(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 939 156 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
03.11.2004 Bulletin 2004/45

(51) Int Cl.[7]: **D03D 47/34**, B65H 51/22

(21) Application number: **99102773.1**

(22) Date of filing: **23.02.1999**

(54) **Method and device for the pneumatic threading of textile machine weft feeders**

Verfahren und Vorrichtung zur pneumatischen Einfädelung eines Schussfadenzubringers

Procédé et dispositif pour l'enfilage d'un fournisseur de trame

(84) Designated Contracting States:
BE CH DE IT LI SE

(30) Priority: **26.02.1998 IT TO980152**

(43) Date of publication of application:
01.09.1999 Bulletin 1999/35

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EP-A- 0 370 066
EP-A- 0 446 447
EP-A- 0 567 045
US-A- 5 441 087
US-A- 5 487 415

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EP 0 939 156 B1

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The present invention relates to a method and a device for the pneumatic threading of textile machine weft feeders, particularly high-speed weaving looms.

[0002] It is known that weft feeders are devices designed to be interposed between the spool and the loom or, more generally, the textile machine in order to allow the correct unwinding of the weft thread from the spool and its correct feeding to the loom, regardless of the stresses to which the thread is subjected by the loom.

[0003] For this purpose, weft feeders typically comprise a fixed drum on which a windmilling arm, located at the base of the drum, winds a reserve of thread. When requested by the loom, at each beat, the thread unwinds from the drum of the feeder, and during unwinding its mechanical tension is controlled by a braking means which is arranged at the front end of the drum. A monitoring element is provided in order to control the extent of the turn reserve and to activate the windmilling arm in order to restore the reserve, and an advancement means is provided in order to move the turns of the reserve from the base to the front end of the drum.

[0004] Typically, the thread that arrives from the spool is guided inside the driving shaft and the windmilling arm of the feeder, both of which are hollow, and after forming the weft reserve on the drum it passes through the braking means and reaches a thread guiding ring, by which it is guided to the loom. This path of the thread inside the weft feeder generally makes it troublesome to thread the feeder; the threading is a frequent operation which must be performed at the beginning of each working cycle or if the thread breaks during production.

[0005] In order to obviate this drawback, systems and devices for automatic threading have already been devised. These are typically pneumatic threading systems based on the suction and conveyance of the thread produced by an air stream which is guided at least along part of the path followed by the thread in the weft feeder.

[0006] Conventional pneumatic threading systems are substantially divided into two categories: partial threading systems, which cause the guided passage of the thread only in the rear side of the feeder, upstream of the reserve accumulation drum; and full threading systems, which provide for the guided automatic passage of the thread from the infeed to the output of the feeder, where the term "output" designates the final thread guiding ring that guides said thread to the loom.

[0007] Systems of the first type have been known and used for many years and substantially employ a controlled pneumatic element which is provided with a thread guiding bush which is arranged at the infeed of the driving shaft of the feeder and has a tapering cross-section which acts like a Venturi tube and into which a stream of pressurized air is injected by means of a suitable duct. The air stream, by producing a partial vacuum at the infeed of said bush, draws the thread, which is then propelled by the stream into the driving shaft and the windmilling arm. The pneumatic element is controlled by an electric valve which is operated by an actuation button and activates or blocks the air stream fed into the bush. The system entails the drawback that it only partially facilitates feeder threading, which is in fact completed manually by passing the thread through the braking means and the final thread guiding ring, which are located in front of the drum of the feeder.

[0008] Systems of the second type, which are more recent and fully automated, use a first pneumatic element and a second pneumatic element which are respectively associated with the input of the driving shaft and with the final thread guiding ring and are actuated simultaneously by corresponding electric control valves.

[0009] Systems of this type are disclosed for example in prior European patents no. 0 355 281 and 0 446 447.

[0010] Another known solution, disclosed in European patent no. 0 370 066, also guides the thread, in the intermediate part between the two infeed and output pneumatic elements, by means of a directional air jet which flows along a rigid guide having a channel-shaped cross-section.

