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(54) **OPEN-END SPINNING MACHINE WITH IMPROVED YARN WASTE DISCHARGE DEVICE AND RELATED YARN WASTE DISCHARGE METHOD**

OFFENENDSPINNMASCHINE MIT EINER VERBESSERTEN GARNABFALLENTSORGUNG UND KORRESPONDIERENDES VERFAHREN

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(73) Proprietor: **Savio Macchine Tessili S.p.A.
33170 Pordenone (IT)**

(72) Inventors:
• **ANTONIEL, Maurizio
I-33170 PORDENONE (IT)**

• **COLUSSI, Vittorio
I-33170 PORDENONE (IT)**

(74) Representative: **Mitola, Marco
Jacobacci & Partners S.p.A.
Piazza Mario Saggin, 2
35131 Padova (IT)**

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Description

FIELD OF APPLICATION

[0001] The present invention relates to an open-end spinning machine with an improved device for discarding the yarn waste and the relative method for discharging the yarn waste in an open-end spinning machine.

PRIOR ART

[0002] As is known, during the spinning process it may happen that a breakdown of the produced yarn occurs in the spinning machines, with consequent interruption of the yarn production. The restoration of this activity involves the junction between two portions of yarn: the one produced before the break, which is wound on the reel, and the amount that will be generated when the spinning resumes.

[0003] In general, in the textile the procedure that joins the ends of the thread is carried out through the piecing cycle (or simply piecing).

[0004] During the piecing cycle it is necessary to provide a suction system whose purpose is both to retain the yarn in order to handle it and to evacuate any waste produced in the processing (fluff, duct, yarn fibres, etc.).

[0005] Known open end spinning machines can be completely automatic, in which the doffing and piecing cycles are carried out by a single trolley.

[0006] Within this single trolley, some devices are designed for the single doffing cycle of a reel, while others are used for the yarn piecing cycle.

[0007] In known machines of the fully automatic type, when said single trolley reaches the spinning unit where intervention is required, it connects with the centralized suction system of the machine. The machine is in fact provided with a suction channel that develops horizontally above the spinning units, in proximity and parallel to the trolley translation tracks. This channel is aeraulically connected to the main suction system of the machine.

[0008] Concurrently with each individual spinning head there is a horizontal axis throttle gate, through the pivoting of which the suction channel can be accessed to interface with each other.

[0009] When necessary, the trolley opens the throttle gate and operates a telescopic nozzle with which it connects to the suction channel. In this way the trolley has available the vacuum needed to operate the devices mounted on the trolley itself.

[0010] In this way, all the waste sucked by the reel suction mouth, by the preparer and by the other service mouths mounted on the trolley, pass through the suction channel and end directly to the machine's main suction system. Once the operations for which suction is necessary have ended, the trolley retracts the telescopic suction mouth and closes the throttle gate.

DISCLOSURE OF THE INVENTION

[0011] Therefore, all the most advanced machines available on the market today directly use the centralized suction system of the machine, thus requiring a system of ducts and mouths to allow the relative pneumatic connection in every single working position of the trolley.

[0012] Therefore, the known solutions described above have drawbacks and limitations, essentially due to the fact that they provide for the use of complex and expensive systems of ducts and mouths which, in addition to increasing the complexity and costs of the machine, also increase the time required to discharge the yarn waste. Such known solutions are disclosed, for example, by JP H0551828 A, EP 0442049 A2, EP 2508659 A1, EP 2530193 A1, EP 2305864 A1.

[0013] The need to solve the drawbacks and limitations mentioned with reference to the prior art is therefore felt.

[0014] This need is met by an open-end spinning machine according to claim 1 and by a method for discharging yarn waste from an open-end spinning machine according to claim 13.

DESCRIPTION OF THE DRAWINGS

[0015] Further features and advantages of the present invention will appear more clearly from the following description of preferred non-limiting embodiments thereof, in which:

figure 1 shows a schematic plan view of a part of an open-end type spinning machine according to an embodiment of the present invention;

figure 2 shows a plan view of the enlarged detail II in figure 1;

figure 3 shows a plan view of the enlarged detail III in figure 1;

figure 4 shows a schematic plan view of a part of a side of an open-end type spinning machine according to an embodiment of the present invention;

figure 5 shows a plan view of the enlarged detail V in figure 4;

figure 6 shows a cross sectional view of a spinning machine according to an embodiment of the present invention;

figure 7 shows a perspective view of a service trolley of a spinning machine according to the present invention;

figures 8-9 show perspective views, from different angles, of a secondary suction device mounted on a service trolley according to the present invention;

figure 10 shows a perspective view of a part of a centralized or main suction system of the spinning machine according to the present invention;

figures 11-12 show perspective views of a yarn waste reception duct of the main suction system according to an embodiment of the present invention, in a retracted and extracted configuration, respec-

tively;

figures 13-14 show perspective views of a main or secondary shut-off valve, according to an embodiment of the present invention, in closed and open configuration, respectively.

[0016] Elements, or parts of elements, in common to the embodiments described below are referred to with the same reference numerals.

DETAILED DESCRIPTION

[0017] With reference to the above figures, reference numeral 4 globally indicates an overall schematic view of an open-end type spinning apparatus according to the present invention.

[0018] In particular, the spinning machine 4 comprises at least one spinning head 8 having a spinning unit 12 and a reel winding unit 16, wherein the reel winding unit 16 wraps on a tube 20 a reel of yarn obtained from the underlying spinning unit 12.

[0019] The spinning machine 4 further comprises a centralized or main suction system 24 having vacuum generating means 28 for the machine 4, such as typically a fan 30 and at least one filter 33.

[0020] The centralized suction system 24 is provided with a reception duct 32 of the yarn waste, such as fluff, dust and/or yarn fibres, having an input mouth 36 aerally connectable to said vacuum generating means 28 by means of a main shut-off valve 40.

[0021] Preferably, the main shut-off valve 40 is a diaphragm-type shut-off valve, having an obturator in sectors 42.

[0022] The use of an obturator in sectors 42 avoids the generation of sudden fluid dynamic impulses which would result in damaging water hammers inside the suction ducts of the spinning machine 4.

[0023] Furthermore, the centralized suction system 24 is provided with at least one service trolley 44 mobile so as to be placed in the vicinity of each spinning head 8 and fitted with its own secondary suction device 48 able to generate a vacuum to aspirate yarn waste from each spinning head 8.

[0024] Advantageously, the secondary suction device 48 is fitted with its own storage tank 52 for collecting the aspirated yarn waste, and its own discharge duct 56 suitable to allow the selective emptying of the waste accumulated in said storage tank 52.

[0025] The discharge duct 56 is in turn fitted with a discharge mouth 60 and a secondary shut-off valve 64 configured to interact selectively with the input mouth 36 of the waste reception duct 32 and/or with the main shut-off valve 40.

[0026] Preferably, the storage tank 52 is arranged immediately below the corresponding secondary suction device 48: in this way, the waste sucked by the suction mouth can fall directly due to gravity inside the storage tank 52.

[0027] According to a possible embodiment, the secondary shut-off valve 64 is a diaphragm-type shut-off valve, having an obturator in sectors 68, of the same type as that of which the main shut-off valve 40 is provided.

[0028] The use of an obturator in sectors 68 avoids the generation of sudden fluid dynamic impulses which would result in damaging water hammers inside the suction ducts of the spinning machine 4.

[0029] Preferably, the secondary shut-off valve 64 is arranged downstream of the storage tank 52 and upstream of the discharge duct 56.

[0030] As seen, the yarn waste must be sent from the discharge duct 56 to the reception duct 32 of the centralized suction system 4.

[0031] According to the invention, the yarn waste reception duct 32 is of the mobile and/or telescopic type so as to pass from a retracted configuration (figure 11) in which it does not interface with the discharge duct 56 of the service trolley 44 to an extracted configuration (figure 12) in which it connects aerally with said discharge duct 56.

[0032] Preferably, the input mouth 36 of the yarn waste reception duct 32 is provided with at least one gasket 72 to achieve a seal with the discharge mouth 60 of the discharge duct 56.

[0033] Preferably, said gasket 72 is of the suction cup type.

[0034] As mentioned, the spinning machine 4 comprises at least one service trolley 44; preferably, the service trolley 44 is a piecing trolley 76 comprising suction and gripping means of a broken end of yarn and means of piecing said broken yarn (not shown).

[0035] According to a possible embodiment, the spinning machine 4 comprises, as a further service trolley 44, at least one doffing trolley 80 which can be positioned at each spinning unit 12 and fitted with devices for picking up and moving a tube 20 from a tube-holder basket to a pair of tailstocks of the winding unit into reels.

[0036] Advantageously, the piecing trolley 76 and the doffing trolley 80 are distinct and independent from each other.

[0037] Preferably (figure 6), the piecing trolley 76 and doffing trolley 80 at least partially penetrate each other in order to mutually override each other along a patrol path of the spinning heads 8 of the spinning machine 4.

[0038] In other words, the piecing trolley 76 and the doffing trolley 80 have a shape and follow a trajectory such that they can meet in any intermediate section and cross it, that is, climb it, without disturbing each other.

[0039] According to a preferred embodiment, the spinning machine 4 comprises at least two distinct piecing trolleys 76', 76'', each with its own secondary suction device 48', 48'', its own storage tank 52', 52'' and its own discharge duct 56', 56'', so that each piecing trolley 76', 76'' can patrol a specific side A, B of the spinning machine 4.

