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(54) **Individual cleaning system for winding units**

Individuelles Reinigungssystem für Wickeleinheiten

Système de nettoyage individuel pour unités d'enroulement

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Description

[0001] The present invention refers to an individual device for cleaning winding units that make up an automatic spooler.

[0002] In industry, there is widespread use of the technique of producing yarns in a spinning stage followed by a winding stage in which the yarn is unwound from its spool, cleaned of its defects and rewound in a reel. Indeed, spoolers consist of a plurality of winding units aligned along the front of the machine and equipped with common control and service apparatuses.

[0003] The diagram of a winding unit is illustrated in its essential components in figure 1 that shows the path of the thread 2 from the lower spool 1 to the upper collecting reel 11, as follows:

- 3 - unwinding group with thread guide members,
- 4 - sensor for detecting the presence of the thread,
- 5 - facing plate-thread tightener,
- 6 - thread joiner, served by
- 8,9 - suction mouths, which take the ends of the interrupted thread to be joined to it, to restore the continuity of the thread, interrupted due to its breaking or to the intervention of the
- 10 - slubcatcher,
- 11 - collecting reel, actuated in rotation by the
- 12 - actuating roller, and supported with the
- 13 - reel-carrying arm. The reel 11 in rotation draws the thread 2, unwinding it at high speed from the spool 1 kept still on a
- 14 - lower positioning pin.

[0004] The mouth 8 sucking on the side of the spool is capable of making the angular movement α that takes the suction nozzle of the mouth itself firstly to catch the end of the thread 2 from the unwinding group 3, to raise according to the rotation α , taking the end to the thread joiner 6. The mouth 9 sucking on the side of the reel, on the other hand, is capable of making the angular movement β that takes the suction nozzle of the mouth itself firstly to catch the end of the thread 2 from the reel 11, to lower with the rotation β , until said end of the reel side is taken to the thread joiner 6.

[0005] The mouths 8 and 9 are connected to a high vacuum generating device that, during the interventions for restoring the continuity of the thread 2 between spool 1 and reel 11, provides the necessary suction for catching and managing the ends on the side of the spool and on the side of the reel.

[0006] The winding processing substantially consists of unwinding the feed yarn and of cleaning it of its defective parts in terms of mechanical consistency or of size. When passing from the spool 1 to the reel 11, the yarn 2 is checked by the slubcatcher 10 that detects its size defects, both in terms of transversal size and in length. The slubcatcher 10 orders the cutting of the thread whenever the detected size of the thread 2 is not within the

range of acceptable sizes of the thread according to its calibration. The thread cutting member can be incorporated in the same slubcatcher 10 or, as in figure 1, it can be separate as a knife 7, shown arranged between the sensor 4 of the thread and the thread tightener 5.

[0007] After breaking, or cutting the thread 2 ordered by the slubcatcher 10, the slubcatcher itself signals the absence of the thread to the control unit 16 of the spooling station. Such a control unit 16 comprises, amongst its functions, the control program for the reattachment procedure, with the example connections indicated with a broken line.

[0008] During winding, both due to the balloon of thread 2 rotating at high speed around the spool 1 and due to the sliding along the path of the thread, a substantial amount of impurities, like dust, fibres and residues of hairiness of the unwound thread, develop. Such impurities can be a substantial disturbance along the path of the thread 2.

[0009] The winding units that form the spooler individually require a significant suction service with the mouths 8 and 9 in the steps of restoring the continuity of the yarn that has been interrupted, both due to it breaking and to replace its empty spools with new spools.

[0010] According to patent applications EP 1.950.162 and IT 2009A2013 in the name of the same applicant, the discontinuous and high head aspiration service, for recovering the ends with the mouths 8 and 9, is carried out with an individual aspirator, one for each of the winding units aligned along the front of the machine, which starts operating to catch the aforementioned ends of thread.

In application IT2009A2013 the individual aspirator provides both the discontinuous high vacuum aspiration service, with winding stopped during the intervention, and the continuous low vacuum service, during winding.

[0011] The amount of dust that develops during the course of the unwinding of the spool depends both on the progress of the unwinding and on the linear winding speed. At the start of the spool little sliding occurs and a smaller amount of dust develops, whereas at the end of the spool greater sliding occurs and more dust is developed. The development of the dust also depends on the linear winding speed, essentially by centrifugal effect.

[0012] Along the path of the thread 2, from the spool 1 to the reel 11, there are some devices that can be negatively affected by the presence of the dust developed by the thread.