[0011] The greatest drawback of these full threading systems is the need, in case of thread breakage, to fully eliminate the residual thread that is present in the feeder.

[0012] Both conventional threading systems, the partial one and the full one, therefore do not fully meet operating requirements.

[0013] US-A-5 441 087 discloses a feeder, i.e. a yam storage and feed device, with a rear part extending between the point of inlet and the point of outlet of the yam winding element and with a front part extending downstream of said outlet and wherein first pneumatic threading means are provided in said rear part of the said feeder and second pneumatic threading means are provided in said front part of the feeder and disclosing the teaching to activate either simultaneously both of said pneumatic threading means when total failure yarn breakage occurs and the yarn reserve has been totally consumed, or to activate only said first pneumatic threading means when partial failure yarn breakage occurs in said rear part of the feeder and the yarn reserve has not been consumed.

[0014] US-A- 5 487 415 discloses a yam storage and feed device with a first and a second pneumatic threading means, provided in the rear and the front part thereof, respectively and which discloses the teaching to always activate both pneumatic threading mans when yam breakage occurs.

[0015] The prior art does neither teach nor suggest the activation only of the second pneumatic threading means alone and to maintain, at the same time, idle the first pneumatic threading means.

[0016] The aim of the present invention is substantially to eliminate the drawbacks of conventional systems, by combining their respective advantages and therefore by providing a threading method and device which allow

the partial threading of the feeder, substantially the threading of the front end part of the feeder, in order to allow, in case of breakage, to tie the thread without having to first remove the residual thread from the drum of the feeder, and likewise allow full threading, which is useful particularly at the beginning of each working cycle or in case of thread replacement and the like.

[0017] According to the present invention, this aim and other important objects which will become apparent from the following detailed description are achieved by a threading method and device having the specific characteristics stated in the appended claims.

[0018] Substantially, the invention is based on the concept of providing the feeder with a first pneumatic threading element and with a second pneumatic threading element which are operatively separate and are located at the infeed and at the output of the feeder, respectively. The pneumatic elements are then selectively activated in order to selectively obtain the threading of the front and end feeder parts only, which is achieved by activating the second pneumatic element and by guiding the thread through the braking means and the final output thread guiding ring, or the partial threading of the rear feeder part only, which is achieved by activating the first pneumatic element and by guiding the thread from the infeed of the driving shaft to the base of the drum through the windmilling arm, or the full threading of the feeder, which is obtained by activating the second element after the first one.

[0019] Further characteristics and advantages of the method and of the device according to the invention will become apparent from the following detailed description and with reference to the accompanying drawings, given by way of non-limitative example, wherein:

Figure 1 is a partially sectional schematic view of a weft feeder with the threading device according to the invention, illustrating the threading of the rear part of the feeder;

Figure 2 is a view, similar to Figure 1, of the threading of the front part of the feeder of Figure 1.

[0020] In the drawings, the reference numeral 10 generally designates a conventional weft feeder which comprises a fixed drum 11 on which a windmilling arm 12, associated with a driving shaft 13 and arranged at the base of the drum 11, winds a plurality of turns of thread F which constitute a thread reserve RF (Figure 2).

[0021] At the front face of the drum 11 there are provided braking means 14 of a per se known type which are suitable to control the tension of the thread F that unwinds from the drum by passing through a final thread guiding ring 15 which is arranged in front of the drum (relative to the travel of the thread) and is generally designated by the reference numeral 15.

[0022] A feeler 16, which can be mechanical and/or electric, is arranged at the drum 11 in order to monitor the extent of the reserve of turns RS and to activate the windmilling arm 12 in order to replenish the reserve. A plurality of rods 17, which protrude periodically from corresponding openings of the drum 11, is also provided in order to move the turns of the reserve from the base to the front end of the drum 11.

