

Description

This invention relates to a lubricating distributor as defined in the preamble of claim 1, a lubricating device for a knitting machine, and the use of said lubricating distributor for a knitting machine.

In general, a distributing valve which includes a metering and oil-accumulating mechanism and is adapted to feed lubricating oil in a predetermined amount in the form of droplets, particularly, spray is conventionally used for a centralized lubricating system which functions to continuously distribute a small amount of lubricating oil to a lubricated section of a knitting machine such as its sliding section, its drive section or the like.

Such a distributing valve is required to gradually feed lubricating oil in a predetermined amount from an oil source to the lubricated section. For this reason, a piston-type accumulator which is adapted to adjust the amount of oil accumulated therein is used as the distributing valve. Unfortunately, the accumulator causes a space to remain in a cylinder chamber during the movement of a piston, so that the piston fails to fully discharge liquid from the cylinder. This leads to the disadvantage that lubricating oil is not fed properly in a predetermined amount, resulting in a failure in lubrication.

In order to avoid this problem, a system has been proposed which continuously feeds lubricating oil in the form of droplets by forming oil gradually fed in a predetermined amount into mist by means of an oil mist unit arranged outside the distributing valve while using compressed air as the carrier medium.

However, the system of feeding lubricating oil in the form of mist or droplets causes fine oil particles to be scattered outside and thereby deteriorates the environment. Thus, it is not suitable for use for a knitting machine or the like which manufactures a product easily damaged by oil. Also, it causes waste of oil sufficient to lead to economical loss.

DE-A-20 04 770 discloses a method and an apparatus for providing dosage when lubricating machinery components. Fig. 2 of this document describes a nozzle for spraying oil, the nozzle comprising a conduit for supplying compressed air having a central boring. The central boring leads to a compressed air outlet opening surrounding an oil outlet opening. It is emphasized in the description of this document that the device operates in a way to spray the oil in the form of fine droplets.

It is the object of the present invention to eliminate the foregoing prior art disadvantages and to provide a lubricating distributor and a lubricating device capable of feeding lubricating oil in proper quantities without requiring to form the oil into mist.

This object is attained by a lubricating distributor as defined in claim 1, the lubricating device as defined in claim 6 and the use of said lubricating distributor for a knitting machine. Preferred and suitable embodiments are defined in the subclaims.

The lubricating distributor and the lubricating device

of the present invention are suitable for a knitting machine such as a circular knitting machine, more particularly for feeding a lubricated section of the knitting machine such as a cam track, a needle, a needle groove, a drive section of the knitting machine, its sliding surface section or the like with lubricating oil in proper quantities.

In accordance with the present invention, a lubricating distributor applicable for a knitting machine is provided to which lubricating oil and compressed air are fed from an oil pump and a compressed air source, respectively, and which feeds the lubricating oil to a lubricated section of the knitting machine. The lubricating distributor is provided therein with a mixing means for mixing the lubricating oil and compressed air therein to feed the lubricating oil to the lubricated section of the knitting machine while carrying the lubricating oil on the compressed air, an oil feed means for feeding the lubricating oil in a predetermined amount to the mixing means, and an air feed means for feeding the compressed air in a predetermined amount to the mixing means.

The oil feed means and air feed means may be constructed so as to adjust the flow rate of lubricating oil and that of compressed air, respectively.

The oil feed means may also be constructed so as to intermittently feed lubricating oil.

Also, in accordance with the present invention, a lubricating device for a knitting machine including said lubricating distributor is provided. The mixing means of the lubricating distributor is adapted for mixing the lubricating oil and compressed air therein to outwardly discharge the lubricating oil while carrying the lubricating oil on the compressed air. In a preferred embodiment, the lubricating distributor is provided therein with an oil passage for flowing the lubricating oil therethrough, which communicates with the mixing means and includes an inlet means communicating with an oil pump and an outlet means. In the oil passage there is arranged an oil feed valve for feeding the lubricating oil in a predetermined amount to the mixing means. Also, an air passage is provided for flowing the compressed air therethrough which is defined in the lubricating distributor so as to communicate with the mixing means. In the air passage means is provided an air feed valve provided for feeding compressed air in a predetermined amount to the mixing means.

