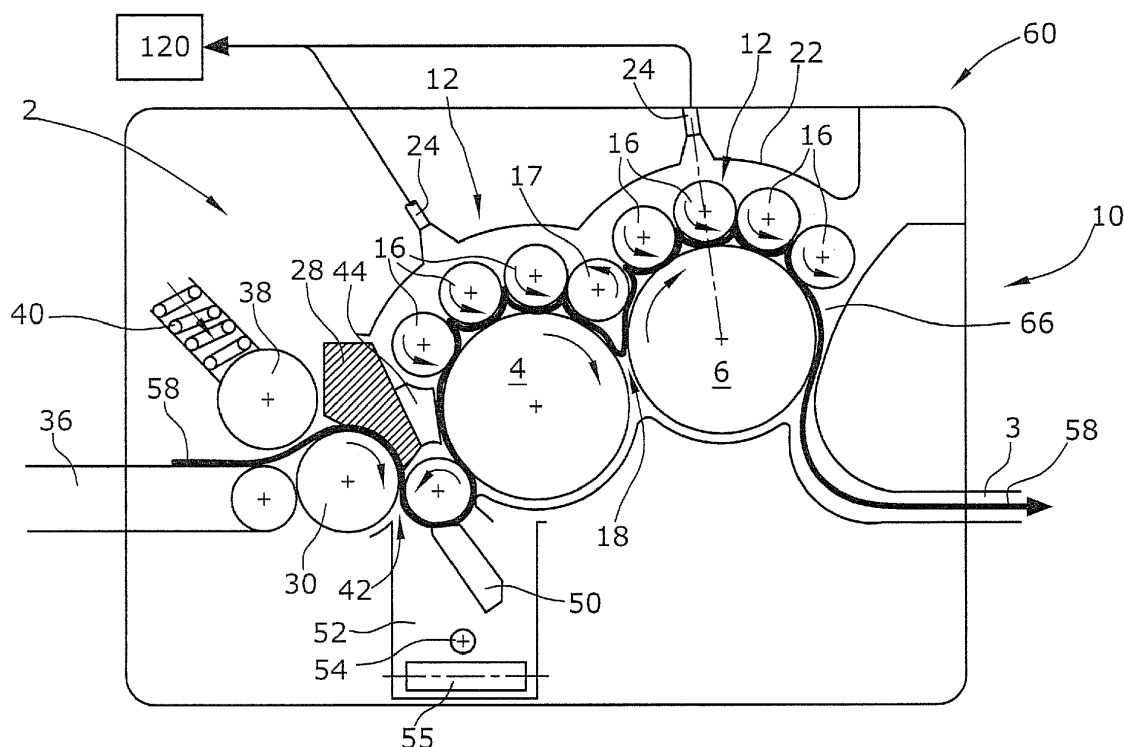
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(54) **TEXTILE APPARATUS FOR OPENING AND CLEANING TEXTILE FIBER MATERIAL AND METHOD FOR OPENING AND CLEANING TEXTILE FIBER MATERIAL**

(57) In a textile apparatus (1) for opening and cleaning textile fiber material (3) comprising a feed device (2), which feeds the textile fiber material (3) to at least one main cylinder (4,6), and a doffing system (10) for take-off of the textile fiber material (1), it is provided that said first

main cylinder (4,6) cooperates with at least one second main cylinder (6), said main cylinders (4,6) rotate in a common first rotational direction and each of the main cylinders is provided with carding elements (12).



**Fig.1**

## Description

**[0001]** The invention is related to a textile apparatus and a method for opening and cleaning textile fiber material comprising a feed device, a main cylinder and a doffing system according to claim 1 or claim 15.

**[0002]** Such textile apparatus and methods are generally known from US 4,854,013, US 4,858,277, US 4,858,276, US 4,890,357, US 6,615,455 and US 7,032,273.

**[0003]** It is an object of the invention to provide an improved textile apparatus and a method for tearing opening and cleaning textile fiber material for opening and cleaning textile fiber material which allows to achieve high productivity and to achieve high fiber qualities simultaneously.

**[0004]** The problem is solved by the features of claim 1 and claim 15.

**[0005]** The invention provides that a first main cylinder cooperates with at least one second main cylinder in such a way that the at least two main cylinders rotate in a common first rotational direction and each of the main cylinders is provided with carding elements.