[0040] The operation of an open-end spinning machine according to the present invention will now be described.

[0041] In particular, the spinning machine 4 operates continuously, producing yarn through the spinning unit 12; in the meantime, the service trolley 44, typically the piecing trolley 76, patrols the various spinning units 12 and, if necessary, performs all the required piecing operations. During its operation, the piecing trolley 76 continues to suck up yarn waste which is conveyed, through the vacuum created by the secondary suction device 48, into the storage tank 52.

[0042] Obviously, the independence and autonomy of the piecing trolley 76 from the rest of the spinning machine 4 in carrying out its functions is limited by the volume of the storage tank 52, which is why at a certain point it will be necessary to proceed with the emptying of the collection container.

[0043] This discharge is then carried out automatically.

[0044] In particular, when it is possible to empty the fluff storage tank 52 (according to the criteria indicated below), the management software of the spinning machine 4 activates the automatic cleaning cycle. The piecing trolley 76 moves to a precise point of the spinning machine 4, that is, at the centralized suction system 24, where it is possible to carry out the waste discharge. In fact, the centralized suction system is connected to the reception duct 32 described above, which allows the piecing trolley 76 to be able to discharge the waste accumulated during the various cycles, thus releasing the fluff storage tank 52.

[0045] The piecing trolley 76 stops in the exact position where it is possible to discharge, for example due to an identification system by means of an optical bar code reader, which is normally used to precisely locate the spinning units 12 on which to operate.

[0046] After alignment between the discharge duct 56 of the piecing trolley 76 and the corresponding reception duct 32 of the centralized suction system 24, the software for managing the spinning machine 4 activates the movement of the reception duct 32. For example, said reception duct 32 is provided with a telescopic system: an electric stepper motor rotates a nut screw, for example with a trapezoidal thread, allowing translation of the input mouth 36 of the reception duct 32, which projects from the side of the spinning machine 4 to reach the adjacent piecing trolley 76.

[0047] Preferably, as seen, the terminal or input mouth 36 of such a reception duct 32 is provided with a gasket 72, preferably suction cup type, which allows the ends of the reception duct 32 and of the discharge duct 56, respectively, to mate thus ensuring a good pneumatic seal. In this way, the continuity and the aeraulic connection between the discharge duct 56 and the reception duct 32 are achieved.

[0048] The other end of the reception duct 32 is connected to the suction channel of the centralized suction system 24 of the technological air of the spinning machine 4.

[0049] The reception duct 32 is in turn provided in an intermediate position with a main shut-off valve 40 with

an obturator in sectors 42, of the same type as the secondary shut-off valve 64 mounted on the discharge duct 56 on the side of the piecing trolley 76.

[0050] When the respective ends of the discharge ducts 56 and of the reception duct 32 are connected to each other, the actual yarn waste discharge cycle begins: the main shut-off valve 40 opens slowly so as not to generate undesired fluid dynamic impulses in the reception duct 32. The secondary shut-off valve 64 then opens, mounted on the piecing trolley 76, taking the same care, in order to avoid the occurrence of water hammer phenomena.

[0051] The fluff storage tank 52 will now be in high vacuum and all of its contents will flow rapidly through the discharge ducts 56 and the related secondary shut-off valves 64 and main shut-off valves 40; from here, through the main air suction channel of the technological air, the waste will end up in the filter of the spinning machine 4 where it can be easily collected together with the other waste and removed by known and universally adopted systems.

[0052] Once the fluff storage tank 52 has been emptied, the secondary shut-off valve 64 on board the piecing trolley 76 is closed again, after which the main shut-off valve 40 of the centralized suction system 24 is also closed, after which the telescopic connection of the input mouth 36 of the reception duct 32 of the centralized suction system 24 is retracted into the footprint of the machine.

[0053] At this point, the piecing trolley 76 is free to leave the centralized suction system 24 resuming its patrolling activities of the various spinning heads 8.

[0054] As mentioned above, the present invention preferably provides for the use of at least one piecing trolley 76 for each machine side A, B to allow all the trolleys 76 of each machine side A, B to be able to discharge the fluff storage tank 52.

[0055] The present invention also relates to the criteria for emptying the storage tank 52, i.e. the control logic for activating the emptying procedures by means of the service trolleys 44.

[0056] In fact, the choice of when to start the emptying cycle of the fluff storage tank 52 is fundamental with a view to optimizing overall machine times.

[0057] The main idea is to not specifically send the piecing trolley 76 to the centralized suction system 24 to follow only the waste discharge, so that it is not in the condition in which the storage tank 52 has reached its limit filling capacity. Preferably, it is contemplated to anticipate the overflow condition of the storage tank 52 and to exploit one of the movements of the piecing trolley 76 in which the same should pass through the section of the centralized suction system 24 or in which it would operate on a spinning unit 12 located close to said centralized suction system 24.

[0058] At this point, taking advantage of the proximity, the piecing trolley 76 could approach the centralized suction system 24 and perform the waste discharge process.

dure.

[0059] In any case, in order to be able to determine when it is more convenient to send the piecing trolley 76 to the fluff discharge, a criterion must be set on the machine management software with which to evaluate when it is necessary to empty the fluff storage tank 52.

[0060] For the purposes of the present invention, there are several criteria that can be used to set the emptying, namely:

- I. time-based;
- II. with the number of piecing made;
- III. by estimating the fullness of the storage tank 52 with a volumetric sensor on the tank itself;
- IV. by estimating the fullness of the storage tank 56 with a pressure gauge on the aspirator on board the service trolley 44;
- V. by estimating the fullness of the storage tank 56 by detecting the electricity consumption of the motor supplying motion to the secondary suction device 48 on board the service trolley 44.

[0061] With the 'time-based' criterion a time interval is set between one discharge and the other: this method can be implemented without the need for additional control devices.

[0062] With the principle of the number of piecing, the service trolley 44 is forced to carry out the discharge of the fluff at predetermined intervention intervals: also in this case no further control devices are required.

[0063] With a volumetric sensor installed on the fluff storage tank 52, the machine could have a more precise control as it would be able to have a more precise estimate of the amount of waste collected.

[0064] The pressure gauge installed on the suction mouth of the secondary suction device 48 would allow evaluating when the machine is too 'straining' due to a too full storage tank 52.

[0065] Also the measurement of current consumption of the motor which moves the impeller of the secondary suction device 48 has the advantage that it does not require any additional device as consumption is a data already known to the management software.

[0066] In the machine of the present invention, preferably the emptying step is activated according to one or more of the above mentioned criteria which can be implemented either individually or in combination with each other.

[0067] As can be appreciated from what has been described, the open-end spinning machine and the method of waste discharge from an open-end spinning machine according to the invention allow overcoming the drawbacks of the prior art.

[0068] The new fluff discharge system has several advantages over all the prior art solutions currently present on the market.

[0069] The main advantages introduced are the following:

- reduction of the suction system;
- reduction of load losses;
- reduction of the trolley intervention times;
- better efficiency in the overall management of the machine.

[0070] The above advantages are better explained hereinafter.

[0071] In particular, the reduction of the suction system is a consequence of the fact that the entire system of secondary ducts and mouths (one for each spinning head) necessary to allow the connection of the trolley in each working position with the centralized suction system is no longer required. With the present invention, the extension of the secondary duct is reduced considerably (even by half of the current open-end marketed by the same applicant) and the interconnection mouths between the machine and the piecing trolley are reduced to two (one for each side). The benefit will also result in maintenance: in fact, fewer components offer less chance of breakage.

[0072] The reduction described above not only entails benefits in terms of reducing machine and maintenance costs, but also benefits in pneumatic terms.

[0073] In fact, the overall reduction in the number of mouths also leads to a reduction in pressure losses (localized losses introduced by each individual mouth) but above all to a clear reduction of the distributed losses due to the extra length of duct necessary to reach the outermost mouths, that is, the mouths farthest from the centralized suction system (used in known solutions).

[0074] The reduction in the intervention time of the trolley is due to the fact that at the beginning of each piecing cycle that the trolley must perform, it will no longer be necessary to dedicate machine time to the opening step of the throttle valve and to the pneumatic connection of the telescopic mouth; furthermore, at the end of the cycle it will not be necessary to spend more time to disconnect the telescopic mouth and close the aforementioned throttle valve. These operations will be carried out anyway but with a frequency much lower than the solutions of the prior art.

[0075] The best efficiency in machine management refers to the fact that in the known systems previously adopted, when the filter of the centralized suction system needs to be cleaned, the action of the trolleys on both sides of the machine is inhibited, as the suction is completely interrupted.

[0076] With the present invention, the trolley works with its own suction system independent of that of the machine, until it is necessary to discharge the fluff: in this way, the trolley can operate even if the central vacuum is in the filter cleaning step.

[0077] A man skilled in the art may make several changes and adjustments to the machines and methods of the present invention in order to meet specific and incidental needs, all falling within the scope of protection defined in the following claims.