[0013] For this purpose, in many models of automatic spoolers, a cleaning apparatus is commonly provided travelling along the front of the machine. It is provided with nozzles that blow, against the front of the machine, a pressurised fluid, for example compressed air at 100-200 mm H₂O, at the level of the devices 3 for guiding the thread, of the thread tightener 5 and of the slubcatcher 10, which are the devices most affected by the dust. Such travelling cleaning equipment carries an on-board air compressor to feed its blowing nozzles and patrols the

front of the machine with a determined frequency, passing in sequence before each winding unit. Such a device serves its purpose, but involves substantial installation and operating costs and is not without drawbacks. For example, the efficiency of the compressed cleaning air is quite low because the blowing nozzles coincide for a brief period with the axial coordinate of the devices of the winding unit that they must clean. The travelling cleaning equipment also has a substantial bulk and can be a hindrance on the front of the machine.

In document FR 1.188.285, in the name of Reiners, a completely different spooling architecture is provided. According to such an architecture, the winding stations are not absolutely autonomous because, in the case of the thread breaking, they still need external intervention. It describes the use of a service trolley that patrols the front of the spooler to serve the various winding stations that need it. On said trolley various winding devices are placed, like the knitter of the thread and the suction mouth of the thread on the side of the reel. Again on-board the trolley a fan is placed that provides the aspiration to the mouth of the reel side and that discharges the air on the slubcatcher or parts of the machine, blowing in the machine.

From the abstracts of patent applications JP 3143874 and JP 6100239 in the name of Murata, it can be seen that fixed blowing nozzles on the devices of the winding unit are fed with pressurized air derived from a common service duct blowing outwards.

Such a distribution duct along the machine and its feeding blower constitute a significant system and operating cost.

[0014] The present invention is aimed at a new cleaning device serving the winding units that make up the spooler, which overcomes the drawbacks described up to now of collective aspiration cleaning systems both with travelling equipment, and those having fixed installation. The present invention, in its most general form of a cleaning device for the winding units that make up the spooler is defined in the first claim. Its variants or preferred embodiments are defined in the dependent claims 2 to 3.

[0015] The present invention, in its most general form of a method for cleaning winding units is defined in the fourth claim. Its variants or preferred embodiments are defined in claims 5 to 6.

[0016] The characteristics and advantages of the cleaning device serving the winding units of a spooler according to the present invention are clearer from the description of a typical embodiments thereof, exemplifying and not limiting, illustrated in figures 1, 2 and 3.

Figure 1 illustrates the side view of the winding unit and is illustrative of the technical problem of the cleaning service to be provided to it and of the diagram of aspiration and cleaning air flows according to the invention.

Figure 2 illustrates an exemplifying arrangement in side view of the devices of the winding unit with the insertion of the cleaning device according to the in-

vention.

Figure 3 illustrates a further exemplifying embodiment of the invention.

[0017] In the technical solution shown in figure 1 for high vacuum discontinuous service, with the mobile nozzles 8 and 9, an individual aspiration unit 22 is provided, one for each of the winding units that make up the machine. Such an aspiration unit consists of a rotary aspirator with a centrifugal impeller actuated with a "brushless" electric motor controlled in frequency by the control unit 16 of the winding unit. Such an actuation system is already illustrated in the quoted patent applications EP 1.950.162 and IT 2009A2013 in the name of the same Applicant.

[0018] As already stated, the mouths 8 and 9, which catch and move the end on the spool side and on the reel side, respectively, to cooperate with the thread joiner 6 to restore the continuity of the thread, work discontinuously with high vacuum aspiration just to restore the continuity of the thread during the interruptions of normal winding. They are respectively connected to the aspiration side of the aspirator 22 with a duct 24.

[0019] A filter is placed on said aspiration duct 24 that has the essential function of holding the pieces of thread removed by the action of the aspirator 22 connected to the mouths 8 and 9 and actuated in high vacuum upstream of the aspirator 22, so as not to involve the impeller.

[0020] Such an operation of catching the end with the mouths 8 and 9 lasts short time periods (about 1-4 seconds per intervention) and requires vacuums, i.e. suction heads, of the order of 600-900 mm H₂O. The catching of the ends and the joining of the thread, due to the interruption of the thread during the course of the unwinding of a spool, can take place in a variable number, but they definitely occur at each spool change.