**[0006]** This inventive concept is useful to achieve high productivity and high fiber quality on machines for tearing, for recycling waste fiber parts, for opening and cleaning fibers and for opening natural fibers, for machines for mixing and blending fibers and for airlaid machines.

**[0007]** Due to the rotation of the main cylinders in the same direction there will be a carding point between these main cylinders which both are provided with separate carding elements on the top.

**[0008]** According to a preferred embodiment a guide plate or a working roller is arranged in the gap between the first and second main cylinder. This has the advantage to intensify the carding action.

**[0009]** The fiber material may be discharged from the second or last main cylinder to an air doffing system. Such an air doffing system would assist to achieve high productivity.

**[0010]** The carding elements are rotating or fixed carding elements, preferably comprising at least one of the following carding elements namely working rollers, carding plates and carding bars.

**[0011]** According to a preferred embodiment the main cylinders have essentially the same diameter.

**[0012]** The feed device preferably comprises a combination of a feed plate and a feed roller followed by an accelerating lick-in cooperating with the first main cylinder and rotating in contrary direction with respect to the first main cylinder.

**[0013]** The feed device may comprise at least one chute feed.

**[0014]** In one embodiment the plane crossing the rotational axes of the main cylinders is inclined from the first to the second main cylinder relative to a horizontal plane by about 15° to 30°. This would allow especially in case of an air doffing system to provide space for an air

permeable transport belt of the air doffing system.

**[0015]** The surface velocity of the main cylinders is preferably between 800 m/min and 3000 m/min, whereas the surface velocity of the second main cylinder is preferably faster than the surface velocity of the first main cylinder.

**[0016]** The diameter of the cylinders is preferably within a range between 300 mm and 600 mm and preferably between 400 mm and 500 mm. A large diameter of the main cylinders is preferred in order to enhance centrifugal forces.

**[0017]** Said air doffing system comprises the perforated belt on which the fibers are airlaid for transporting the fibers to a following processing machine.

**[0018]** According to a method for opening and cleaning textile fiber material by feeding the material to at least one main cylinder and by doffing the textile fiber material off from the last main cylinder, it is provided to feed the fiber material to a first main cylinder in mutual engagement with at least one second main cylinder wherein the at least two main cylinders are rotated in a common first rotational direction and wherein the main cylinders are provided with carding elements.

**[0019]** In the following, embodiments of the invention are shown in the drawings and described in detail:

Fig. 1 a first embodiment of a textile apparatus for fiber opening and cleaning,

Fig. 2 an alternative second embodiment similar to Fig. 1 in which a guide plate is provided between the main cylinders,

Fig. 3 a third embodiment with an air doffing system,

Fig. 4 a fourth embodiment with chute-feeding with a guide plate between the main cylinders and with guide bars on the second main cylinder, and

Fig. 5 a waste opening line in which a tearing and fine opening and cleaning machine according to Fig. 1 to 4 is incorporated.

**[0020]** The first embodiment of Fig. 1 shows a textile apparatus for tearing and for fiber opening and cleaning.

**[0021]** The general construction of the machine comprises a feed device 2 which feeds the fiber material 3 to consecutive main cylinders 4, 6 wherein said main cylinders rotate in a common first rotational direction. The diameter of the main cylinders is at least between 400 mm and 500 mm. Preferably both main cylinders 4, 6 have the same diameter.

**[0022]** The surface velocity of the main cylinders 4, 6 is within a range between 800 m/min up to 3000 m/min wherein the surface velocity of the second main cylinder 6 being preferably faster than the surface velocity of the first main cylinder 4. According to the first embodiment the diameter is within a range between 400 mm and 500

mm. Preferably the first main roll 4 has a surface velocity between 1000 m/min and 2000 m/min and the second main roll 6 a surface velocity between 1000 m/min and 3000 m/min.

[0023] Following the second main cylinder 6, a doffing system 10 is provided which is preferably an air doffing system. Carding elements 12 are provided on the top of the main cylinders 4, 6.

[0024] These carding elements 12 can be built by working rollers 16 rotating in a common second rotational direction contrary to the first rotation direction of the main cylinders 4, 6.

[0025] In the embodiment of Fig. 1 a working roller 17 is provided in the gap 18 between the first and second main cylinder 4, 6.