Claims

1. Open-end spinning machine (4) comprising at least one spinning head (8) having a spinning unit (12) and a winding unit into reels (16), wherein the winding unit into reels (16) winds onto a tube (20) a reel of yarn obtained from the underlying spinning unit (12),
 - a main suction system (24) of the spinning machine (4), with means for producing a vacuum (28) for the machine (4) and provided with a reception duct (32) of the yarn waste, such as fluff, dust and/or yarn fibres, with an input mouth (36) aeraulically connectable to said vacuum generating means (28) by means of a main shut-off valve (40),
 - at least one service trolley (44) mobile so as to be placeable in the vicinity of each spinning head (8), the service trolley being fitted with its own secondary suction device (48) able to generate a vacuum to aspirate yarn waste from each spinning head (8),
 - wherein
 - the secondary suction device (48) is fitted with its own storage tank (52) for collecting the aspirated yarn waste, and its own discharge duct (56) suitable to allow the selective emptying of the waste accumulated in said storage tank (52),
 - the discharge duct (56) being fitted with a discharge mouth (60) and a secondary shut-off valve (64) configured to interact selectively with the input mouth (36) of the waste reception duct (32) and/or with the main shut-off valve (40), wherein the yarn waste reception duct (32) is of the mobile and/or telescopic type so as to pass from a retracted configuration in which it does not interface with the discharge duct (56) of the service trolley (44) to an extracted configuration in which it connects aeraulically with said discharge duct (56) in order to allow the passage of the waste from the collection tank (52) into the centralised suction system (24).
2. Open-end spinning machine (4) according to claim 1, wherein the storage tank (52) is placed immediately below the corresponding secondary suction device (48).
3. Open-end spinning machine (4) according to claim 1 or 2, wherein the secondary shut-off valve (64) is a diaphragm-type shut-off valve, having an obturator in sectors (68).
4. Open-end spinning machine (4) according to any of the preceding claims, wherein the secondary shut-off valve (64) is placed downstream of the storage tank (52) and upstream of the discharge duct (56).
5. Open-end spinning machine (4) according to any of the preceding claims, wherein the input mouth (36) of the yarn waste reception duct (32) is provided with at least one gasket (72) to achieve a seal with the discharge mouth (60) of the discharge duct (56).
6. Open-end spinning machine (4) according to claim 5, wherein said gasket (72) is of the suction cup kind.
7. Open-end spinning machine (4) according to any of the preceding claims, wherein the main shut-off valve (40) is a diaphragm-type shut-off valve, having an obturator in sectors (42).
8. Open-end spinning machine (4) according to any of the preceding claims, wherein the service trolley (44) is a piecing trolley (76) comprising suction and gripping means of a broken end of yarn and means of piecing said broken yarn.
9. Open-end spinning machine (4) according to any of the preceding claims, wherein the machine comprises at least one doffing trolley (80) which can be positioned at each spinning unit (12) and fitted with devices for picking up and moving a tube (20) from a tube-holder basket to a pair of tailstocks of the winding unit into reels (16).
10. Open-end spinning machine (4) according to claim 8 in conjunction with claim 9, wherein the trolley (44) coincides with the piecing trolley (76), said piecing trolley (76) and doffing trolley (80) being separate and independent of each other.
11. Open-end spinning machine (4) according to claim 10, wherein the piecing trolley (76) and doffing trolley (80) at least partially penetrate each other in order to mutually override each other along a patrol path of the spinning heads (8) of the machine (4).
12. Open-end spinning machine (4) according to any of the preceding claims, comprising at least two distinct piecing trolleys (76', 76'') such as service trolleys, each with its own secondary suction device (48', 48''), its own storage tank (52', 52'') and its own discharge duct (56', 56''), each trolley (76', 76'') patrolling a specific side (A, B) of the spinning machines (4).
13. Method of discharging yarn waste from an open-end spinning machine (4) comprising the steps of:
 - providing an open-end spinning machine (4) comprising at least one spinning head (8) having a spinning unit (12) and a winding unit into reels (16), wherein the winding unit into reels (16) winds onto a tube (20) a reel of yarn obtained from the underlying spinning unit (12),

- providing a main suction system (24) of the spinning apparatus (4), with means of producing a vacuum (28) for the machine (4) and provided with a reception duct (32) of the yarn waste, such as fluff, dust and/or yarn fibres, with an input mouth (36) aeraulically connectable to said vacuum generating means (28) by means of a main shut-off valve (40),
 - providing at least one service trolley (44) mobile so as to be placeable in the vicinity of each spinning head (8), the service trolley (44) being fitted with its own secondary suction device (48) able to generate a vacuum to aspirate yarn waste from each spinning head (8),
 - fitting the secondary suction device (48) with its own storage tank (52) for collecting the aspirated yarn waste, and its own discharge duct (56) suitable to allow the selective emptying of the waste accumulated in said storage tank (52), wherein the yarn waste reception duct (32) is of the mobile and/or telescopic type so as to pass from a retracted configuration in which it does not interface with the discharge duct (56) of the service trolley (44) to an extracted configuration in which it connects aeraulically with said discharge duct (56),
 - fitting the discharge pipe (56) with a discharge mouth (60) and a secondary shut-off valve (64) configured to interact selectively with the input mouth (36) of the waste reception duct (32) and/or with the main shut-off valve (40),
 - selectively emptying the storage tank (52) after aeraulically connecting the discharge duct (56) of the secondary suction device (48) of the service trolley (44) with the centralised or main suction system (24) of the spinning machine (4),
 - actuating an emptying procedure of the storage tank (52),
 - bringing the service trolley (44) to the centralised suction system (24), where the waste can be discharged,
 - aligning and connecting aeraulically to each other, in an airtight manner, the previously extracted input mouth (36), with the discharge mouth (60), to allow the passage of the waste from the collection tank (52) into the centralised suction system (24).
- 14.** Method of discharging yarn waste from an open-end spinning apparatus (4) according to claim 13, wherein following the mutual alignment of the input mouth (36) and the discharge mouth (60), the following steps are performed:
- gradual opening of the main shut-off valve (40),
 - gradual opening of the secondary shut-off valve (64) on the service trolley (44),
 - emptying of the storage tank (52) by means of
- the vacuum inside the centralised suction system (24).
- 15.** Method of discharging yarn waste from an open-end spinning machine (4) according to claim 14, comprising the steps of:
- slowly re-closing the secondary shut-off valve (64) on the service trolley (44),
 - slowly re-closing the main shut-off valve slowly (40),
 - retracting the input mouth (36).
- 16.** Method of discharging yarn waste from an open-end spinning machine (4) according to any of the claims from 13 to 15, comprising the steps of emptying the yarn waste from the storage tank (52) before the tank has reached its limit filling capacity, anticipating the overfull condition in one or more of the following circumstances:
- the service trolley (44) is passing the input mouth (36) of the centralised suction system (24),
 - the service trolley (44) is operating on a spinning head (8) located near the input mouth (36) of the centralised suction system (24).
- 17.** Method of discharging yarn waste from an open-end spinning machine (4) according to any of the claims from 13 to 15, where the emptying step is activated according to one or more of the following criteria in combination with each other:
- temporal basis, after setting an interval of time between one emptying and the next of the storage tank (52);
 - criterion of counting the number of piecing operations performed by the service trolley (44) bearing in mind the thread counts to be machined;
 - criterion of estimating the fullness of the storage tank (52) by means of a volume sensor on the storage tank (52);
 - criterion of estimating the fullness of the storage tank (52) with a pressure gauge placed on the secondary suction device (48) on board the service trolley (44);
 - criterion of estimating the fullness of the storage tank (52) by detecting the electricity consumption of the motor supplying motion to the secondary suction device (48) on board the service trolley (44).

Patentansprüche

- 1.** Offenend-Spinnmaschine (4), umfassend zumin-

dest einen Spinnkopf (8) mit einer Spinneinheit (12) und einer Auf-Rollen-Wickeleinheit (16), wobei die Auf-Rollen-Wickeleinheit (16) eine Garnrolle, die von der darunterliegenden Spinneinheit (12) erhalten wird, auf eine Hülse (20) wickelt,

- ein Hauptsaugsystem (24) der Spinnmaschine (4) mit Mitteln zum Erzeugen eines Vakuums (28) für die Maschine (4) und versehen mit einem Aufnahmekanal (32) für den Garnabfall, wie Flusen, Staub und/oder Garnfasern, mit einer Eingangsöffnung (36), die mittels eines Hauptabsperrentils (40) lufttechnisch mit der Vakuumerzeugungseinrichtung (28) verbindbar ist,

- zumindest einen Servicewagen (44), der dahingehend mobil ist, in der Nähe jedes Spinnkopfes (8) platzierbar zu sein, wobei der Servicewagen mit seiner eigenen sekundären Saugvorrichtung (48) ausgestattet ist, die in der Lage ist, ein Vakuum zum An- bzw. Absaugen von Garnabfall von jedem Spinnkopf (8) zu erzeugen, wobei

- die sekundäre Saugvorrichtung (48) mit ihrem eigenen Aufbewahrungsbehälter (52) zum Sammeln des angesaugten Garnabfalls und ihrem eigenen Ausstoßkanal (56) ausgestattet ist, der geeignet ist, das selektive Entleeren des in dem Aufbewahrungsbehälter (52) angesammelten Abfalls zu erlauben,

- der Ausstoßkanal (56) mit einer Ausstoßöffnung (60) und einem sekundären Absperrventil (64) ausgestattet ist, das konfiguriert ist, selektiv mit der Eingangsöffnung (36) des Abfallaufnahmekanals (32) und/oder mit dem Hauptabsperrentil (40) zusammenzuwirken, wobei der Garnabfallaufnahmekanal (32) vom mobilen und/oder teleskopischen Typ ist, um aus einer zurückgezogenen Konfiguration, in der er nicht mit dem Ausstoßkanal (56) des Servicewagens (44) verbunden ist, in eine herausgezogene Konfiguration überzugehen, in der er lufttechnisch mit dem Ausstoßkanal (56) verbunden ist, um den Durchgang des Abfalls aus dem Sammelbehälter (52) in das zentralisierte Saugsystem (24) zu erlauben.