The mixing means of the present invention comprises an oil/air mixing section for mixing the compression air and lubricating oil therein, a throttle nozzle connected between the oil/air mixing section and the oil passage means for discharging the lubricating oil to the oil/air mixing section, a compressed air blowout section defined around the throttle nozzle and communicating with the air passage means and oil/air mixing section so as to forcibly discharge the compression air thereto and guide the compression air to the oil/air mixing section.

In a preferred embodiment of the present invention, the oil feed valve means comprises a hollow shaft formed with an axially extending through-hole, a piston fitted on the hollow shaft so as to be slidable in the axial direction

thereof and an elastic check valve provided with a lip and functioning to operate the through-hole of the hollow shaft.

These and other objects and many of the attendant advantages of the present invention will be appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings in which like reference numerals designate like or corresponding parts throughout; wherein:

Fig. 1 is a vertical sectional view showing a lubricating distributor incorporated in a lubricating device for a knitting machine according to the present invention;

Fig. 2 is a front elevation view of the lubricating distributor shown in Fig. 1;

Fig. 3 is a plan view of the lubricating distributor shown in Fig. 1;

Fig. 4 is a fragmentary enlarged vertical sectional view showing an oil/air mixing section of the lubricating distributor shown in Fig. 1;

Fig. 5 is a fragmentary enlarged sectional side elevation view showing an oil feed valve of the lubricating distributor shown in Fig. 1; and

Fig. 6 is a side elevation view showing the manner of use of the lubricating device shown in Fig. 1.

A lubricating device for a knitting machine according to the present invention will be described hereinafter with reference to the accompanying drawings.

Figs. 1 to 6 illustrate an embodiment of a lubricating device for a knitting machine according to the present invention. A lubricating device of the illustrated embodiment is adapted to introduce compressed air from a compressed air source 10 such as an air pump, a compressor or the like to a lubricating distributor 12 to permit lubricating oil fed thereto from an oil pump 14 to be fed to a lubricated section 16 (Fig. 6) of a circular knitting machine while carrying it on the compressed air. For this purpose, the lubricating device of the illustrated embodiment is so constructed that the lubricating distributor 12 is provided therein with at least one oil passage 18, which includes an oil inlet means 20 connected to an oil path 22 communicating with the oil pump 14 and an oil outlet means 24. In the illustrated embodiment, five such oil passages 18 are formed in the lubricating distributor 12 and correspondingly the outlet means 24 comprises five outlets. The inlet means 20 comprises one inlet. The lubricating distributor 12 is also provided with a throttle nozzle 26 in a manner to be positioned on the way of each of the oil passages 18. The throttle nozzle 26 may be mounted in the distributor 12 by means of screws. Further, the lubricating distributor 12 includes compressed air blowout sections 28 arranged corresponding to the oil passages 18 so as to permit compressed air to be jetted from each of air passages 30 defined in the lubricating distributor 12 so as to communicate with each

of the compressed air blowout sections 28. In the illustrated embodiment, the compressed air blowout sections 28 each are formed by reducing a part of the outer diameter of the throttle nozzle 26 as indicated at reference numeral 31 in Fig. 1. The oil passages 18 each include a cylinder or cylindrical space 32, and the cylindrical spaces 32 and the air passage 30 are provided therein with oil feed valves 34 and air feed valves 36, respectively.