[0026] This working roller 17 may be replaced by a guide plate 20 as can be taken from the second embodiment of Fig. 2.

[0027] The carding elements 12 can be rotating carding elements, e.g. working rollers 16, 17 or fixed carding elements in form of card plates or carding bars 25 as shown in Fig. 4.

[0028] The apparatus can be completely enclosed for avoiding dust emission. A housing 22 can be provided with suction connections 24 which allow to put the apparatus under low pressure and to transport dust loaded air to a remote dust collection device, e.g. a filtering device 120.

[0029] The feed device 2 can be configured as usual feed device for carding machines and may comprise the combination of a feed plate 28 and a feed roller 30 followed by an accelerating lick-in 32 engaged with the first main cylinder 4.

[0030] The feed plate 28 may be adjustable and extends into a gap 42 between the feed roll 30 and the lick-in 32.

[0031] The lick-in 32 interacts with the first main cylinder and is rotating in a second rotational direction contrary to the first rotational direction of the main cylinders 4, 6.

[0032] The textile fiber material 3 can be fed to the feed roll 30 via a conveyor 36 whereby the textile fiber material 3 is fed to the feed roll 30 through a gap between a pressing roll 38 which is pressed against the textile fiber material 1 via a tension means 40, e.g. a spring.

[0033] A fixed guide plate 44 can be interposed in the gap between the feed plate 28 and the main cylinder 4.

[0034] A mote knife 50 as generally known from US patent 6,138,326 may be arranged adjacent to the periphery of the lick-in 32. The removed waste drops down into a waste removal duct 52 which can be provided with a suction connection 54 in order to remove waste material by air suction. Alternatively or additionally a transport belt 55 may be used for waste removal.

[0035] The mote knife 50 is adjustable with respect to the lick-in 32 as shown in the drawings.

[0036] The path of the textile fiber material 1 between the feed device 2 and the doffing system 10 is shown by

line 58 in the drawings.

[0037] The second embodiment of Fig. 2 differs from Fig. 1 by the replacement of the working roller 17 through a guide plate 20.

5 [0038] Fig. 3 shows a third embodiment which corresponds to the embodiment of Fig. 1 and in which of the doffing system 10 is shown more in detail as an embodiment of an air doffing system. The air doffing system includes an air intake 60 in which air is aspirated by a suction device 64 which provides an underpressure in an air duct 66 in a duct 68 and/or in a duct 70 associated to a perforated drum 72. The ducts 66, 68 and 70 extend essentially about the complete width of the main cylinder 6.

10 [0039] The textile fiber material 3 doffed-off from the main cylinder 6 is transported by the air in the duct 66 along the perforated cylinder 72 in direction to an air permeable perforated belt 74 on which the textile fiber material 3 is laid down for being transported to the next machine.

20 [0040] It can be taken from Fig. 3 that the duct 70 of the perforated cylinder 72 is partly covered by a covering 76 such that a suction is only applied in area 78 of the perforated cylinder 72.

25 [0041] Fig. 4 shows an embodiment in which the feed device 2 is provided with a chute feed 80 which cooperates with an intake roller 82.

[0042] Additionally hand feeding may be possible via the conveyor belt 36.

30 [0043] The carding elements 12 of the second main cylinders 6 are built by carding bars 25. Between the carding bars 25 suction connections 24 can be provided to exhaust dust loaded air.

35 [0044] Fig. 5 shows the integration of a tearing and fiber opening and cleaning apparatus 1 in a waste opening line 90 in which textile fiber material 3 in form of waste material is loaded to a first cutter 92 and further on to an optional second cutter 94.

40 [0045] The textile material 3 is then forwarded to a bale feeder 96 and then to the textile apparatus 1 of one of the embodiments of Figs. 1 to 4. The textile fiber material 3 leaving the air doffing system is transported via ducts 98 and a fan 100 with a capacity of e.g. about 5000 m<sup>3</sup>/h to a step cleaner 102 and then forwarded via a duct 104 and via a second fan 106 with a capacity of e.g. 4000 m<sup>3</sup>/h to a valve 108 which deviates the fiber material 3 to a blending line 110 and/or to baler 112.

45 [0046] Transport belts 114, 116 between the first and the second cutter 92, 94 and the bale feeder 96 the textile apparatus 1 and the step cleaner 102 may be connected to a filtering device 120 to filter exhausted dust loaded air.