[0021] According to the present invention the spooling station is equipped with a series of fixed nozzles 30 blowing in its points most sensitive to dust, for example at the guiding devices 3, the thread tightener 5 and the slubcatcher 10, as already known from the abstracts of patent applications JP 3143874 and 6100239.

Such nozzles are oriented directly towards the parts to be cleaned and so as to remove the dust out of the path of the thread, for example as illustrated in the arrangement shown in figure 2.

[0022] According to the present invention, the blowing nozzles 30 are connected to the delivery side of the aspirator 22 by means of a duct 31 and fed with the delivery flow of the aspirator 22, individually equipping each unit or spooling station, so as to reuse such a delivery flow that constitutes the discharge of the aspirator 22, at every intervention thereof to serve the mouths 8 and 9 that are actuated to take the ends of the thread to be joined.

[0023] As shown in the exemplifying embodiment of figure 2, the aspirator device 22 is placed in the rear part of the spooling station, having the fixed support structure

20. It is connected to the suction mouths 8 and 9 with its aspiration side 24. Its delivery side, on the other hand, feeds the blowing nozzles 30 and duct 31; such nozzles 30 provided with diffuser terminal 34, oriented towards the outside of the spooling station and arranged, respectively, near to the slubcatcher 10, the thread tightener 5 and the tip of the spool 1, arranged immediately below the devices 3 for guiding the thread. In this way the direction of the flow of cleaning air removes the impurities towards the outside of the winding unit and out of the path of the thread 2.

[0024] Such blowing nozzles 30 thus periodically carry out the cleaning of the devices of the spooling station when the thread is interrupted, in other words in the absence of thread and with the spooling station stopped. In such conditions, the cleaning of the path of the thread is much easier, for example since the slubcatcher 10 is free from the thread and the plates of the thread tightener 5 are open: it is possible to inject air into them efficiently and without drawbacks. Contrarily, as occurs with the devices according to the prior art, the action of injecting air into such devices with the presence of the thread in motion during winding is more difficult and less efficient.

[0025] According to a further improved embodiment of the invention, a silencer 33 is installed on the duct 31 to reduce the noise of the aspirator 22 that operates with high aspiration head with a high number of revolutions. Figure 3 illustrates an exemplifying embodiment wherein the aspirator 22 is mounted with its delivery side directly connected to a distributor container 42 that can also perform the function of the silencer 33 with the adoption of damping internal parts. The blowing nozzles 30 with the terminals 34 are directly connected to the container 42, for example on the wall opposite the delivery of the aspirator.

On the bottom of the container 42 a gate valve 43 is placed, actuated with a piston 44 controlled by the control unit 16 of the winding unit. The gate valve 43 allows the delivery of the aspirator 22 to discharge in a common collector 45 that runs parallel to the axis of the spooler, collecting the discharges of the aspirators 22 that individually equip the winding units. The gate valve 43 performs the function of regulating the pressure and the blowing flow rate in the nozzles 30, partialising the delivery of the aspirator 22 deviating a part thereof towards the discharge in the collector 45 partially opening the gate valve 43.

Such an embodiment is also particularly suitable for use of the aspiration device according to patent application IT 2009A2013 in the name of the same Applicant, wherein the aspirator 22 alternatively provides either the high vacuum, for service to the suction mouths 8 and 9, or the low vacuum for services to other uses.

In the case of the device according to patent application IT 2009A2013, wherein the aspirator 22 also operates as the supplier of other low vacuum services, during such low vacuum services the gate valve 43 can be completely opened thus completely discharging its entire flow rate

into the collector 45 and leaving the nozzles 30 substantially inactive, or it can be left closed allowing the low flow rate to flow with low vacuum to provide a continuous anti-dust barrier that does not disturb the winding process.

When the aspirator 22 operates to provide the high vacuum service for the mouths 8 and 9, the gate valve 43 regulates the blowing with the nozzles 30, remaining closed or modulating the pressure and flow rate in the nozzles 30.

[0026] Compared with systems for cleaning winding stations with travelling equipment that patrols the spoolers according to the prior art, the cleaning system according to the present invention offers substantial advantages.

[0027] With the device according to the present invention the installation and operating costs of travelling equipment are saved and its bulk on the front of the machine is avoided, or the distribution of compressed air for blowing at the fixed nozzles. In addition to this, the winding stations receive a much more efficient cleaning service of the dust-sensitive devices, since it is carried out with the station stopped and with the path of the thread free.