The oil feed valve 34 arranged in the cylinder 32 comprises a hollow shaft 37 formed with an axially extending through-hole 40 and stationarily arranged in the cylindrical space 32, a hollow piston 38 slidably fitted on the hollow shaft 37 and an elastic check valve member 42 provided with a peripheral lip 43 and arranged for operating one end of the through-hole 40 of the hollow shaft 37. In the illustrated embodiment, the hollow piston 38 is constantly urged toward the check valve member 42 by means of a spring 44 and the check valve member 42 is arranged between the hollow piston 38 and the oil outlet 20. Also, the elastic check valve member 42 is normally forced against the through-hole 40 of the hollow shaft 37 by means of a spring 46, so that the through-hole 40 is normally closed by the valve member 42. In addition, the check valve member 42, when the peripheral lip 43 is enlarged, contacts with the inner surface of the cylindrical space 32 to block the communication between the inlet means 20 and the outlet means 24. In the illustrated embodiment, the elastic check valve member 42 may be made of a suitable elastic material such as rubber or the like. The lubricating distributor 12 is also provided with a nipple 48 corresponding to each of the oil feed valves 34, which, in the illustrated embodiment, is mounted on the distributor 12 by means of screws. The nipples 48 each include a ball valve 50 elastically forced against the other end of through-hole 40. In the illustrated embodiment, a combination of a spring 52 and a receiving seat 54 is arranged for forcing the valve 50 against the through-hole 40.

When the oil pump 14 is started to guide lubricating oil of a high pressure to the oil inlet 20, the lip 43 of the check valve member 42 is deflated while the valve closes the one or inlet end of the through-hole 40. This results in a gap being circumferentially defined between the inner surface of the cylinder 32 and the valve member 42, through which lubricating oil flows toward the piston 38 to force the piston 38 against the spring 44 in the right direction in Figs. 1 and 5, to thereby cause lubricating oil in a predetermined amount to be accumulated between the piston 38 and the check valve member 42. Then, when the oil pump 14 is stopped to reduce a pressure in the inlet 20, the spring 44 returns the hollow piston 38 toward its original position, so that the accumulated lubricating oil is pressurized to force the check valve member 42 in the right direction in Figs. 1 and 5. This causes the lip 43 to be expanded to exhibit a sealing action and the check valve member 42 to be moved apart from the hollow shaft 37 to open the through-hole 40, so that the

accumulated lubricating oil may enter the through-hole 40 to open the ball valve 50 and then be fed to the throttle nozzle 26. Thus, it will be noted that the oil feed valves 38 each function to intermittently and gradually feed a predetermined amount of lubricating oil to the throttle nozzle 26 every time when the supply of oil to the inlet 20 is intermittently carried out by means of the pump 14. The feed rate of the oil may be controlled by positionally adjusting each of the nipples 48.

The throttle nozzles 26 each are formed with an axially extending through-hole 56 and correspondingly the nipple 48 is formed with a port 58, through which the through-hole 56 of the throttle nozzle 26 communicates with the ball valve 50.

The throttle nozzle 26 is threadedly arranged in the lubricating distributor 12 so that the central through-hole 56 of the nozzle 26 communicates with the port 58 of the nipple 48 to permit lubricating oil to be guided to the throttle nozzle 26. To each of the throttle nozzles 26 is connected a joint 60 so as to communicate therewith. The joint 60 is provided therein with an oil/air mixing section 62, in which compressed air jetted from the air passage 30 to the compressed air blowout section 28 and lubricating oil jetted from the through-hole 56 are mixed to prepare an oil/air mixture, which is then discharged through the outlet 24. In the illustrated embodiment, the outlets 24 each may be provided at a discharge nipple 66 connected to each of the joints 60. In the illustrated embodiment, the air feed valves 36 arranged in the air passage 30 each comprise a needle valve which is threadedly inserted in the air passage 30 through a threaded member 68 so as to be axially movable in the passage 30, resulting in feeding air to the oil/air mixing section 62 while, if desired, controlling or adjusting the flow rate of the air. In the illustrated embodiment, the air passage 30 is branched at the intermediate portion thereof into a plurality of passage sections 69 each connected to each of the compressed air blowout sections 28, and the air feed valve 36 is arranged in each of the passage sections, as shown in Fig. 1. The air feed valve 36 may be set so as to carry out the feed of air also when the feed of lubricating oil is not carried out, to thereby exhibit a function of cooling the lubricating distributor 12 and therefore the lubricating device of the illustrated embodiment.

In the drawings, reference numerals 70 and 72 (Fig. 1) each designate an O-ring, 74 and 76 each are a seal element, 78 is a washer, 80 (Fig. 6) is a circular knitting machine, 82 is a revolving shaft, 84 is a needle cylinder, 86 is multi-feeder section, and 88 is a bobbin. Reference numeral 90 (Fig. 1) is a through-hole formed at the front portion of the air feed valve 36 so as to axially extend therethrough.

