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AIR CIRCULATION ARRANGEMENT FOR SPINNING APPARATUS

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Fig. 1

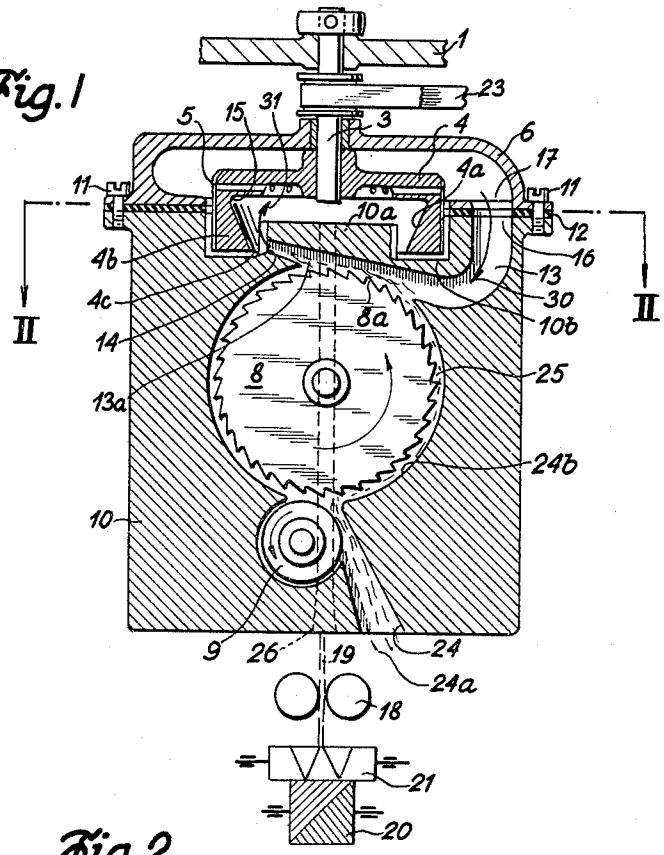
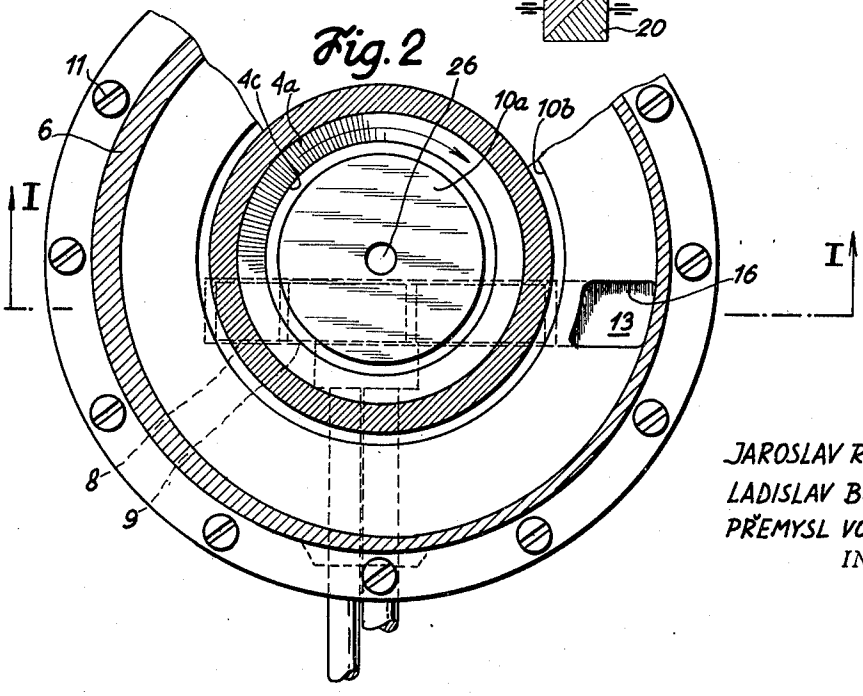


Fig. 2



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AIR CIRCULATION ARRANGEMENT FOR SPINNING APPARATUS

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ABSTRACT OF THE DISCLOSURE

Air sucked with entrained fibers into a rotary spinning chamber is recirculated from the outlet of the spinning chamber back into the inlet of the same in a continuous stream along a closed path, while new fibers are continuously supplied into the circulating stream of the same air and separated from the same in the spinning chamber.