[0028] Moreover, there is a greater efficiency of the compressed air, which is injected with fixed nozzles oriented towards the parts to be cleaned and so as to remove the dust out of the path of the thread.

Claims

1. Cleaning device for winding stations through blowing nozzles injecting pressurized air at devices arranged along the path of the thread (2) from the feeding spool (1) to the collecting reel (11), and particularly for removing impurities, like dust, fibres and residues of hairiness of the unwound thread, from the devices of such path which are more sensitive to their presence, such blowing nozzles being fixed nozzles (30), mounted on each spooling station, oriented towards the outside of the spooling station and fed by a source of compressed air available on-board the spooling machine, **characterised in that** the source of compressed air for feeding the cleaning device consists of the delivery of an aspirator (22), individually equipping each unit or spooling station and providing for the discontinuous aspiration service to mobile nozzles (8,9) of its spooling station for catching the ends of thread at the thread interruptions.
2. Cleaning device for winding stations according to claim 1, **characterised in that** on the delivery duct (31) of the aspirator (22) a silencer (33) is installed.
3. Cleaning device for winding stations according to claim 1, **characterised in that** between the delivery of the aspirator (22) and the nozzles (30) a distributor container (42) is inserted, on which a gate valve (43)

is arranged that allows the delivery of the aspirator (22) to the nozzles (30) to be regulated, discharging it completely or partially in a common collector (45), to respectively limit or zero the flow rate and blowing pressure in the nozzles (30).

4. Method for cleaning winding stations by blowing of pressurized air with blowing nozzles at devices arranged along the path of the thread (2) from the feeding spool (1) to the collecting reel (11), and particularly for removing impurities, like dust, fibres and residues of hairiness of the unwound thread, from the devices of such path which are more sensitive to their presence, such blowing nozzles being fixed nozzles (30), mounted on each spooling station, oriented towards the outside of the spooling station and fed by a source of compressed air available on-board the spooling machine, **characterised in that** such blowing is carried out with nozzles (30) fed with the delivery of an aspirator (22), individually equipping each unit or spooling station and providing the discontinuous service of aspiration to mobile nozzles (8,9) of its spooling station for catching the ends of thread at the thread interruptions.
5. Cleaning method according to claim 4, **characterised in that** the source of compressed air consists of the delivery of an aspirator (22), individually equipping each unit or spooling station and providing said winding units with both the discontinuous high vacuum aspiration service, with winding stopped during interventions, and with the continuous low vacuum service, during winding.
6. Cleaning method according to claim 4, **characterised in that** the pressure and flow rate of blowing in the nozzles (30) is regulated by partialising the delivery of the aspirator (22) through a gate valve (43) that deviates a part towards a common collector (45).

Patentansprüche

1. Reinigungsvorrichtung für Wickelstationen durch Blasedüsen, die Druckluft an Vorrichtungen injizieren, die entlang des Pfades des Fadens (2) von der Speisespule (1) zu der Sammelrolle (11) angeordnet sind, und insbesondere zum Beseitigen von Verunreinigungen wie Staub, Fasern und Rückständen der Haarigkeit des abgewickelten Fadens, von den Vorrichtungen eines derartigen Pfades, die empfindlicher bezüglich deren Vorliegens sind, wobei derartige Blasedüsen feststehende Düsen (30) sind, die an jeder Spulstation angebracht sind, nach außerhalb der Spulstation orientiert sind und durch eine Pressluftquelle, die auf der Spulmaschine verfügbar ist, gespeist werden, **dadurch gekennzeichnet, dass** die Pressluftquelle zum Speisen der Reini-

gungsvorrichtung aus der Ausgabeleistung eines Sauggebläses (22) besteht, wobei jede Einheit oder Spulstation einzeln ausgestattet und der diskontinuierliche Ansaugbetrieb beweglichen Düsen (8, 9) seiner Spulstation bereitstellt wird, um die Fadenenden an den Fadenunterbrechungen aufzunehmen.