## Claims

- 55 1. Textile apparatus (1) for opening and cleaning textile fiber material (3) comprising a feed device (2), which feeds the fiber material (3) to at least one main cyl-

inder (4,6), and a doffing system (10) for take-off of the textile fiber material (1),

**characterized in that**

said first main cylinder (4) cooperates with at least one second main cylinder (6), said main cylinders (4,6) rotate in a common first rotational direction and each of the main cylinders (4,6) is provided with carding elements (12).

2. Textile apparatus (1) according to claim 1, **characterized in that** a guide plate (20) or a working roller (17) is arranged in the gap (18) between the first and second main cylinder (4,6). 10
3. Textile apparatus (1) according to claim 1 or 2, **characterized in that** the fiber material (3) is discharged from said second main cylinder (6) to an air doffing system. 15
4. Textile apparatus (1) according to claim 1 to 3, **characterized in that** the carding elements (12) are rotating or fixed, preferably comprising at least one of the following carding elements, namely working rollers (16,17), carding plates and carding bars (25). 20
5. Textile apparatus (1) according to any one of the preceding claims, **characterized in that** the main cylinders (4,6) have the same diameter or differ in diameter not more than by 10%. 25
6. Textile apparatus (1) according to any one of the preceding claims, **characterized in that** the feed device (2) comprises a combination of a feed plate (28) and a feed roller (30) followed by an accelerating licker-in (32) cooperating with the first main cylinder (4) and rotating in a second rotational direction contrary with respect to the first rotational direction of the main cylinder (4). 30
7. Textile apparatus (1) according to any one of the preceding claims, **characterized in that** the feed device (2) comprises at least one chute feed (80). 35
8. Textile apparatus according to claim 6 or 7 **characterized in that** a mote knife (50) is provided under the licker-in (32). 40
9. Textile apparatus (1) according to any one of the preceding claims, **characterized in that** the plane crossing the rotational axes of the main cylinders (4,6) from the first to the second main cylinder (6) is inclined to a horizontal plane by about 15° to 30°. 45
10. Textile apparatus (1) according to any one of the preceding claims, **characterized in that** the surface velocity of the main cylinders (4,6) is between 800 m/min and 3000 m/min, the surface velocity of the second main cylinder (6) being preferably faster than 50

the surface velocity of the first main cylinder (4).

11. Textile apparatus (1) according to any one of the preceding claims, **characterized in that** the main cylinders (4,6) have a diameter within a range between 300 mm and 600 mm, preferably between 400 mm and 500 mm. 5
12. Textile apparatus (1) according to claims 3 to 11, **characterized in that** said doffing system (10) comprises a perforated belt (72), on which the textile material fibers (3) are airlaid for transporting the fibers (3) to a following processing machine. 10
13. Method for opening and cleaning textile fiber material (3) by feeding the textile fiber material (3) to at least one main cylinder (4,6), and by doffing the textile fiber material (3) off from the last main cylinder (6), **characterized by** 15  
feeding the textile fiber material (3) to a first main cylinder (4) being engaged cooperating with at least one second main cylinder (6), said main cylinders (4,6) being rotated in a common first rotational direction and the main cylinders (4,6) being provided with carding elements (12). 20