BACKGROUND OF THE INVENTION

The present invention relates to spinning apparatus in which a spinning chamber having an inlet and an outlet is rotated so that air is sucked into the inner cavity of the spinning chamber and discharged through the outlet by the centrifugal force. Fibers entrained in the air entering the cavity are spun into a rope of yarn which is withdrawn along the axis of rotation of the spinning chamber. A combing roller forms fibers of a supplied sliver, and orients the same while transporting the fibers into the air inlet duct which leads into the cavity of the spinning chamber.

In spinning apparatus of this type according to the prior art, air is continuously sucked into the spinning chamber and discharged from the same while the fibers are retained in the spinning chamber. In spinning apparatus according to the prior art, the air discharged from the spinning chamber is guided by exhaust channels which pass through the spinning apparatus and then under the floor of the room in which the spinning apparatus is located to a discharge area. The building and cleaning of the exhaust channels is fairly expensive. Another disadvantage of apparatus according to the prior art is that dirt, dust and other foreign particles in the proximity of the spinning apparatus, enter the supply channel of the spinning chamber and are transported by the combing roller and the airstream produced by the rotating spinning chamber into the cavity of the spinning chamber so that not only the operation of the spinning chamber is detrimentally affected, but also some foreign particles are embedded into the spun rope of yarn reducing the quality of the same.

While it may be possible to provide the inlet of the spinning apparatus with a suitable filter to prevent the entry of foreign bodies into the supply channel and spinning chamber, the filter would be gradually covered with dust so that the stream of air entering the apparatus would encounter great resistance. Furthermore, a greater amount of air would enter the apparatus when the filter is clean, as compared with a partly or completely dust covered filter so that it would be necessary to very frequently clean the filters so as to maintain uniform operational conditions. The servicing and cleaning of the filters would increase the costs of operation.

Another disadvantage of the prior art is that some fibers which are not utilized for the formation of the spun yarn, escape from the spinning chamber through

the air outlet openings into the exhaust channels and are wasted.

SUMMARY OF THE INVENTION

It is one object of the invention to provide an air circulation arrangement for a spinning apparatus which recirculates the same air which has passed through the spinning chamber.

Another object of the invention is to entrain the fibers supplied to the spinning chamber in clear and dust-free air.

Another object of the invention is to use all fibers supplied to the spinning chamber for the spun yarn, and to prevent escape and wasting of fibers together with the air discharged from the spinning chamber.

With these objects in view, the present invention provides a spinning chamber with a conduit connecting the outlet ducts of the spinning chamber with the inlet of the same so that the air which carries the fibers into the spinning chamber is continuously recirculated along a closed path.

One embodiment of the invention comprises a spinning chamber formed with an inner cavity having an inlet, and an outlet radially outward of the inlet, conduit means outside of the cavity connecting the outlet with the inlet, and feeding means for feeding fibers into the conduit means.

Since the conduit means and the cavity of the spinning chamber are filled with air, the centrifugal force drives the air out of the spinning chamber through the outlet, and sucks air, together with fibers, into the inlet of the cavity of the spinning chamber. Since the conduit means and the spinning chamber form a closed endless path, air continuously circulates through the conduit means and the spinning chamber, being mixed with new fibers every time before entering the inlet of the spinning chamber.

Since the air is continuously circulated, and no fresh air enters the spinning chamber, the air which carries the fibers is free of dust and foreign particles, and no exhaust channels have to be provided for the spinning apparatus.

In the preferred embodiment of the invention, the conduit means includes a housing and a dished cover detachably secured to the housing. The spinning chamber is partly located in a recess of the housing, and partly located within the dished cover so that an annular air chamber communicating with the outlet of the spinning chamber is formed in the cover. The housing is formed with a conduit portion communicating with the annular air chamber and with the inlet of the spinning chamber so that air discharged through the outlet of the spinning chamber enters the annular air chamber, flows through the inlet conduit portion of the housing and through the inlet into the cavity of the spinning chamber.

The housing has a supply passage in which a supply roller transporting a sliver is located, and widens to receive a combing roller which forms separated fibers of the supplied sliver and has a peripheral portion located in a lateral opening of the conduit portion in the housing to transport oriented fibers into the airstream flowing through the inlet conduit portion into the inlet of the spinning chamber.