2. Offenend-Spinnmaschine (4) nach Anspruch 1, wobei der Aufbewahrungsbehälter (52) unmittelbar unterhalb der entsprechenden sekundären Saugvorrichtung (48) platziert ist.
3. Offenend-Spinnmaschine (4) nach Anspruch 1 oder 2, wobei das sekundäre Absperrventil (64) ein Absperrventil von Membrantyp ist, das in Sektoren ein Absperrorgan bzw. einen Verschluss (68) aufweist.

4. Offenend-Spinnmaschine (4) nach einem der vorhergehenden Ansprüche, wobei das sekundäre Absperrventil (64) stromabwärts des Aufbewahrungsbehälters (52) und stromaufwärts des Ausstoßkanals (56) platziert ist.

5. Offenend-Spinnmaschine (4) nach einem der vorhergehenden Ansprüche, wobei die Eingangsöffnung (36) des Garnabfallaufnahmekanals (32) mit zumindest einer Dichtung (72) versehen ist, um eine Abdichtung mit der Ausstoßöffnung (60) des Ausstoßkanals (56) zu erreichen.

6. Offenend-Spinnmaschine (4) nach Anspruch 5, wobei die Dichtung (72) von der Art eines Saugnapfs ist.

7. Offenend-Spinnmaschine (4) nach einem der vorhergehenden Ansprüche, wobei das Hauptabsperrentil (40) ein Absperrventil vom Membrantyp ist, das in Sektoren ein Absperrorgan bzw. einen Verschluss (42) aufweist.

8. Offenend-Spinnmaschine (4) nach einem der vorhergehenden Ansprüche, wobei der Servicewagen (44) ein Anspinn- bzw. Ansetzwagen (76) ist, der Saug- und Greifmittel für ein gebrochenes Garnende und Mittel zum Anspinnen bzw. Ansetzen des gebrochenen Garns umfasst.

9. Offenend-Spinnmaschine (4) nach einem der vorhergehenden Ansprüche, wobei die Maschine zumindest einen Doffwagen (80) umfasst, der an jeder Spinneinheit (12) positionierbar ist und mit Vorrichtungen zum Aufnehmen und Bewegen einer Hülse (20) von einem Hülsenhalterkorb zu einem Paar Reitstöcke der Auf-Rollen-Wickeleinheit (16) versehen ist.

10. Offenend-Spinnmaschine (4) nach Anspruch 8 in Verbindung mit Anspruch 9, wobei der Wagen (44) mit dem Anspinnwagen (76) zusammenfällt, wobei der Anspinnwagen (76) und der Doffwagen (80) getrennt und unabhängig voneinander sind.

11. Offenend-Spinnmaschine (4) nach Anspruch 10, wobei sich der Anspinnwagen (76) und der Doffwagen (80) zumindest teilweise gegenseitig durchdringen, um entlang einer Überwachungs- bzw. Patrouillenbahn der Spinnköpfe (8) der Maschine (4) übereinander zu fahren.

12. Offenend-Spinnmaschine (4) nach einem der vorhergehenden Ansprüche, umfassend zumindest zwei verschiedene Anspinn- bzw. Ansetzwagen (76', 76'') wie Servicewagen, jeder mit seiner eigenen sekundären Saugvorrichtung (48', 48''), seinem eigenen Aufbewahrungsbehälter (52', 52'') und seinem eigenen Ausstoßkanal (56', 56''), wobei jeder

Wagen (76', 76' ') eine bestimmte Seite (A, B) der Spinnmaschinen (4) überwacht bzw. dort patrouilliert.

13. Verfahren zum Ausstoßen von Garnabfall aus einer Offenend-Spinnmaschine (4), umfassend die Schritte:

- Bereitstellen einer Offenend-Spinnmaschine (4), umfassend zumindest einen Spinnkopf (8) mit einer Spinneinheit (12) und einer Auf-Rollen-Wickeleinheit (16), wobei die Auf-Rollen-Wickeleinheit (16) eine Garnrolle, die von der darunterliegenden Spinneinheit (12) erhalten wird, auf eine Hülse (20) wickelt, 10
- Bereitstellen bzw. Versehen eines Hauptsaugsystems (24) der Spinnvorrichtung (4) mit Mitteln zum Erzeugen eines Vakuums (28) für die Maschine (4) und versehen mit einem Aufnahmekanal (32) für den Garnabfall, wie Flusen, Staub und/oder Garnfasern, mit einer Eingangsöffnung (36), die mittels eines Hauptabsperrentils (40) lufttechnisch mit der Vakuumerzeugungseinrichtung (28) verbindbar ist, 20
- Bereitstellen zumindest eines Servicewagens (44), der dahingehend mobil ist, in der Nähe jedes Spinnkopfes (8) platzierbar zu sein, wobei der Servicewagen mit seiner eigenen sekundären Saugvorrichtung (48) ausgestattet ist, die in der Lage ist, ein Vakuum zum An- bzw. Absaugen von Garnabfall von jedem Spinnkopf (8) zu erzeugen, 25
- Ausstatten der sekundären Saugvorrichtung (48) mit ihrem eigenen Aufbewahrungsbehälter (52) zum Sammeln des angesaugten Garnabfalls und ihrem eigenen Ausstoßkanal (56), der geeignet ist, das selektive Entleeren des in dem Aufbewahrungsbehälter (52) angesammelten Abfalls zu erlauben, wobei der Garnabfallaufnahme- 30
- kanal (32) vom mobilen und/oder teleskopischen Typ ist, um aus einer zurückgezogenen Konfiguration, in der er nicht mit dem Ausstoßkanal (56) des Servicewagens (44) verbunden ist, in eine herausgezogene Konfiguration überzugehen, in der er lufttechnisch mit dem Ausstoßkanal (56) verbunden ist, 35
- Ausstatten des Ausstoßkanals (56) mit einer Ausstoßöffnung (60) und einem sekundären Absperrventil (64), das konfiguriert ist, selektiv mit der Eingangsöffnung (36) des Abfallaufnahme- 40
- kanals (32) und/oder mit dem Hauptabsperrentil (40) zusammenzuwirken,
- selektives Entleeren des Aufbewahrungsbehälters (52) nach lufttechnischer Verbindung des Ausstoßkanals (56) der sekundären Saug- 45
- vorrichtung (48) des Servicewagens (44) mit dem zentralisierten oder Hauptsaugsystem (24) der Spinnmaschine (4), 50

- Auslösen eines Entleerungsvorgangs des Aufbewahrungsbehälters (52),
- Bringen des Servicewagens (44) zu dem zentralisierten Saugsystem (24), wo der Abfall entsorgt werden kann,
- Ausrichten und luftdichtes Verbinden der zuvor extrahierten Eingangsöffnung (36) mit der Ausstoßöffnung (60), um den Durchgang des Abfalls aus dem Sammelbehälter (52) in das zentralisierte Saugsystem (24) zu erlauben.

14. Verfahren zum Ausstoßen von Garnabfall aus einer Offenend-Spinnvorrichtung (4) nach Anspruch 13, wobei nach der gegenseitigen Ausrichtung der Eingangsöffnung (36) und der Ausstoßöffnung (60) folgende Schritte durchgeführt werden:

- allmähliches Öffnen des Hauptabsperrentils (40),
- allmähliches Öffnen des sekundären Absperrventils (64) an dem Servicewagen (44),
- Entleeren des Aufbewahrungsbehälters (52) mittels des Vakuums innerhalb des zentralisierten Saugsystems (24).

15. Verfahren zum Ausstoßen von Garnabfall aus einer Offenend-Spinnmaschine (4) nach Anspruch 14, umfassend die Schritte:

- langsames Wiederschließen des sekundären Absperrventils (64) an dem Servicewagen (44),
- langsames Wiederschließen des Hauptabsperrentils (40),
- Zurückziehen der Eingangsöffnung (36).

16. Verfahren zum Abführen von Garnabfall aus einer Offenend-Spinnmaschine (4) nach einem der Ansprüche 13 bis 15, umfassend die Schritte des Entleerens des Garnabfalls aus dem Aufbewahrungsbehälter (52), bevor der Behälter seine Grenzfüllkapazität erreicht hat, und zwar in Erwartung des Überfüllungszustands unter einem oder mehreren der folgenden Umstände:

- der Servicewagen (44) passiert die Eingangsöffnung (36) des zentralisierten Absaugsystems (24),
- der Servicewagen (44) arbeitet an einem Spinnkopf (8), der sich in der Nähe der Eingangsöffnung (36) des zentralisierten Saugsystems (24) befindet.

17. Verfahren zum Ausstoßen von Garnabfall aus einer Offenend-Spinnmaschine (4) nach einem der Ansprüche 13 bis 15, wobei der Entleerungsschritt nach einem oder mehreren der folgenden Kriterien in Kombination miteinander aktiviert wird:

- auf zeitlicher Basis, nach Einstellen eines Zeitintervalls zwischen einer Entleerung und der nächsten Entleerung des Aufbewahrungsbehälters (52);
- Kriterium des Zählens der Anzahl der von dem Servicewagen (44) durchgeführten Anspinn- bzw. Ansetzvorgänge unter Berücksichtigung der zu bearbeitenden Fadenzahlen;
- Kriterium des Schätzens des Vollseins des Aufbewahrungsbehälters (52) mittels eines Volumensensors an dem Aufbewahrungsbehälter (52),
- Kriterium des Schätzens des Vollseins des Aufbewahrungsbehälters (52) mit einem Manometer bzw. Druckmesser, der an der sekundären Saugvorrichtung (48) an Bord des Servicewagens (44) angebracht ist;
- Kriterium des Schätzens des Vollseins des Aufbewahrungsbehälters (52) durch Erfassen des Elektrizitätsverbrauchs des Motors, der die sekundäre Saugvorrichtung (48) an Bord des Servicewagens (44) antreibt bzw. bewegt.