2. Reinigungsvorrichtung für Wickelstationen gemäß Anspruch 1, dadurch gekennzeichnet, dass auf dem Ausgabeleistungskanal (31) des Sauggebläses (22) ein Schalldämpfer (33) installiert ist.
3. Reinigungsvorrichtung für Wickelstationen gemäß Anspruch 1, dadurch gekennzeichnet, dass zwischen der Ausgabeleistung des Sauggebläses (22) und den Düsen (30) ein Verteilbehälter (42) eingefügt ist, an dem ein Schieberventil (43) angeordnet ist, das ermöglicht, dass die Ausgabeleistung des Sauggebläses (22) an die Düsen (30) reguliert werden kann, wobei es in einer gemeinsamen Sammelvorrichtung (45) vollständig oder teilweise entladen wird, um die Strömungsrate und den Blasdruck in den Düsen (30) zu begrenzen beziehungsweise zu beenden.
4. Verfahren zum Reinigen von Wickelstationen durch Blasen von Druckluft mit Blasedüsen an Vorrichtungen, die entlang des Pfades des Fadens (2) von der Speise-spule (1) zu der Sammelrolle (11) angeordnet sind, und insbesondere zum Beseitigen von Verunreinigungen wie Staub, Fasern und Rückständen der Haarigkeit des abgewickelten Fadens, von den Vorrichtungen eines derartigen Pfades, die empfindlicher bezüglich deren Vorliegens sind, wobei derartige Blasedüsen feststehende Düsen (30) sind, die an jeder Spulstation angebracht sind, nach außerhalb der Spulstation orientiert sind und durch eine Pressluftquelle, die auf der Spulmaschine verfügbar ist, gespeist werden, **dadurch gekennzeichnet, dass** ein derartiges Blasen mit Düsen (30) durchgeführt wird, die mit der Ausgabeleistung eines Sauggebläses (22) gespeist werden, wobei jede Einheit oder Spulstation einzeln ausgestattet und der diskontinuierliche Ansaugbetrieb beweglichen Düsen (8, 9) seiner Spulstation bereitstellt wird, um die Fadenenden an den Fadenunterbrechungen aufzunehmen.

5. Reinigungsverfahren gemäß Anspruch 4, **dadurch gekennzeichnet, dass** die Pressluftquelle aus der Ausgabeleistung eines Sauggebläses (22) besteht, wobei jede Einheit oder Spulstation einzeln ausgestattet wird und die Wickeleinheiten sowohl mit dem diskontinuierlichen Hochvakuum-Saugbetrieb, wobei das Wickeln während Interventionen gehalten wird, und während des Wickelns mit dem kontinuierlichen Niedrigvakuumbetrieb versehen werden.

6. Reinigungsverfahren gemäß Anspruch 4, **dadurch gekennzeichnet, dass** der Druck und die Strömungsrate des Blasens in den Düsen (30) reguliert wird, indem die Ausgabeleistung des Sauggebläses (22) durch ein Schieberventil (43), das einen Teil zu einer gemeinsamen Sammelvorrichtung (45) hin ableitet, aufgeteilt wird.

Revendications

1. Système de nettoyage pour stations de bobinage par le biais de buses de soufflage injectant de l'air sous pression sur des dispositifs agencés le long de la trajectoire du fil (2) de la bobine d'alimentation (1) à la bobine collectrice (11) et en particulier pour retirer des impuretés comme la poussière, les fibres et les résidus de pilosité du fil déroulé, des dispositifs d'une telle trajectoire qui sont plus sensibles à leur présence, de telles buses de soufflage étant des buses fixes (30), montées sur chaque station de bobinage, orientées vers l'extérieur de la station de bobinage et alimentées par une source d'air comprimé disponible sur le bobinoir, **caractérisé en ce que** la source d'air comprimé pour alimenter le dispositif de nettoyage se compose du refoulement d'un aspirateur (22), équipant individuellement chaque unité ou station de bobinage et fournissant le service discontinu d'aspiration aux buses mobiles (8, 9) de sa station de bobinage pour attraper les extrémités du fil aux interruptions du fil.
2. Dispositif de nettoyage pour stations de bobinage selon la revendication 1, **caractérisé en ce que**, sur le conduit de refoulement (31) de l'aspirateur (22), on installe un silencieux (33).
3. Dispositif de nettoyage pour stations de bobinage selon la revendication 1, **caractérisé en ce que**, entre le refoulement de l'aspirateur (22) et les buses (30), on insère un récipient distributeur (42), sur lequel on agence une vanne qui permet de réguler le refoulement de l'aspirateur (22) aux buses (30), le déchargeant complètement ou partiellement dans un collecteur commun (45), pour limiter ou annuler respectivement le débit et la pression de soufflage dans les buses (30).
4. Procédé pour nettoyer des stations de bobinage en soufflant de l'air sous pression avec des buses de soufflage sur des dispositifs agencés le long de la trajectoire du fil (2) de la bobine d'alimentation (1) à la bobine collectrice (11), et en particulier pour retirer des impuretés comme la poussière, des fibres et des résidus de pilosité du fil déroulé, des dispositifs d'une telle trajectoire qui sont plus sensibles à leur présence, de telles buses de soufflage étant des buses fixes (30) montées sur chaque station de bobinage, orien-