[0023] The windmilling arm 12 and the driving shaft 13 are both hollow, in order to receive the thread F that arrives from the spool (not shown) and deposit it on the drum 11 in the form of reserve turns. From the drum, the thread unwinds, when requested by the loom (not shown), by passing through the braking means 14 and the thread guiding ring 15.

[0024] According to the present invention, a first pneumatic threading element 18 is arranged at the infeed section of the driving shaft 13 in order to suck up the thread and guide it through the cavities of the driving shaft and of the windmilling arm 12 to the base of the drum 11. The pneumatic element 18, which is of a per se known type, is substantially constituted by a bush which has a central channel 18a with a funnel-shaped profile which acts like a Venturi tube into which a duct 19 opens which is inclined in the direction in which the thread travels (shown by the arrow in the figure); the duct 19 feeds a stream of pressurized air into the bush.

[0025] A second pneumatic threading element 20 is associated with the final thread guiding ring 15 and allows to complete the threading of the front part of the feeder 10, sucking up the end of the thread F that is present on the drum 11 and guiding it through the braking means 14, which are released beforehand (i.e., moved away from the drum 11), and through said thread guiding ring 15.

[0026] The pneumatic threading element 20 too is provided with a funnel-shaped cavity 20a into which a respective duct 21 opens which feeds a stream of pressurized air. The pressurized air stream, which arrives from a source SA, is fed separately to the ducts 19 and 21 by a distribution unit 22 which is provided with electric valves 23 and 24 which control the corresponding ducts and are respectively controlled by a first button 25 and by a second button 26 for selectively activating the duct 19 or the duct 21.

[0027] Accordingly, with the above-described device it is possible, in accordance with the stated aim, to selectively achieve the threading of the front part of the feeder 10 only, by pressing the second button 26 for activating the electric valve 24 in order to send the air stream into the duct 21 (Figure 2); or to achieve full threading, by pressing the second button 26 after the first one 25 in order to send the air stream first into the duct 19, to produce the threading of the rear part or infeed of the feeder 10 and then into the duct 21 in order to complete the threading of the front part or output of the feeder 10.

[0028] In order to facilitate the threading of the front part or output of the feeder 10, the button 26 and the respective electric valve 24 can be separate from the distribution unit 22 and can be arranged on the duct 21,

for example at the front side of the feeder 10, in order to directly control said duct, which in this case branches off from the pressurized air source SA instead of from the distribution unit 22.

[0029] Without altering the concept of the invention, the details of execution and the embodiments may of course be altered extensively with respect to what has been described and illustrated by way of non-limitative example, without thereby abandoning the scope of the invention.

[0030] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. A selective method for pneumatic threading of weft feeders of the type comprising a fixed drum (11), a hollow driving shaft (13), a hollow windmilling arm (12) which winds the thread (F) onto said drum, braking means (14) and a final thread guiding ring (15), first pneumatic threading means (18) at the infeed of the driving shaft (13), second pneumatic threading means (20) near said final thread guiding ring (15), control means (23, 24,25, 26) for selectively activating said first and second pneumatic threading means (18, 20), wherein the method consists of the alternative selection of the following operative conditions of the said first and second pneumatic threading means:

   selection of a first operative condition in which both the first and the second pneumatic threading means (18 and 20) are activated;
   to obtain full threading of the feeder,
   selection, instead of said first operative condition, of a second operative condition to obtain the partial threading of the rear part of the feeder (10) only which only the first pneumatic threading means (18) is activated, while the second pneumatic threading means (20) is maintained idle; in order to guide the thread from the infeed of the driving shaft (13) to
   the base of the drum (11) through the woud milling arm (12)

   characterised in that,

   - instead of said first and said second operative conditions, a third operative condition is selected in which only said second pneumatic threading means (20) is activated, while said first pneumatic threading means (18) is maintained idle to obtain a partial threading of the front part of the feeder (10) only by guiding the thread through the braking means (14) and the final thread guiding ring (15).