Revendications

1. Métier à filer à bout libre (4) comprenant au moins une tête de filage (8) ayant une unité de filage (12) et une unité d'enroulement en bobines (16), dans lequel l'unité d'enroulement en bobines (16) enroule sur un tube (20) une bobine de fil obtenu à partir de l'unité de filage (12) sous-jacente,

- un système d'aspiration principal (24) du métier à filer (4), avec des moyens de production d'un vide (28) pour le métier (4) et doté d'un canal de réception (32) des déchets de fil, tels que les peluches, la poussière et/ou les fibres de fil, avec une bouche d'entrée (36) pouvant être raccordée de manière aéraulique auxdits moyens de génération de vide (28) au moyen d'une vanne d'arrêt principale (40),

- au moins un chariot de service (44) mobile de façon à pouvoir être placé à proximité de chaque tête de filage (8), le chariot de service étant équipé de son propre dispositif d'aspiration secondaire (48) apte à générer un vide pour aspirer les déchets de fil de chaque tête de filage (8), dans lequel

- le dispositif d'aspiration secondaire (48) est équipé de son propre réservoir de stockage (52) pour la collecte des déchets de fil aspirés et de son propre canal d'évacuation (56) adapté pour permettre le vidage sélectif des déchets accumulés dans ledit réservoir de stockage (52),

- le canal d'évacuation (56) étant équipé d'une bouche d'évacuation (60) et d'une vanne d'arrêt secondaire (64) configurée pour interagir de ma-

nière sélective avec la bouche d'entrée (36) du canal de réception des déchets (32) et/ou avec la vanne d'arrêt principale (40),

dans lequel

le canal de réception des déchets de fil (32) est du type mobile et/ou télescopique de façon à passer d'une configuration rétractée dans laquelle il ne s'interface pas avec le canal d'évacuation (56) du chariot de service (44) à une configuration extraite dans laquelle il se raccorde de manière aéraulique avec ledit canal d'évacuation (56) afin de permettre le passage des déchets du réservoir de collecte (52) dans le système d'aspiration centralisé (24).

2. Métier à filer à bout libre (4) selon la revendication 1, dans lequel le réservoir de stockage (52) est placé immédiatement en dessous du dispositif d'aspiration secondaire (48) correspondant.

3. Métier à filer à bout libre (4) selon la revendication 1 ou 2, dans lequel la vanne d'arrêt secondaire (64) est une vanne d'arrêt du type à diaphragme, ayant un obturateur à secteurs (68).

4. Métier à filer à bout libre (4) selon l'une quelconque des revendications précédentes, dans lequel la vanne d'arrêt secondaire (64) est placée en aval du réservoir de stockage (52) et en amont du canal d'évacuation (56).

5. Métier à filer à bout libre (4) selon l'une quelconque des revendications précédentes, dans lequel la bouche d'entrée (36) du canal de réception des déchets de fil (32) est dotée d'au moins un joint d'étanchéité (72) pour obtenir un joint étanche avec la bouche d'évacuation (60) du canal d'évacuation (56).

6. Métier à filer à bout libre (4) selon la revendication 5, dans lequel ledit joint d'étanchéité (72) est du type ventouse.

7. Métier à filer à bout libre (4) selon l'une quelconque des revendications précédentes, dans lequel la vanne d'arrêt principale (40) est une vanne d'arrêt du type à diaphragme, ayant un obturateur à secteurs (42).

8. Métier à filer à bout libre (4) selon l'une quelconque des revendications précédentes, dans lequel le chariot de service (44) est un chariot de rattachage (76) comprenant des moyens d'aspiration et de préhension d'une extrémité cassée de fil et des moyens de rattachage dudit fil cassé.

9. Métier à filer à bout libre (4) selon l'une quelconque des revendications précédentes, dans lequel le métier comprend au moins un chariot de levée (80) le-

quel peut être positionné au niveau de chaque unité de filage (12) et équipé de dispositifs de prélèvement et de déplacement d'un tube (20) d'un panier porte-tube vers une paire de contre-poupées de l'unité d'enroulement en bobines (16).

10. Métier à filer à bout libre (4) selon la revendication 8 conjointement avec la revendication 9, dans lequel le chariot (44) coïncide avec le chariot de rattachage (76), ledit chariot de rattachage (76) et le chariot de levée (80) étant séparés et indépendants l'un de l'autre.

11. Métier à filer à bout libre (4) selon la revendication 10, dans lequel le chariot de rattachage (76) et le chariot de levée (80) pénètrent au moins partiellement l'un dans l'autre afin de surpasser mutuellement l'un l'autre le long d'un trajet de patrouille des têtes de filage (8) du métier (4).

12. Métier à filer à bout libre (4) selon l'une quelconque des revendications précédentes, comprenant au moins deux chariots de rattachage (76', 76'') distincts tels que des chariots de service, ayant chacun son propre dispositif d'aspiration secondaire (48', 48''), son propre réservoir de stockage (52', 52'') et son propre canal d'évacuation (56', 56''), chaque chariot (76', 76'') patrouillant un côté spécifique (A, B) des métiers à filer (4).

13. Procédé d'évacuation des déchets de fil d'un métier à filer à bout libre (4) comprenant les étapes de :

- fourniture d'un métier à filer à bout libre (4) comprenant au moins une tête de filage (8) ayant une unité de filage (12) et une unité d'enroulement en bobines (16), dans lequel l'unité d'enroulement en bobines (16) enroule sur un tube (20) une bobine de fil obtenu à partir de l'unité de filage (12) sous-jacente,
- fourniture d'un système d'aspiration principal (24) du métier à filer (4), avec des moyens de production d'un vide (28) pour le métier (4) et doté d'un canal de réception (32) des déchets de fil, tels que les peluches, la poussière et/ou les fibres de fil, avec une bouche d'entrée (36) pouvant être raccordée de manière aéraulique auxdits moyens de génération de vide (28) au moyen d'une vanne d'arrêt principale (40),
- fourniture d'au moins un chariot de service (44) mobile de façon à pouvoir être placé à proximité de chaque tête de filage (8), le chariot de service (44) étant équipé de son propre dispositif d'aspiration secondaire (48) apte à générer un vide pour aspirer les déchets de fil de chaque tête de filage (8),
- équipement du dispositif d'aspiration secondaire (48) de son propre réservoir de stockage

(52) pour la collecte des déchets de fil aspirés et de son propre canal d'évacuation (56) adapté pour permettre le vidage sélectif des déchets accumulés dans ledit réservoir de stockage (52), dans lequel le canal de réception des déchets de fil (32) est du type mobile et/ou télescopique de façon à passer d'une configuration rétractée dans laquelle il ne s'interface pas avec le canal d'évacuation (56) du chariot de service (44) à une configuration extraite dans laquelle il se raccorde de manière aéraulique avec ledit canal d'évacuation (56),

- équipement du tuyau d'évacuation (56) d'une bouche d'évacuation (60) et d'une vanne d'arrêt secondaire (64) configurée pour interagir de manière sélective avec la bouche d'entrée (36) du canal de réception des déchets (32) et/ou avec la vanne d'arrêt principale (40),

- vidage sélectif du réservoir de stockage (52) après le raccordement aéraulique du canal d'évacuation (56) du dispositif d'aspiration secondaire (48) du chariot de service (44) avec le système d'aspiration centralisé ou principal (24) du métier à filer (4),

- activation d'une procédure de vidage du réservoir de stockage (52),

- amenée du chariot de service (44) au système d'aspiration centralisé (24), où les déchets peuvent être évacués,

- alignement et raccordement aéraulique l'une à l'autre, de manière étanche à l'air, de la bouche d'entrée (36) extraite précédemment, avec la bouche d'évacuation (60), pour permettre le passage des déchets du réservoir de collecte (52) dans le système d'aspiration centralisé (24).

14. Procédé d'évacuation des déchets de fil d'un appareil à filer à bout libre (4) selon la revendication 13, dans lequel après l'alignement mutuel de la bouche d'entrée (36) et de la bouche d'évacuation (60), les étapes suivantes sont effectuées :

- ouverture progressive de la vanne d'arrêt principale (40),

- ouverture progressive de la vanne d'arrêt secondaire (64) sur le chariot de service (44),

- vidage du réservoir de stockage (52) au moyen du vide à l'intérieur du système d'aspiration centralisé (24).

15. Procédé d'évacuation des déchets de fil d'un métier à filer à bout libre (4) selon la revendication 14, comprenant les étapes de :

- refermeture lente de la vanne d'arrêt secondaire (64) sur le chariot de service (44),

- refermeture lente de la vanne d'arrêt principale

- (40) lentement,
- rétraction de la bouche d'entrée (36).