tées vers l'extérieur de la station de bobinage et alimentées par une source d'air comprimé disponible sur la machine de bobinage, **caractérisé en ce qu'un tel soufflage est réalisé par des buses (30) alimentées avec le refoulement d'un aspirateur (22), équipant individuellement chaque unité ou station de bobinage et fournissant le service discontinu d'aspiration aux buses mobiles (8, 9) de sa station de bobinage pour attraper les extrémités du fil aux interruptions de fil.**

5. Procédé de nettoyage selon la revendication 4, **caractérisé en ce que** la source d'air comprimé se compose du refoulement d'un aspirateur (22), équipant individuellement chaque unité ou station de bobinage et dotant lesdites unités de bobinage à la fois du service discontinu d'aspiration à vide élevé, avec le bobinage arrêté pendant les interventions et du service continu à faible vide, pendant le bobinage.
6. Procédé de nettoyage selon la revendication 4, **caractérisé en ce que** la pression et le débit de soufflage dans les buses (30) sont régulés en fournissant le refoulement partiel de l'aspirateur (22) par une vanne (43) qui en dévie une partie vers un collecteur commun (45).

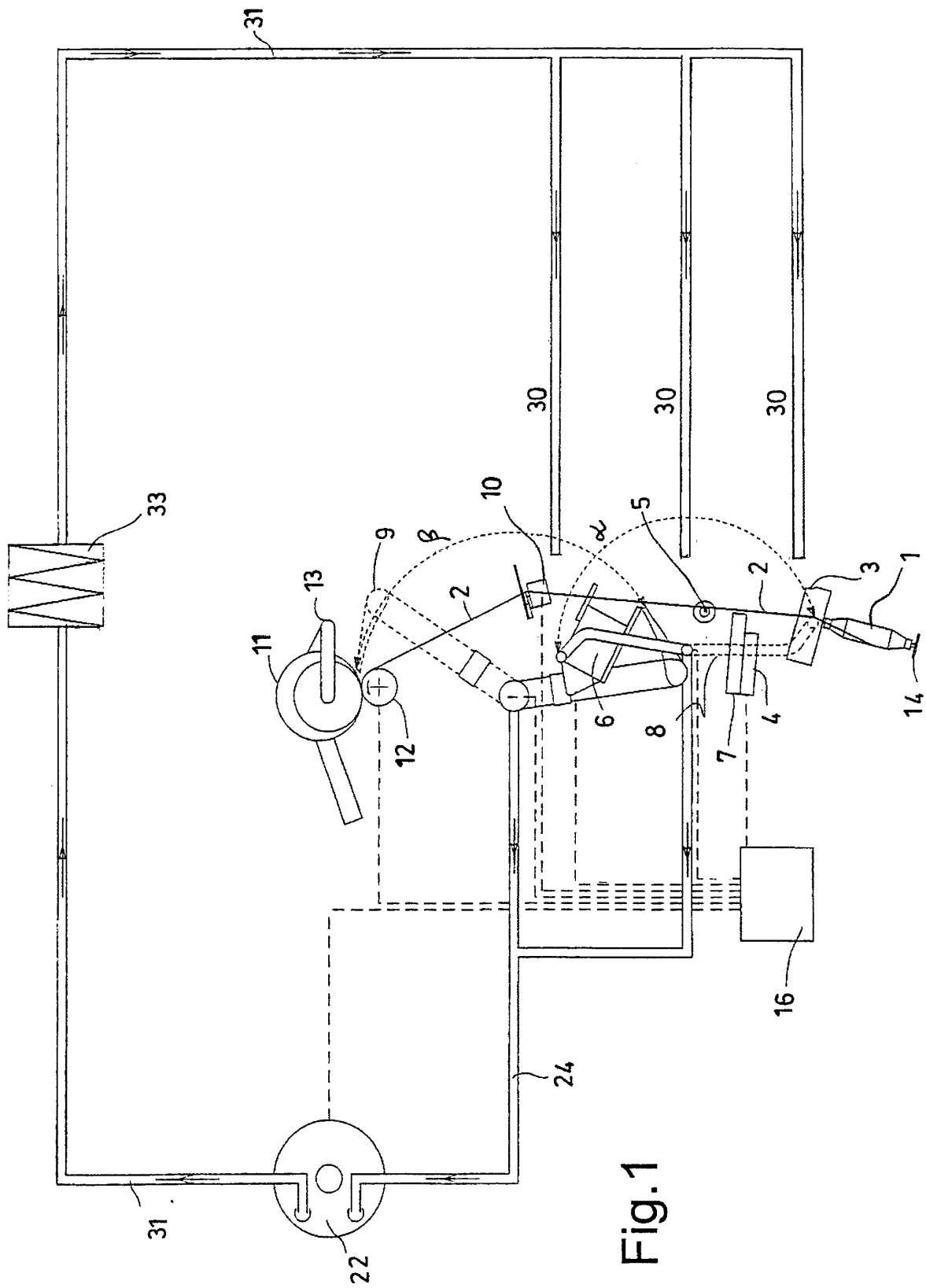
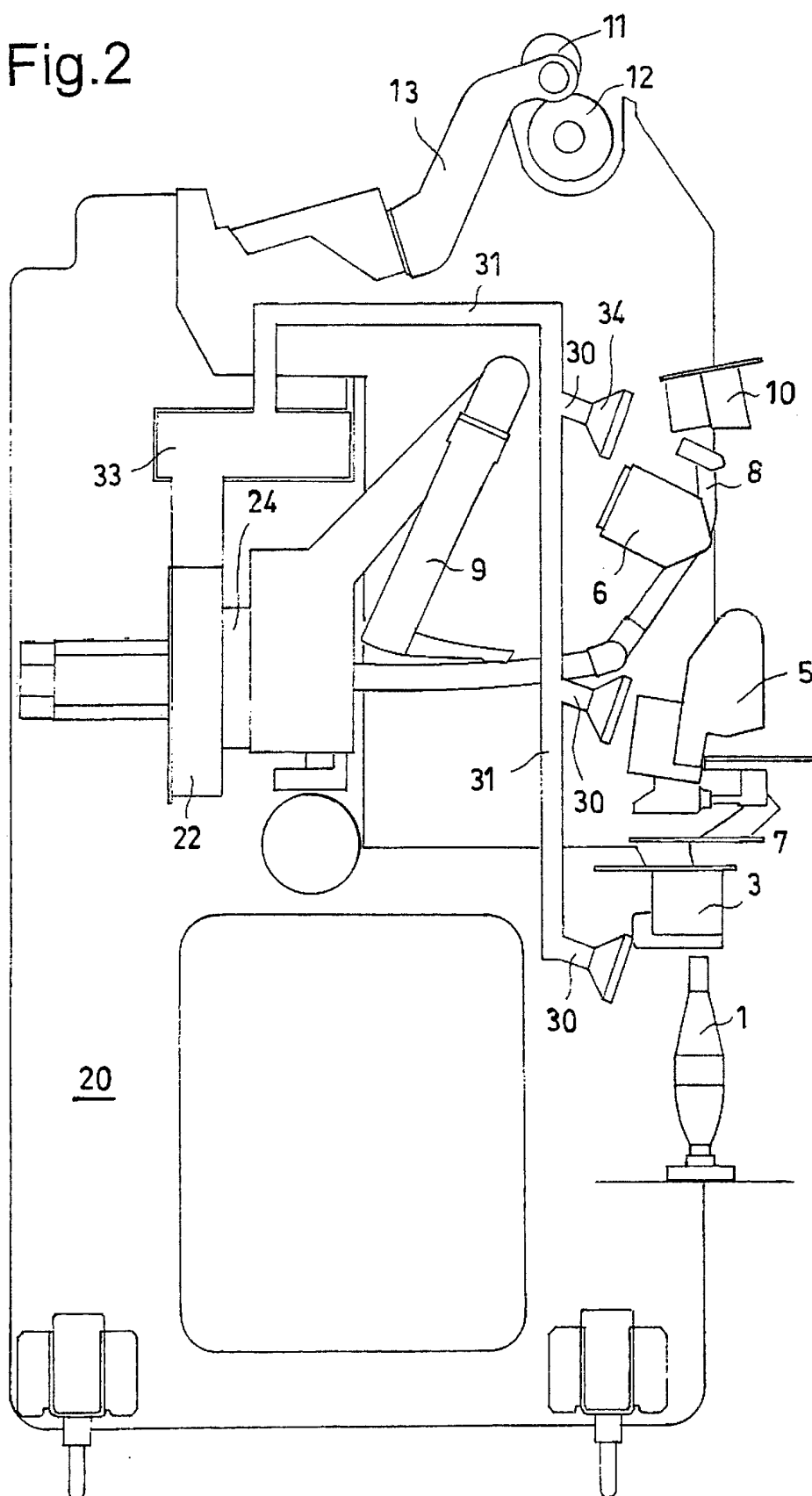