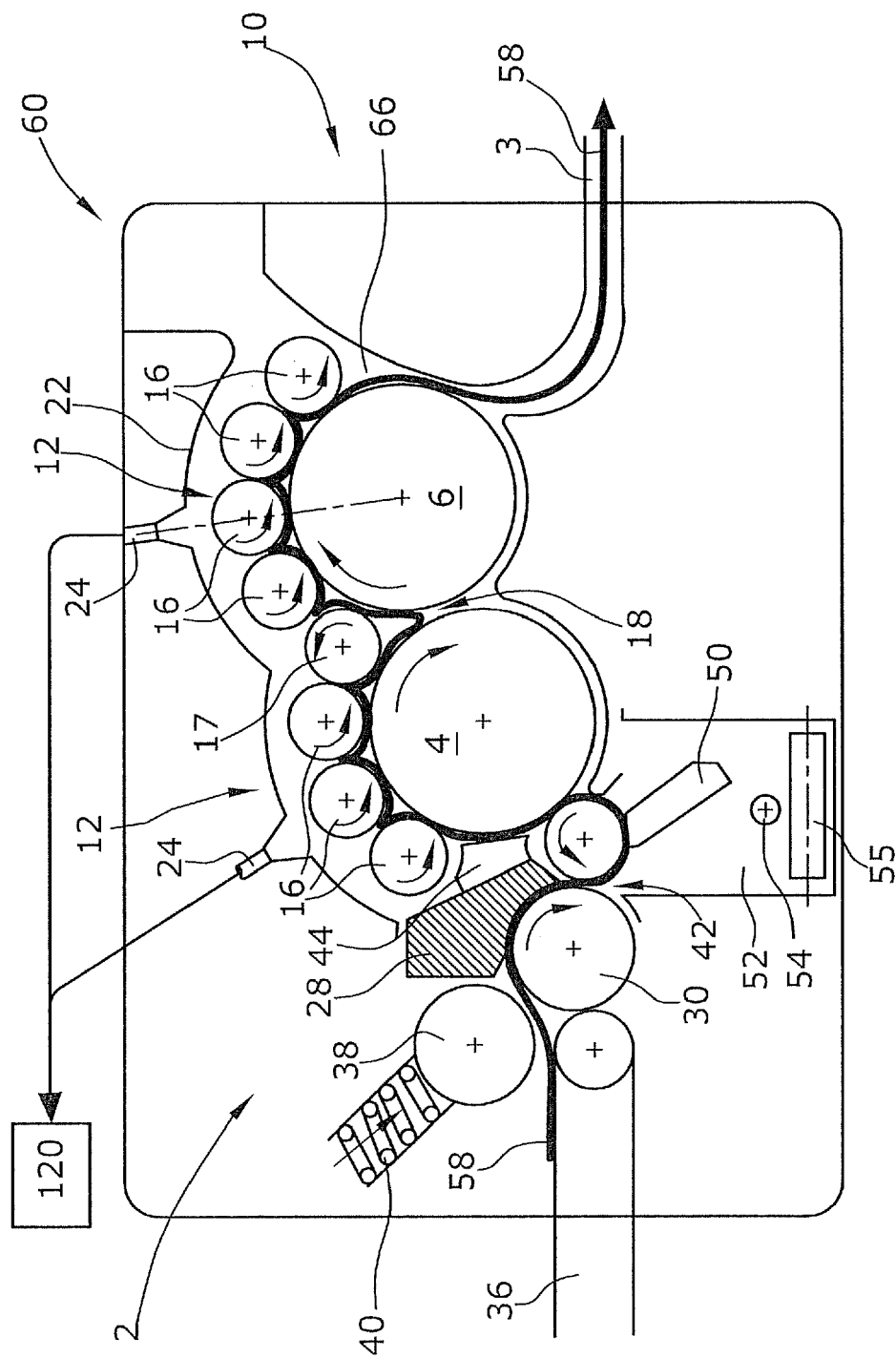


Fig. 1

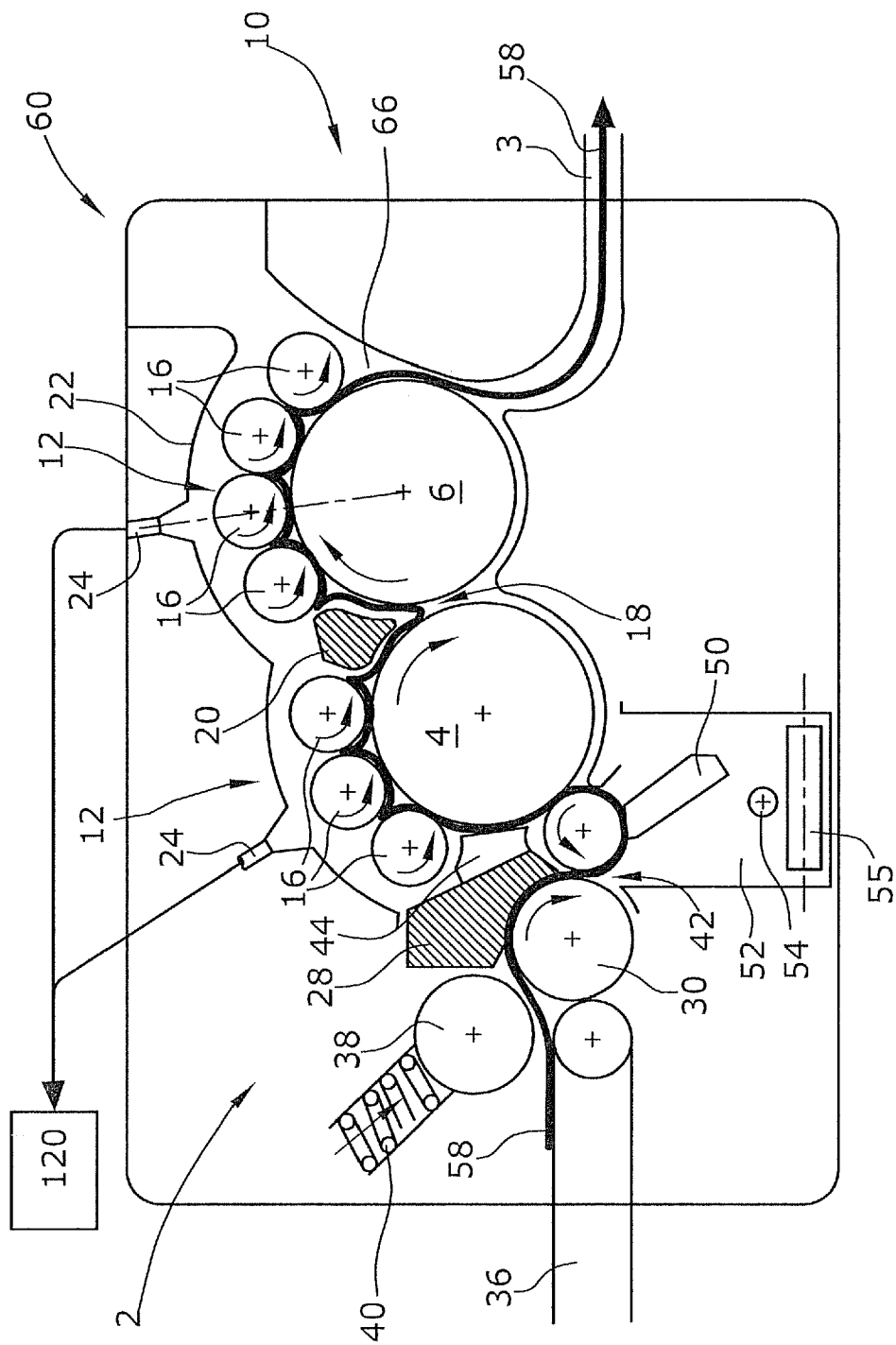