16. Procédé d'évacuation des déchets de fil d'un métier à filer à bout libre (4) selon l'une quelconque des revendications 13 à 15, comprenant les étapes de vidage des déchets de fil du réservoir de stockage (52) avant que le réservoir n'ait atteint sa capacité de remplissage limite, anticipant l'état de trop-plein dans une ou plusieurs des circonstances suivantes : 5 10

- le chariot de service (44) passe la bouche d'entrée (36) du système d'aspiration centralisé (24),
- le chariot de service (44) fonctionne sur une tête de filage (8) située près de la bouche d'entrée (36) du système d'aspiration centralisé (24). 15

17. Procédé d'évacuation des déchets de fil d'un métier à filer à bout libre (4) selon l'une quelconque des revendications 13 à 15, dans lequel l'étape de vidage est activée selon un ou plusieurs des critères suivants en combinaison les uns avec les autres : 20

- base temporelle, après le réglage d'un intervalle de temps entre un vidage et le prochain vidage du réservoir de stockage (52) ; 25
- critère de comptage du nombre d'opérations de rattachage effectuées par le chariot de service (44) en tenant compte des comptages de fils à usiner ; 30
- critère d'estimation du niveau de remplissage du réservoir de stockage (52) au moyen d'un capteur de volume sur le réservoir de stockage (52) ;
- critère d'estimation du niveau de remplissage du réservoir de stockage (52) avec une jauge de pression placée sur le dispositif d'aspiration secondaire (48) à bord du chariot de service (44) ; 35
- critère d'estimation du niveau de remplissage du réservoir de stockage (52) par détection de la consommation électrique du moteur fournissant un mouvement au dispositif d'aspiration secondaire (48) à bord du chariot de service (44). 40

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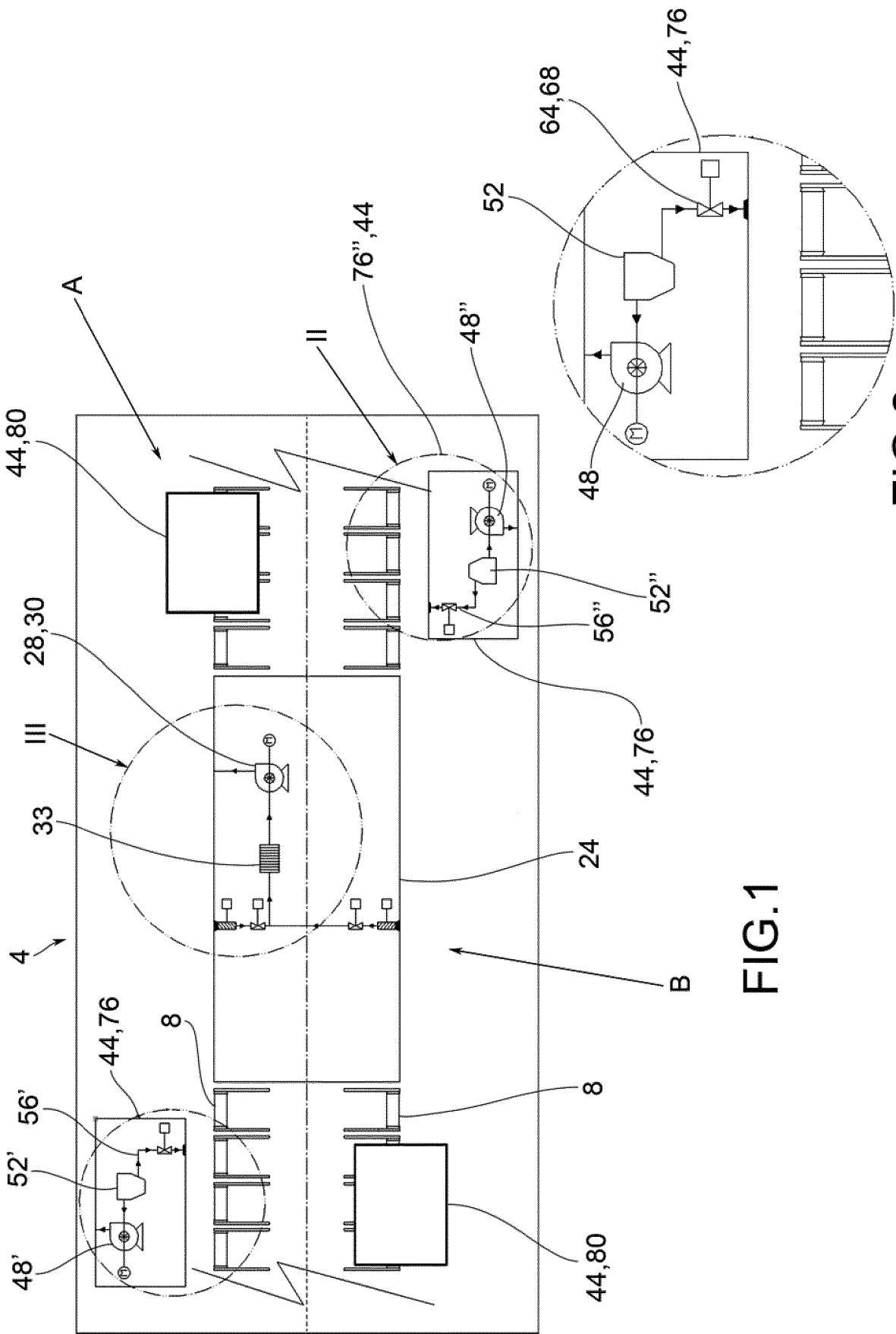