Fig.1

Fig.2



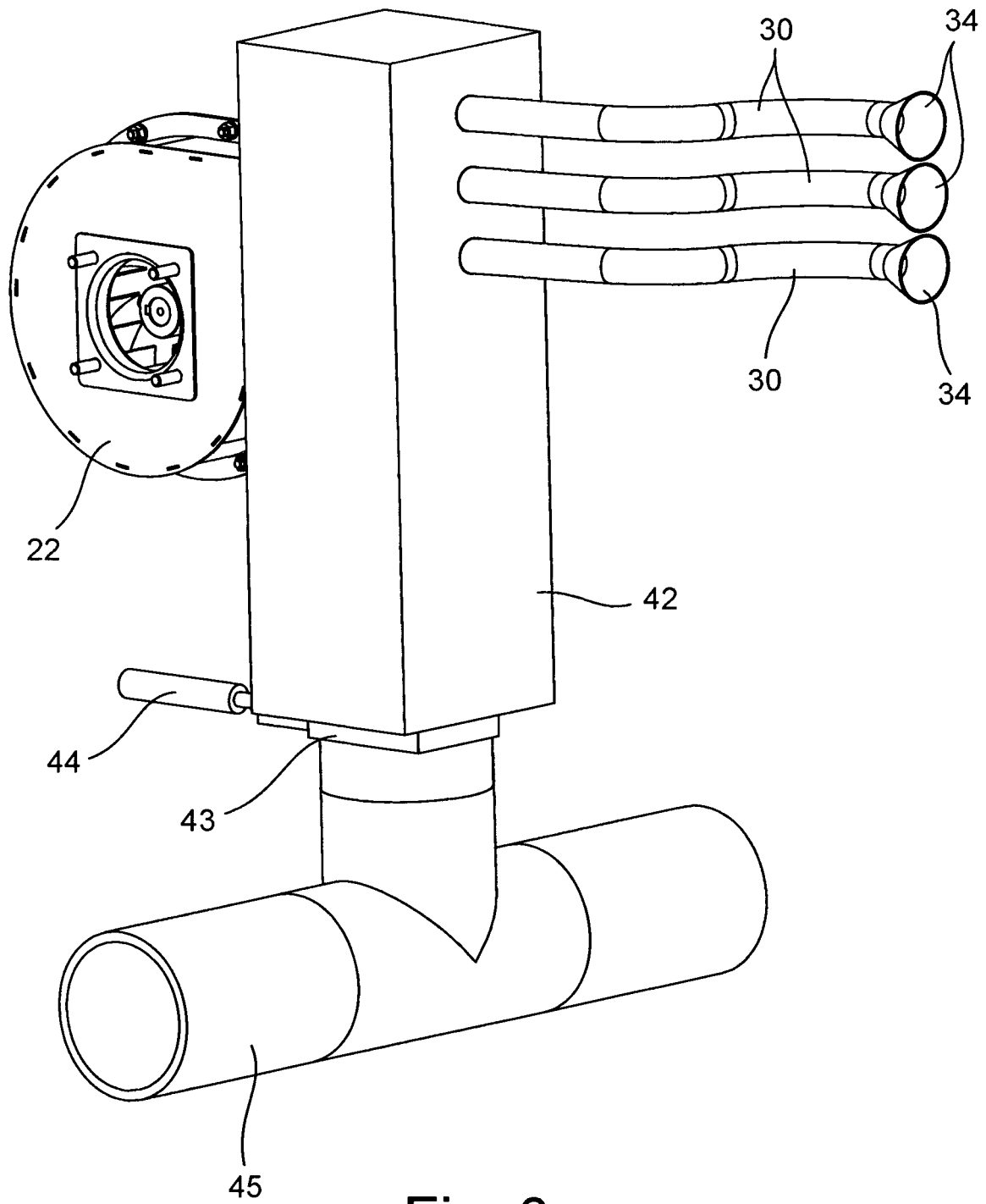


Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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