Fig.2

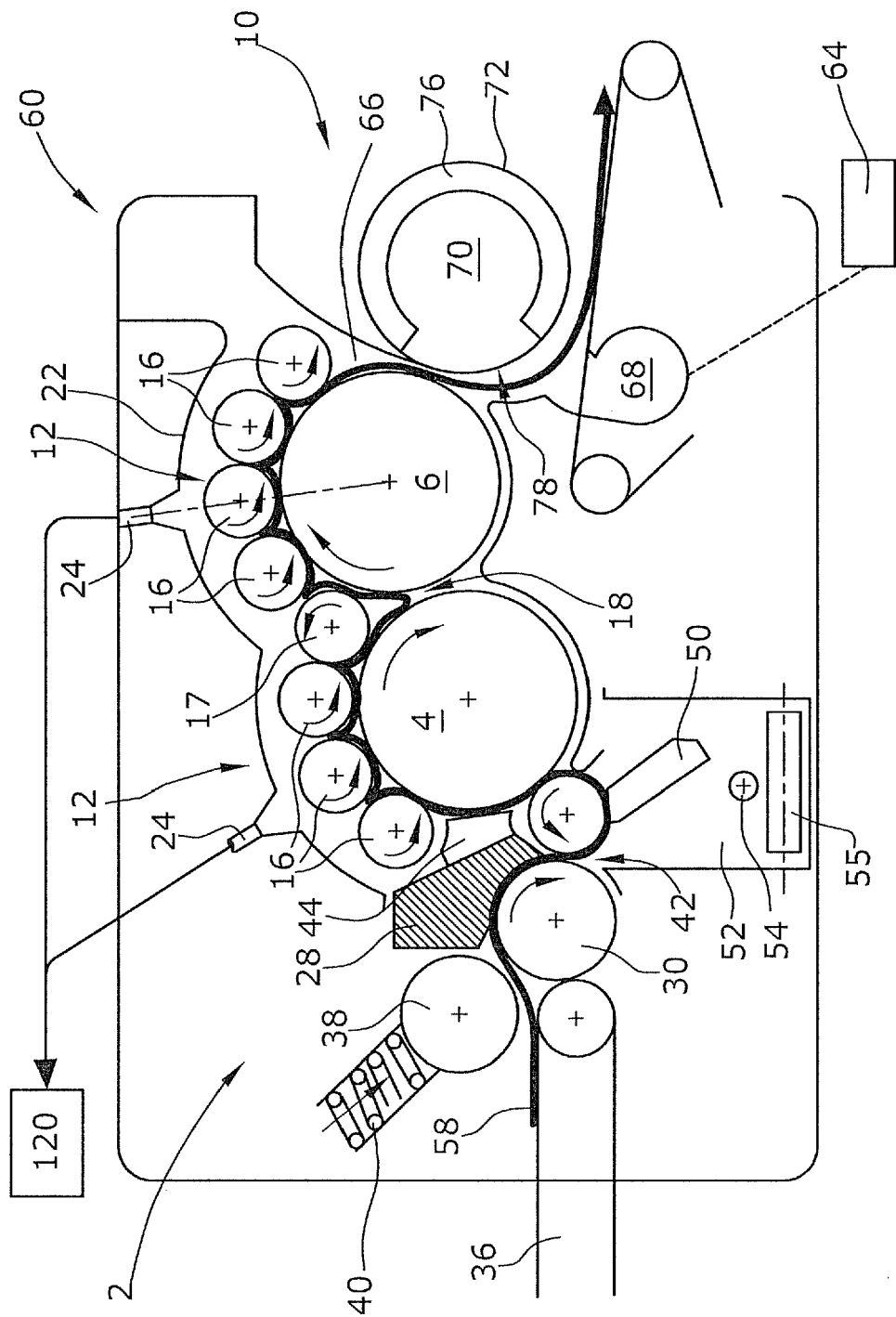