2. A weft feeder for carrying out the method of claim 1, comprising a fixed drum (11), a hollow driving shaft (13), a hollow windmilling arm (12) which winds the thread (F) onto said drum, braking means (14) and a final thread guiding ring (15), first pneumatic threading means (18) at the infeed of the driving shaft (13), second pneumatic threading means (20) near said final thread guiding ring (15), control means (23, 24,25, 26). for selectively activating said first and second pneumatic threading means (18, 20),
   characterised in that
   the weft feeder comprises a first circuitry (19) including control means (23, 25) for supplying pressurised air to said first pneumatic threading means (18), directly and independently from a source (SA) of pressurised air and a second circuitry (21) including control means (24, 26) for supplying pressurised air to said second pneumatic threading means (20), directly and independently from said source (SA) of pressurised air.

Patentansprüche

1. Selektives Verfahren zum pneumatischen Einfädeln von Schussfaden-Zuführeinrichtungen von der Art, welche eine feststehende Trommel (11), eine hohle Antriebswelle (13), einen hohlen umlaufenden Arm (12), welcher den Faden (F) auf die Trommel aufwickelt, eine Bremseinrichtung (14) und einen abschließenden Fadenführungsring (15), eine erste pneumatische Einfädeleinrichtung (18) an der Eingangsseite der Antriebswelle (13), eine zweite pneumatische Einfädeleinrichtung (20) nah bei dem abschließenden Fadenführungsring (15), Steuermittel (23, 24, 25, 26) zum selektiven Aktivieren der ersten und zweiten pneumatischen Einfädeleinrichtung (18, 20) aufweist, wobei das Verfahren aus der abwechselnden Auswahl der folgenden Betriebsbedingungen der ersten und zweiten pneumatischen Einfädeleinrichtung besteht:

   - Auswahl einer ersten Betriebsbedingung, bei welcher sowohl die erste als auch die zweite pneumatische Einfädeleinrichtung (18 und 20) aktiviert werden, um ein vollständiges Einfädeln des Fadenführers (10) herbeizuführen;
   - Auswahl einer zweiten Betriebsbedingung anstelle der ersten Betriebsbedingung, um das teilweise Einfädeln nur des rückwärtigen Teils des Fadenführers (10) herbeizuführen, bei welcher nur die erste pneumatische Einfädelein-

richtung (18) aktiviert wird, während die zweite pneumatische Einfädeleinrichtung (20) im Leerlauf gehalten wird, um so den Faden von der Eingangsseite der Antriebswelle (13) zur Basis der Trommel (11) über den umlaufenden Arm (12) zu führen,

dadurch gekennzeichnet, dass

- anstelle der ersten und der zweiten Betriebsbedingung eine dritte Betriebsbedingung ausgewählt wird, bei welcher nur die zweite pneumatische Einfädeleinrichtung (20) aktiviert wird, während die erste pneumatische Einfädeleinrichtung (18) im Leerlauf läuft, um so ein teilweises Einfädeln nur des vorderen Teils des Fadenführers (10) herbeizuführen, indem der Faden durch die Bremseinrichtung (14) und den abschließenden Fadenführungsring (15) geführt wird.

2. Schussfadenführer zur Durchführung des Verfahrens nach Anspruch 1, welcher eine feststehende Trommel (11), eine hohle Antriebswelle (13), einen hohlen umlaufenden Arm (12), welcher den Faden (F) auf die Trommel aufwickelt, eine Bremseinrichtung (14) und einen abschließenden Fadenführungsring (15), eine erste pneumatische Einfädeleinrichtung (18) an der Eingangsseite der Antriebswelle (13), eine zweite pneumatische Einfädeleinrichtung (20) nah bei dem abschließenden Fadenführungsring (15), Steuermittel (23, 24, 25, 26) zum selektiven Aktivieren der ersten und zweiten pneumatischen Einfädeleinrichtung (18, 20) aufweist,
dadurch gekennzeichnet, dass
der Schussfadenführer eine erste Schaltung (19) aufweist, welche Steuermittel (23, 25) zum direkten Zuführen von Druckluft zu der ersten pneumatischen Einfädeleinrichtung (18) unabhängig von einer Druckluftquelle (SA) umfasst, sowie eine zweite Schaltung (21), welche Steuermittel (24, 26) zum direkten Zuführen von Druckluft zu der zweiten pneumatischen Einfädeleinrichtung (20) unabhängig von der Druckluftquelle (SA) umfasst.