Now, the manner of operation of the lubricating device of the illustrated embodiment will be described in connection with lubrication with respect to the needle cylinder 84 of the circular knitting machine 80 or the like.

Compressed air is fed from the compressor 10

through the air passage 30 to each of the air feed valves 36 and concurrently lubricating oil is fed from the oil pump 14 through the oil path 22 and oil inlet 20 to the oil feed valve 34 in each of the cylinders 32. Subsequently, the compressed air and lubricating oil are fed in amounts predetermined by the valves 34 and 36 to the compressed air blowout section 28 and the throttle nozzle 26 and then mixed together in the oil/air mixing section 62, so that the lubricating oil is fed to and then discharged from the outlet means 24 for lubrication while being carried on the compressed air.

In the illustrated embodiment, the oil feed valve 34 and air feed valve 36 may be adjusted or controlled through the nipple 48 and threaded member 68 so as to vary the flow rate of lubricating oil and that of compressed air, respectively, so that a mixing ratio between compressed air and lubricating oil may be varied as desired. For example, the flow rate of lubricating oil may be varied within the range between 0.01ml and 0.5ml for every shot. Also, the lubricating device of the illustrated embodiment may be constructed so as to permit lubrication to be carried out with respect to eight to twenty lubricated sections including a cylinder needle butt, a dial needle butt, a knitting needle latch, a dial, a needle cylinder and the like.

As can be seen from the foregoing, the lubricating device of the present invention is so constructed that the throttle nozzle means is arranged in the oil passage means including the oil inlet means communicating with the oil pump and the oil outlet means, the compressed air blowout section is defined around the throttle nozzle means and the air passage means is arranged so as to communicate with the compressed air blowout section. Also, the oil feed valve means and air feed valve means are arranged in the oil passage means and air passage means, respectively. Such construction of the present invention permits lubricating oil to be outwardly discharged while being carried on compressed air and the necessity of forming lubricating oil into mist to be eliminated, resulting in lubrication to be carried out with high efficient and without polluting a knitting machine. Also, the present invention eliminates uselessness of lubricating oil to a degree sufficient to accomplish economical lubrication while ensuring stable lubrication. Further, the present invention ensures stable operation of a knitting machine at a high speed and reduces maintenance of the lubricating device and therefore the knitting machine.

While a preferred embodiment of the present invention has been described with a certain degree of particularity with reference to the drawings, obvious modifications and variations are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.



Claims

1. A lubricating distributor (12), comprising

a mixing means (26, 28, 56, 62) for mixing lubricating oil and compressed air to outwardly discharge the lubricating oil while carrying it on the compressed air;
 an oil feed means (38) for feeding the lubricating oil in a predetermined amount to said mixing means (26, 28, 56, 62);
 an air feed means (36) for feeding the compressed air in a predetermined amount to said mixing means (26, 28, 56, 62);
 wherein said mixing means (26, 28, 56, 62) comprises a throttle nozzle (26) for discharging the lubricating oil, and a compressed air blowout section (28) around said throttle nozzle (26) for blowing out and guiding the compressed air,
characterized by
 an oil/air mixing section (60, 62) communicating with the throttle nozzle (26) for discharging the lubricating oil and with the compressed air blowout section (28) for blowing out and guiding the compressed air into said mixing section, wherein the oil/air mixing section (60, 62) further communicates with an oil outlet means (24).

2. The lubricating distributor of claim 1, characterized in that said oil feed means (38) and air feed means (36) are constructed so as to adjust the flow rate of the lubricating oil and/or the flow rate of the compressed air.

3. The lubricating distributor of claim 1, characterized in that said oil feed means (38) is constructed so as to intermittently feed the lubricating oil.

4. The lubricating distributor of claim 1 or 3, characterized in that said oil feed means comprises a hollow shaft (37) formed with an axially extending through-hole (40), a piston (38) fitted on said hollow shaft (37) so as to be slidably in the axial direction thereof and an elastic check valve (42) provided with a lip (43) and functioning to operate said through-hole (40) of said hollow shaft (37).