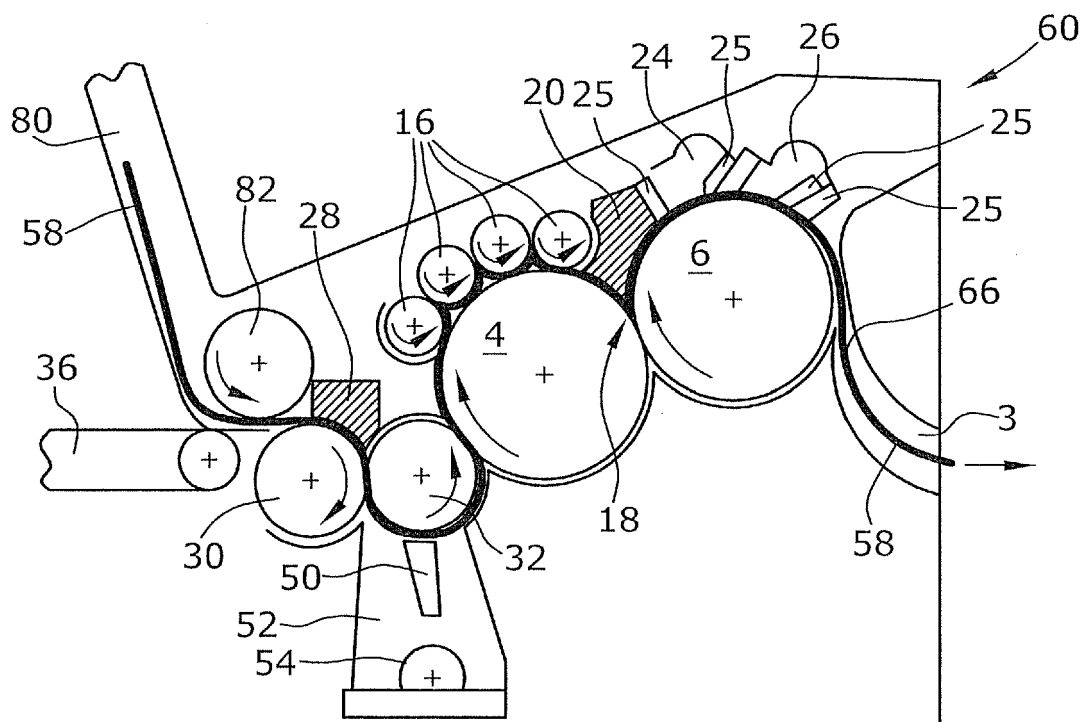
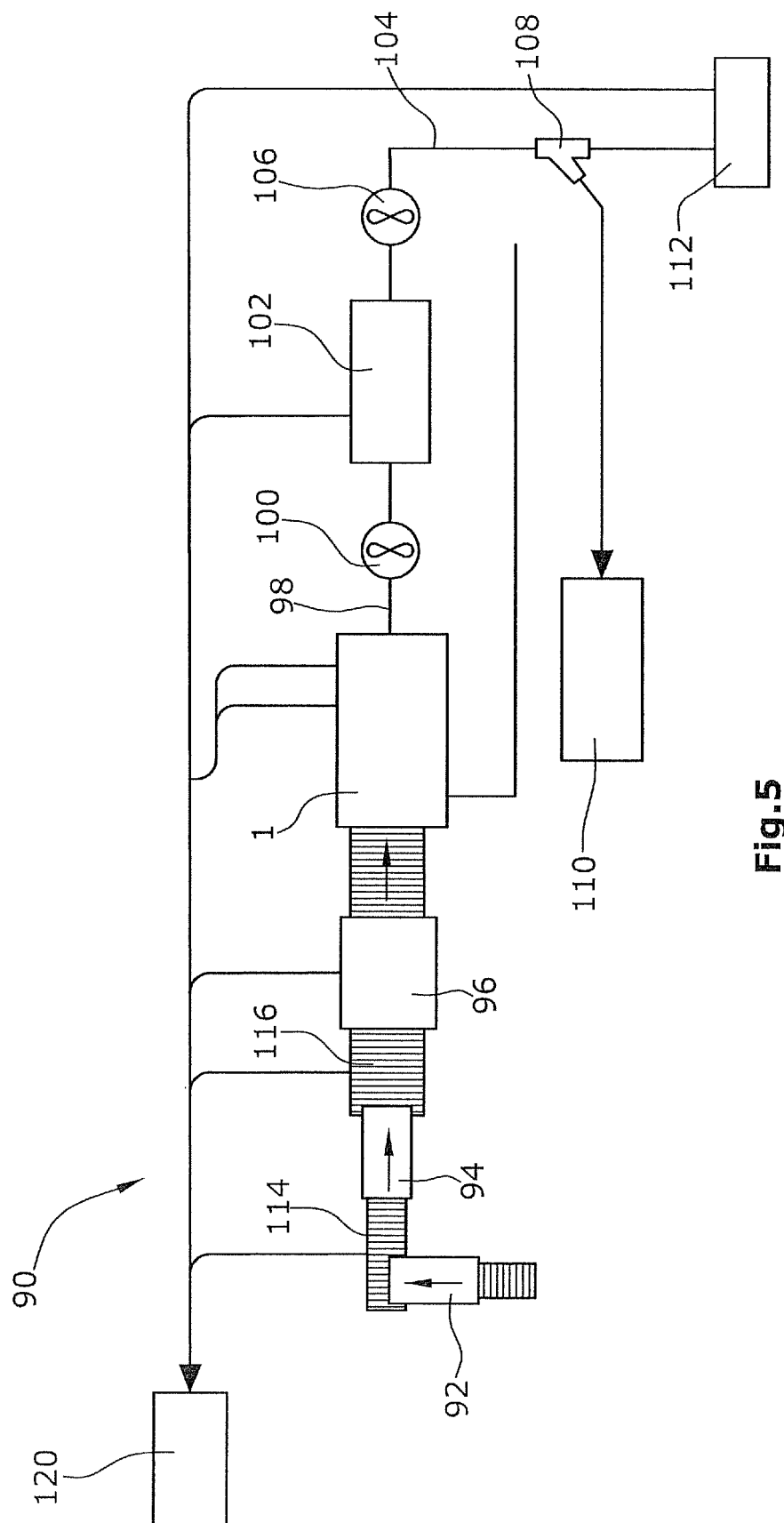


Fig.3



**Fig.4**







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