FIG.1

FIG.2

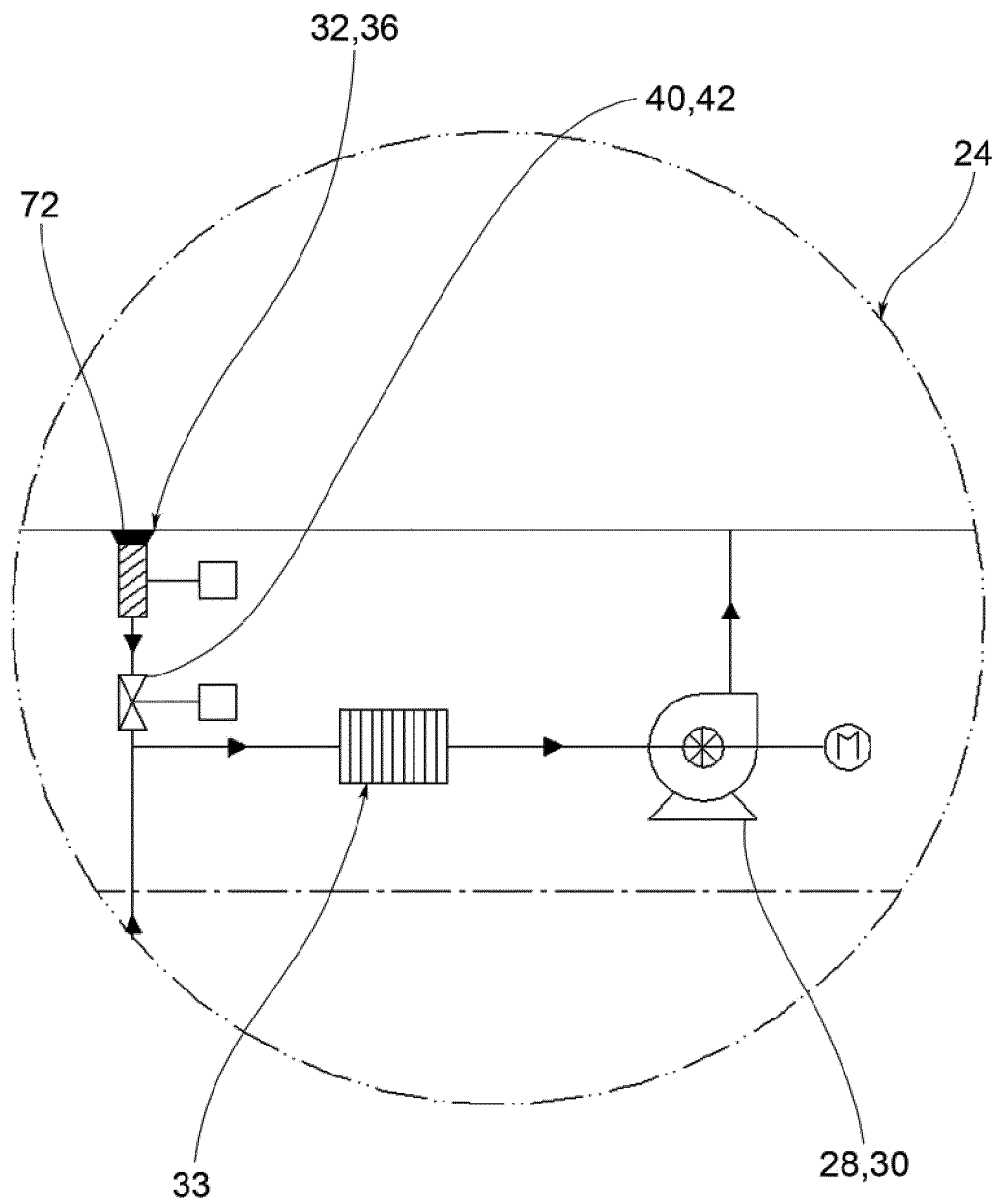


FIG.3

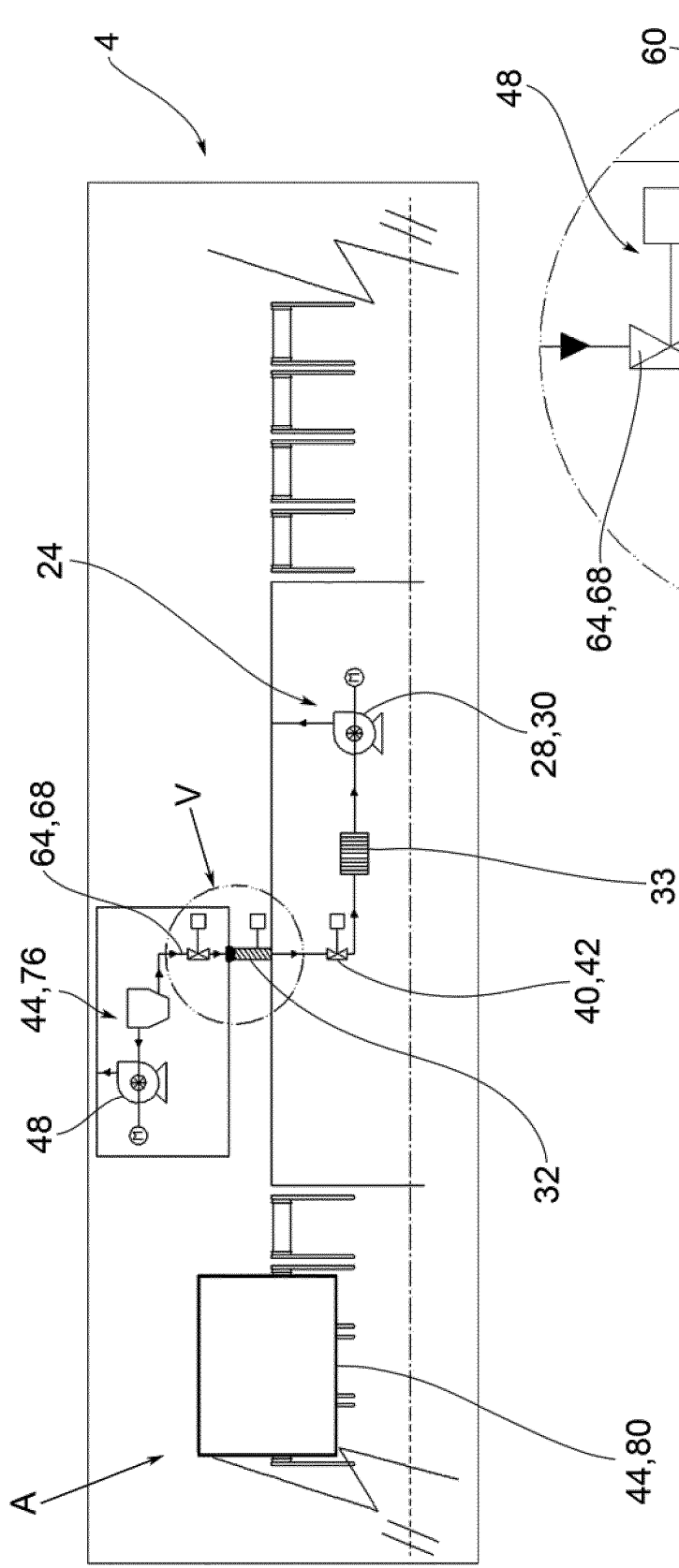


FIG. 4

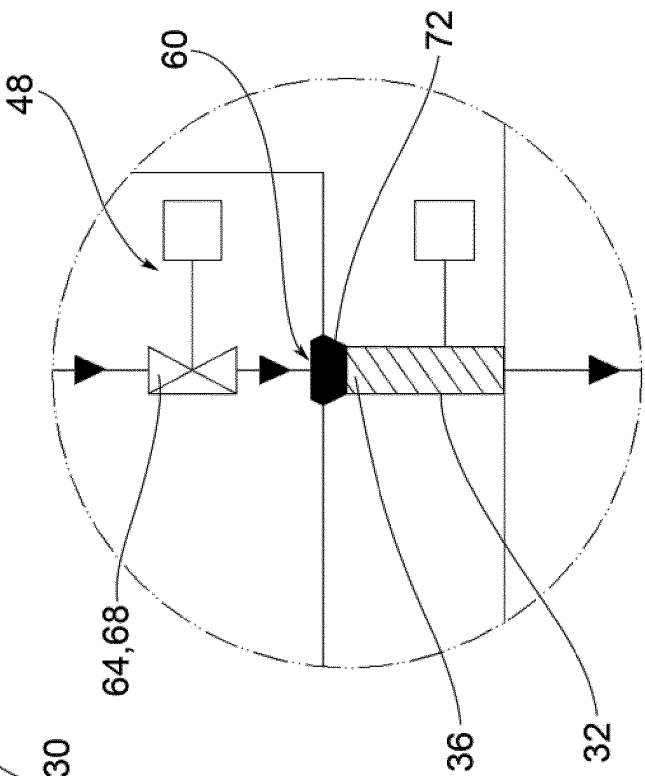


FIG. 5

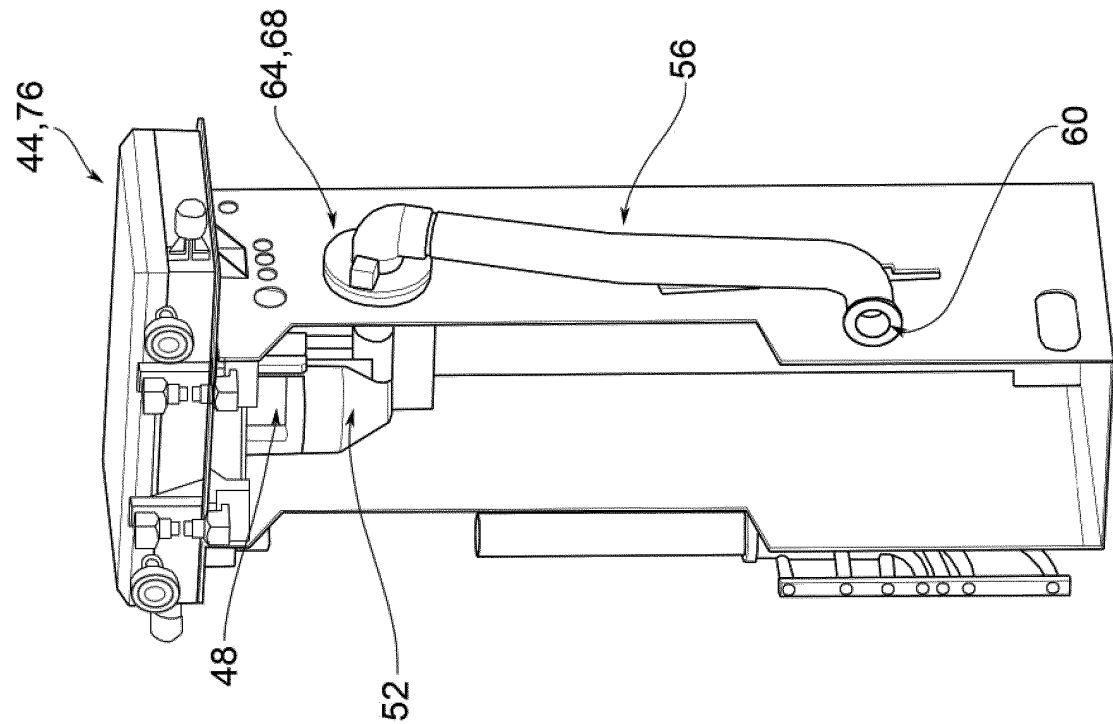


FIG. 7

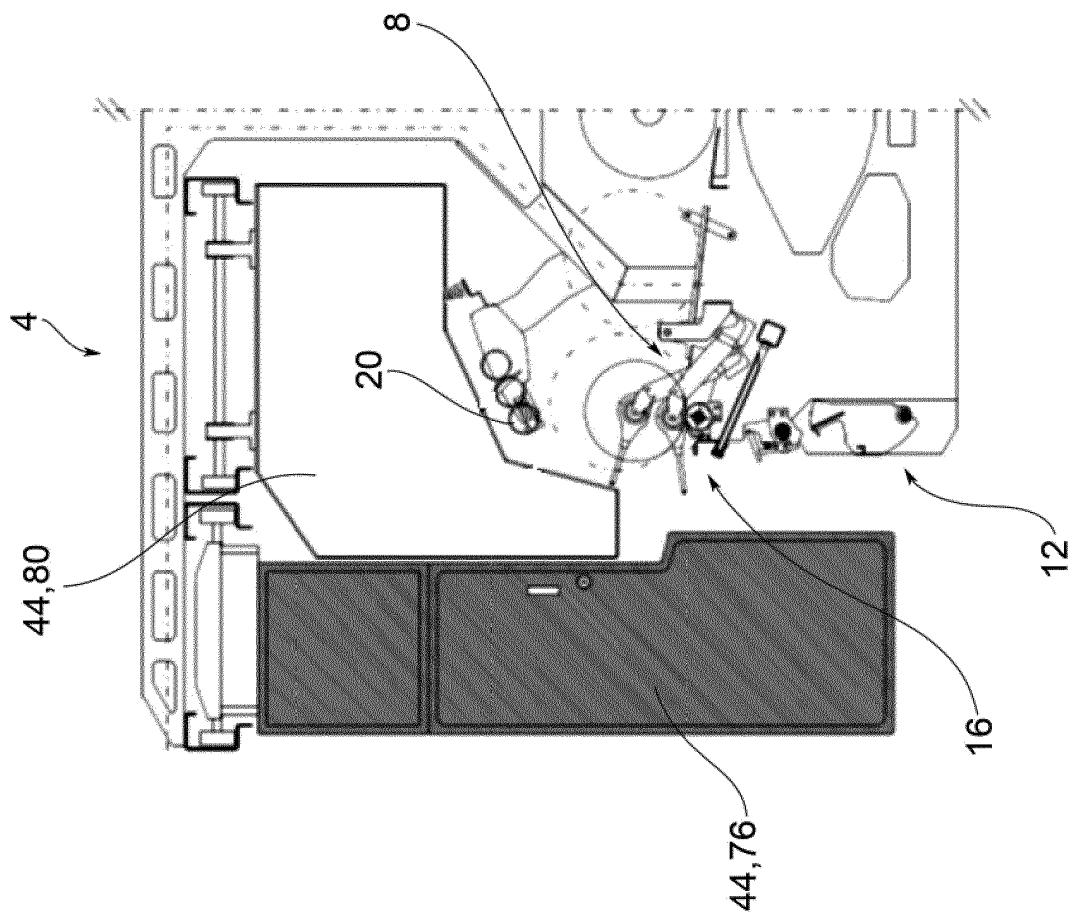


FIG. 6

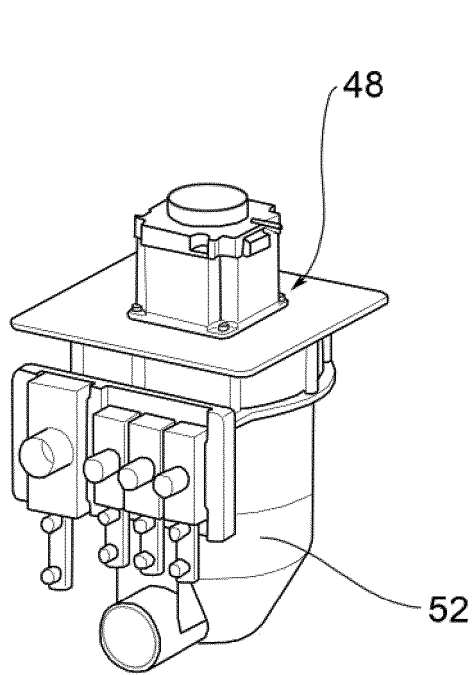


FIG. 8

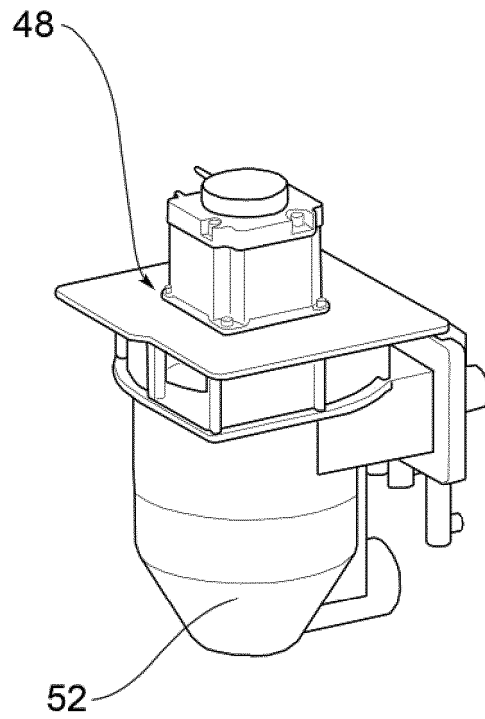