5. The lubricating distributor of anyone of the preceding claims, characterized by

an oil passage (18) defined in the lubricating distributor (12) and communicating with said mixing means (26, 28, 56, 62) and including an inlet means (20) communicating with an oil pump (14) and an outlet means;
 an oil feed valve (34) provided in said oil passage (18) for feeding the lubricating oil in a predetermined amount to said mixing means (26,

28, 56, 62);

an air passage (30) defined in the lubricating distributor (12) and communicating with said mixing means (26, 28, 56, 62); and
 an air feed valve (36) provided in said air passage (30) for feeding compressed air in a predetermined amount to said mixing means (26, 28, 56, 62).

6. A lubricating device for a knitting machine, comprising the lubricating distributor of anyone of the preceding claims.

7. Use of the lubricating distributor of anyone of claims 1 to 5 for a knitting machine.

Patentansprüche

1. Schmiermittelverteiler, aufweisend

eine Mischeinrichtung (26, 28, 56, 62) zum Mischen von Schmieröl und Druckluft, um das Schmieröl nach außen auszutragen, während es auf der Druckluft getragen wird;
 eine Ölzuführungseinrichtung (38) zum Zuführen einer vorbestimmten Menge des Schmieröls zur Mischeinrichtung (26, 28, 56, 62);
 eine Luftzuführungseinrichtung (36) zum Zuführen einer vorbestimmten Menge der Druckluft zur Mischeinrichtung (26, 28, 56, 62);
 wobei die Mischeinrichtung (26, 28, 56, 62) eine Drosseldüse (26) zum Austragen der Schmieröls aufweist, sowie um die Drosseldüse (26) herum einen Bereich (28) zum Ausblasen von Druckluft, um die Druckluft auszublasen und zu führen,

gekennzeichnet durch

einen Öl/Luft-Mischbereich (60, 62), der mit der Drosseldüse (26) zum Austragen des Schmieröls und mit den Bereich (28) zum Ausblasen von Druckluft in Verbindung steht, um die Druckluft in den Mischbereich auszublasen und zu führen, wobei der Öl/Luft-Mischbereich (60, 62) außerdem mit einer Ölauslaßeinrichtung (24) in Verbindung steht.

2. Schmiermittelverteiler nach Anspruch 1, dadurch gekennzeichnet, daß die Ölzuführungseinrichtung (38) und die Luftzuführungseinrichtung (36) zum Einstellen der Flußgeschwindigkeit des Schmieröls und/oder der Flußgeschwindigkeit der Druckluft eingerichtet sind.

3. Schmiermittelverteiler nach Anspruch 1, dadurch gekennzeichnet, daß die Ölzuführungseinrichtung (38) zum intermittierenden Zuführen des Schmieröls eingerichtet ist.



4. Schmiermittelverteiler nach Anspruch 1 oder 3, dadurch gekennzeichnet, daß die Ölzuführungseinrichtung ein hohles Rohr (37) mit einem sich axial erstreckenden Durchgangsloch (40), einen Kolben (38), der in das hohle Rohr (37) so eingepaßt ist, daß er in dessen axialer Richtung gleitbar ist, sowie ein elastisches Rückschlagventil (42) aufweist, welches für den Betrieb des Durchgangsrohrs (40) des hohlen Rohrs (37) mit einer Lippe (43) ausgestattet ist.

5. Schmiermittelverteiler nach einem der vorhergehenden Ansprüche, gekennzeichnet durch

eine Ölleitung (18), die in dem Schmiermittelverteiler (12) gebildet ist und mit der Mischeinrichtung (26, 28, 56, 62) in Verbindung steht und eine Einlaßeinrichtung (20) einschließt, die mit einer Ölpumpe (14) und einer Auslaßeinrichtung in Verbindung steht;
eine Ölzuführungseinrichtung (34), die in der Ölleitung (18) vorgesehen ist, um der Mischeinrichtung (26, 28, 56, 62) eine vorbestimmte Menge des Schmieröls zuzuführen;
eine Luftleitung (30), die in dem Schmiermittelverteiler (12) gebildet ist und mit der Mischeinrichtung (26, 28, 56, 62) in Verbindung steht; und
eine Luftzuführungseinrichtung (36), die in der Luftleitung (30) vorgesehen ist, um der Mischeinrichtung (26, 28, 56, 62) eine vorbestimmte Menge der Druckluft zuzuführen.