Revendications

1. Procédé sélectif pour l'enfilage pneumatique des approvisionneurs en fil de trame du type comprenant un tambour fixe (11), un arbre d'entraînement creux (13), un bras d'enroulement à moulinet creux (12) qui enroule le fil (F) sur ledit tambour, des moyens de freinage (14) et un anneau terminal de guidage de fil (15), des premiers moyens d'enfilage pneumatique (18) à l'entrée d'approvisionnement de l'arbre d'entraînement (13), des seconds moyens d'enfilage pneumatique (20) à proximité dudit anneau terminal de guidage de fil (15), des moyens de commande (23, 24, 25, 26) pour activer de manière sélective lesdits premiers et seconds moyens d'enfilage pneumatique (18, 20), dans lequel le procédé consiste en la sélection alternative des conditions opératoires desdits premiers et seconds moyens d'enfilage pneumatique comme suit :

- sélection d'une première condition opératoire dans laquelle à la fois les premiers et les seconds moyens d'enfilage pneumatique (18 et 20) sont activés pour obtenir un enfilage complet de l'approvisionneur (10) ;
- sélection, au lieu de ladite première condition opératoire, d'une seconde condition opératoire pour obtenir l'enfilage partiel de la partie arrière de l'approvisionneur (10) seulement, dans laquelle seuls les premiers moyens d'enfilage pneumatique (18) sont activés, tandis que les seconds moyens d'enfilage pneumatique (20) sont maintenus sans activité afin de guider le fil depuis l'entrée d'approvisionnement de l'arbre d'entraînement (13) à la base du tambour (11) en passant à travers le bras d'enroulement à moulinet (12) ;

caractérisé en ce que,

- au lieu desdites première et seconde conditions opératoires, une troisième condition opératoire est sélectionnée dans laquelle seuls lesdits seconds moyens d'enfilage pneumatique (20) sont activés, tandis que lesdits premiers moyens d'enfilage pneumatique (18) sont maintenus sans activité pour obtenir un enfilage partiel de la partie avant de l'approvisionneur (10) seulement, en guidant le fil à travers les moyens de freinage (14) et l'anneau terminal de guidage de fil (15).

2. Approvisionneur de fil de trame pour mettre en oeuvre le procédé selon la revendication 1, comprenant un tambour fixe (11), un arbre d'entraînement creux (13), un bras d'enroulement à moulinet creux (12) qui enroule le fil (F) sur ledit tambour, des moyens de freinage (14) et un anneau terminal de guidage de fil (15), des premiers moyens d'enfilage pneumatique (18) à l'entrée d'approvisionnement de l'arbre d'entraînement (13), des seconds moyens d'enfilage pneumatique (20) à proximité dudit anneau terminal de guidage de fil (15), et des moyens de commande (23, 24, 25, 26) pour activer de manière sélective lesdits premiers et seconds moyens d'enfilage pneumatique (18, 20),
caractérisé en ce que,
l'approvisionneur en fil de trame comprend un premier circuit (19) comportant des moyens de com-

mande (23, 25) pour fournir de l'air sous pression auxdits premiers moyens d'enfilage pneumatique (18), directement et indépendamment à partir d'une source (SA) d'air sous pression, et un second circuit (21) comportant des moyens de commande (24, 26) pour fournir de l'air sous pression auxdits seconds moyens d'enfilage pneumatique (20), directement et indépendamment à partir de ladite source (SA) d'air sous pression.