FIG. 9

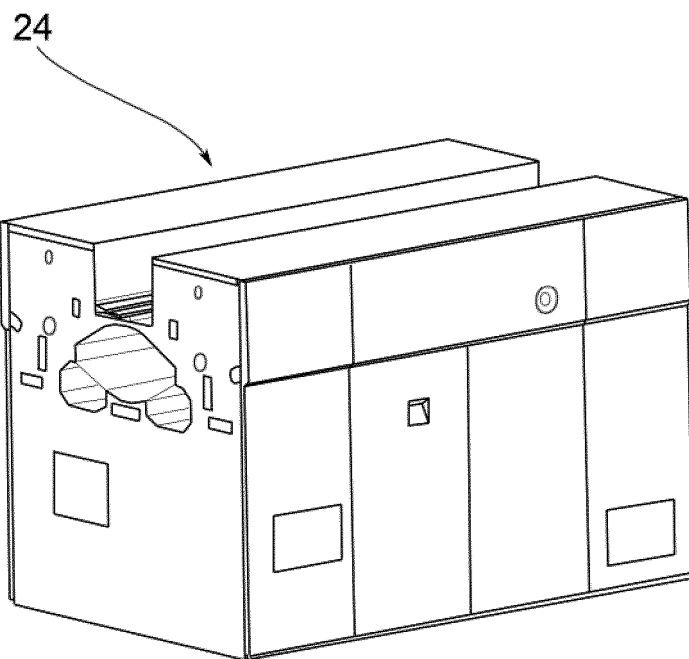


FIG. 10

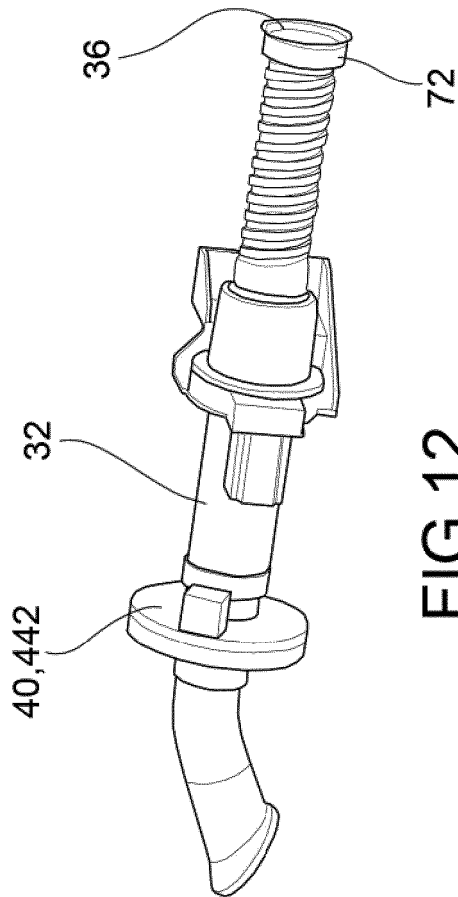


FIG.12

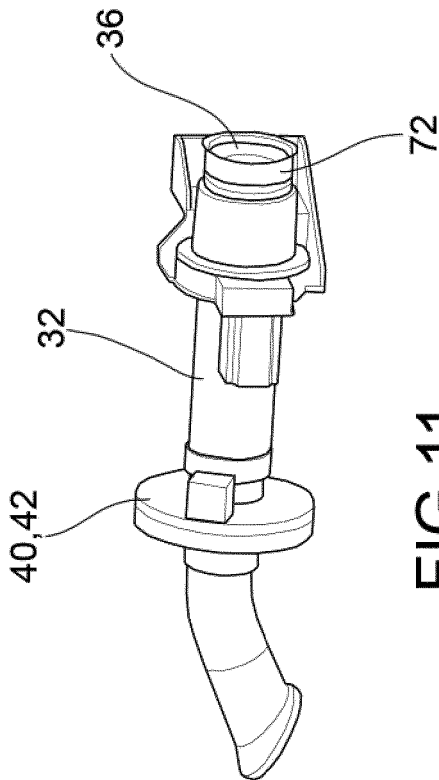


FIG.11

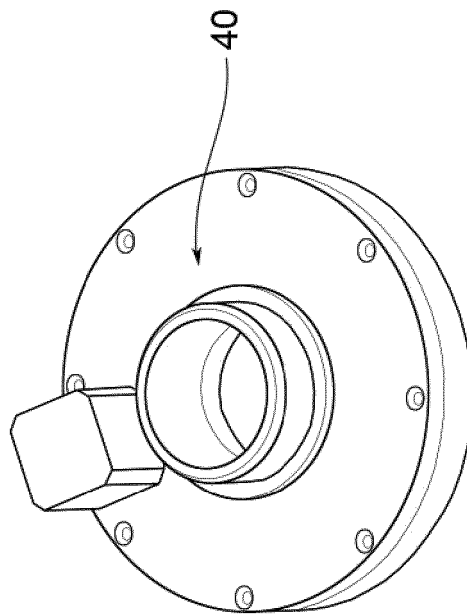


FIG.14

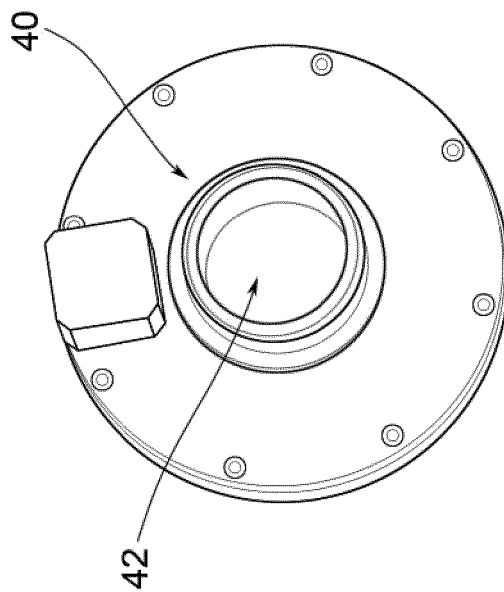


FIG.13

REFERENCES CITED IN THE DESCRIPTION

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