6. Schmiervorrichtung für eine Strickmaschine, aufweisend den Schmiermittelverteiler nach einem der vorhergehenden Ansprüche.

7. Verwendung des Schmiermittelverteilers nach einem der Ansprüche 1 bis 5 für eine Strickmaschine.

Revendications

1. Distributeur de lubrification (12) comprenant

un moyen mélangeur (26, 28, 56, 62) servant à mélanger de l'huile lubrifiante et de l'air comprimé pour débiter l'huile lubrifiante à l'extérieur en la transportant dans l'air comprimé ;
un moyen d'amenée d'huile (38) servant à amener l'huile lubrifiante audit moyen mélangeur (26, 28, 56, 62) en une quantité prédéterminée ;
un moyen d'amenée d'air (36) servant à amener l'air comprimé audit moyen mélangeur (26, 28, 56, 62) en une quantité prédéterminée ;
dans lequel ledit moyen mélangeur (26, 28, 56, 62) comprend une buse d'étranglement (26)

servant à débiter l'huile lubrifiante et une section (28) de soufflage d'air comprimé autour de ladite buse de réglage (26) pour souffler et guider l'air comprimé,

caractérisé par
une section de mélange huile/air (60, 62) communiquant avec la buse d'étranglement (26) pour débiter l'huile lubrifiante et avec la section (28) de soufflage d'air comprimé, et pour souffler et guider l'air comprimé dans la section de mélange, la section de mélange huile/air (60, 62) communiquant en outre avec un moyen de sortie d'huile (24).

2. Distributeur de lubrification selon la revendication 1, caractérisé en ce que ledit moyen d'amenée d'huile (38) et ledit moyen d'amenée d'air (36) sont construits de manière à régler le débit de l'huile lubrifiante et/ou le débit de l'air comprimé.

3. Distributeur de lubrification selon la revendication 1, caractérisé en ce que ledit moyen d'amenée d'huile (38) est construit de manière à amener l'huile lubrifiante de façon intermittente.

4. Distributeur de lubrification selon la revendication 1 ou 3, caractérisé en ce que ledit moyen d'amenée d'huile comprend une tige creuse (37) présentant un trou traversant (40) s'étendant axialement, un piston (38) monté sur ladite tige creuse (37) de manière à coulisser dans sa direction axiale, et un clapet anti-retour élastique (42) muni d'une lèvre (43) et ayant pour fonction d'actionner ledit trou traversant (40) de ladite tige creuse (37).

5. Distributeur de lubrification selon une quelconque des revendications précédentes, caractérisé par :

un passage d'huile (18) défini dans le distributeur de lubrification (12), communiquant avec ledit moyen mélangeur (26, 28, 56, 62) et comprenant un moyen d'entrée (20) qui communique avec une pompe à huile (14) et avec un moyen de sortie ;

une soupape d'amenée d'huile (34) prévue dans ledit passage d'huile (18) pour amener l'huile lubrifiante audit moyen mélangeur (26, 28, 56, 62) en une quantité prédéterminée ;
un passage d'air (30) défini dans le distributeur de lubrification (12) et communiquant avec le moyen mélangeur (26, 28, 56, 62) ; et
une soupape d'amenée d'air (36) prévue dans ledit passage d'air (30) pour amener de l'air comprimé audit moyen mélangeur (26, 28, 56, 62) en une quantité prédéterminée.

6. Dispositif de lubrification pour une machine à tricoter, qui comprend le distributeur de lubrification



selon une quelconque des revendications précédentes.

7. Emploi du distributeur de lubrification selon une quelconque des revendications 1 à 5 pour une machine à tricoter. 5

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