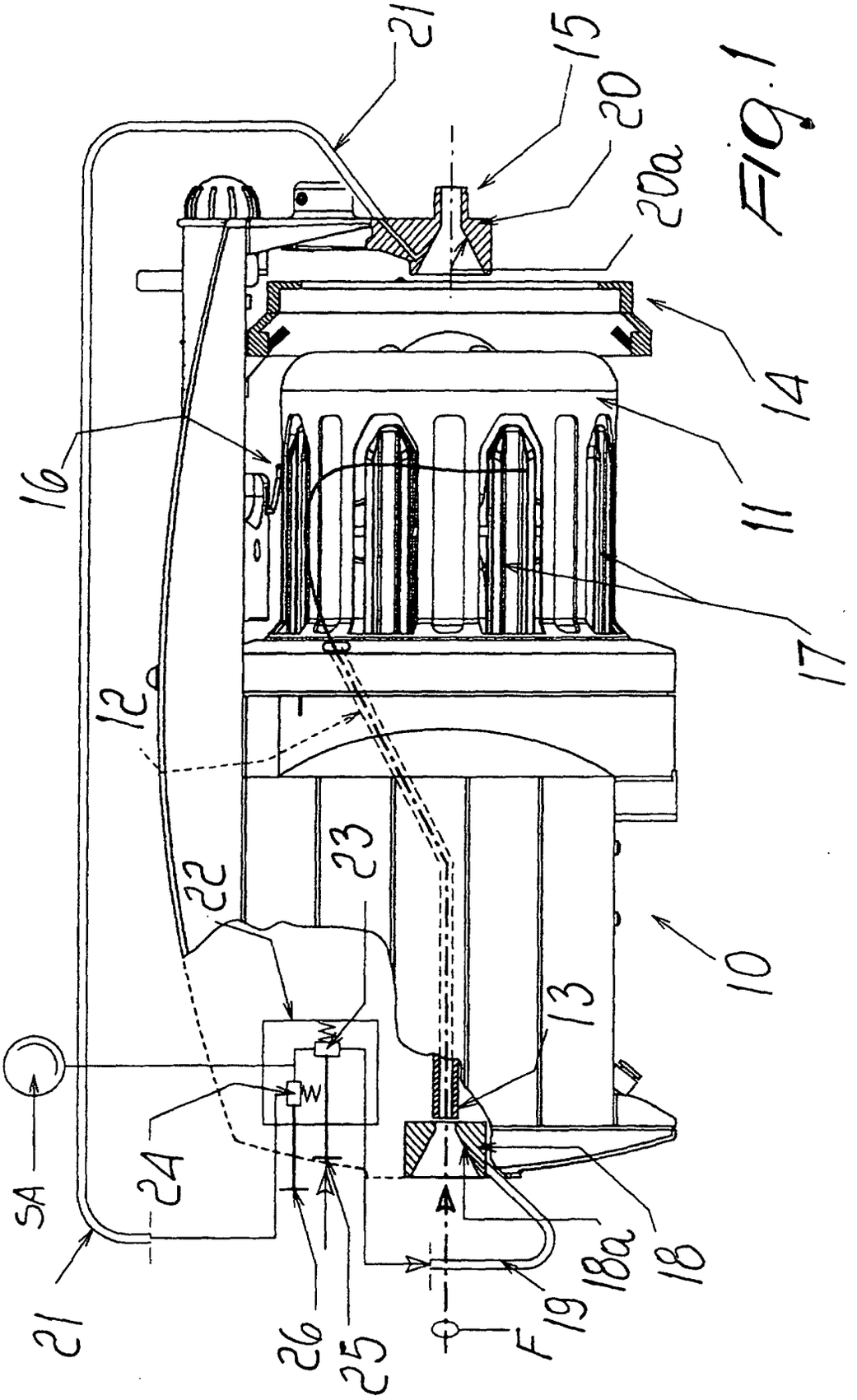

Fig. 1

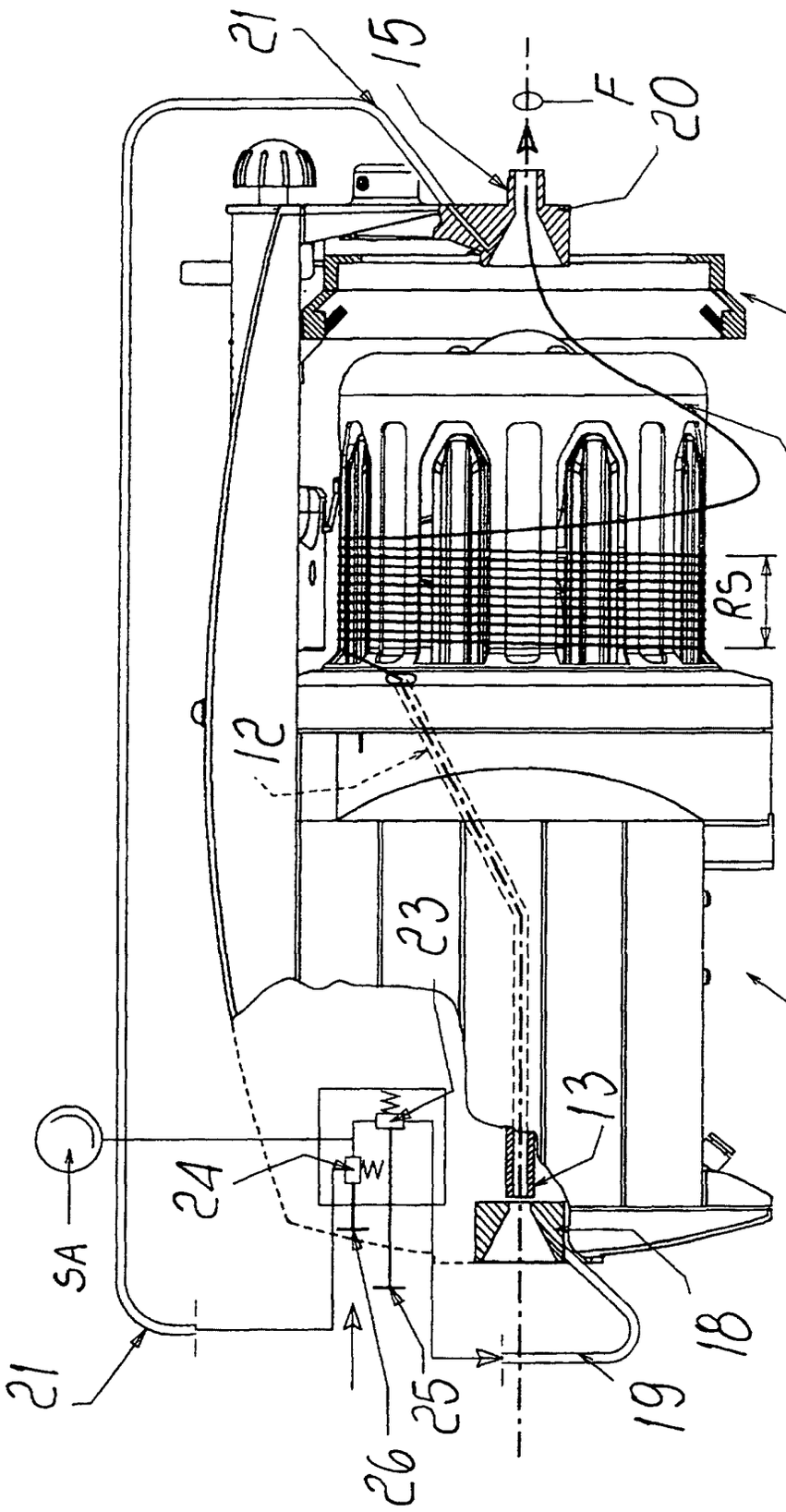

Fig. 2