The cover is detachably attached to the housing so that by removing the cover, the spinning chamber, and also the conduit portion in the housing become accessible for cleaning and servicing.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be

best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side view, partially in section, illustrating an embodiment of the invention; and

FIG. 2 is a fragmentary sectional view illustrating a part of the embodiment shown in FIG. 1 on a larger scale.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A spinning chamber **4** is secured to a shaft **3** carrying a pulley connected by an endless belt **23** with a drive pulley connected by an endless belt 23 with a drive pulley of a motor, not shown, so that the spinning chamber is rotated. Shaft **3** of spinning chamber **2** is suspended on a frame wall **1** having a bearing for shaft **3**. Spinning chamber **4** has a frusto-conical cavity **4***a* and a peripheral wall **4***b* forming a central opening **4***c*. Outlet ducts **5** connect the cavity **4***a* with the outer peripheral surface of the circular wall **4***b*. A circular fiber collecting face **15** is located in the region of the greatest diameter of the cavity **4***a* of the spinning chamber. The inner ends of the outlet ducts **5** are located radially inward of the circular fiber colecting face **15**, while the outer ends of the outlet ducts are located radially outwardly of the same.

A dished cover **6** has a flange detachably secured by bolts and nuts **11** to a corresponding flange of the housing **10**, and a sealing means **12** is located between the abutting faces of cover **6** and housing **10**.

The upper portion of the spinning chamber **4** is located within the space formed by cover **6**, so that an annular air chamber surrounds the outlet ducts **5** of spinning chamber **4**.

Housing **10** has a circular portion **10***a* projecting into the central opening **4***c* and defining a narrow gap with the peripheral wall **4***b*. Projection **10***a* is surrounded by a circular groove **10***b* receiving the lower portion of the peripheral wall **4***b*.

A conduit portion **13** in housing **10** has one end **16** communicating with the annular air chamber **5** through an outlet opening **17**, and a gradually tapering other end having an outlet **14** opening into the annular inlet of cavity **4***a* formed by the annular gap **4***c*. The outlet **14** of the conduit portion **13** is located inwardly of the fiber collecting surface **5**, and spaced substantially the same radial distance from the axis of rotation of spinning chamber **4** as the inner end of outlet ducts **5**.

Housing **10** also has a supply conduit **24** leading to a supply roller **9** rotating in counterclockwise direction for transporting a sliver **24***a* to a circular enlargement **24***b* of supply duct **24** in which a combing roller **8** rotates in counterclockwise direction. The shafts of rollers **9** and **8** are driven by suitable drive means, not shown.

A peripheral portion **8***a* of combing roller **8** is located in a lateral opening **13***a* of conduit portion **13**. The rotating combing roller **8** separates the fibers of sliver **24***a* and transports the fibers into the inlet conduit portion **13** so that the fibers are entrained in air flowing in the direction of the arrow **30** and enter the cavity **4***a* through the outlet **14** of inlet conduit portion **13**. The span rope of yarn produced by the rotating spinning chamber **4** is withdrawn through a channel **26** coaxial with the rotary spinning chamber by a pair of transporting rollers **18** which transport the spun yarn to a winding mechanism including a winding roller **21** and a bobbin **20**.

OPERATION

Supply roller **9** and combing roller **8** are driven in counterclockwise direction by a motor, not shown, while spinning chamber **4** is rotated by the pulley and belt drive **23**. A sliver **24***a* supplied into passage **24** is transported by supply roller **9** to combing roller **8** whose peripheral surface is preferably covered with wire cloth so that fibers are separated from the sliver and carried into the inlet conduit portion **13**.

Rotation of the spinning chamber causes rotation of the air in cavity **4***a* so that the centrifugal force drives the air out of cavity **4***a* and through outlet ducts **5** into the annular chamber **5** so that suction is created in the cavity **4***a*, while air is driven in the direction of the arrow **30** from the annular chamber **5** through openings **17** and **16** into the inlet conduit portion **13** so that the fibers supplied by combing roller **8** are entrained in the airstream and enter the inner cavity **4**.

The air flows in the inner cavity **4***a* in the direction indicated by the arrow **31** into the inner ends of outlet ducts **5** while the fibers accumulate along the rotating circular collecting face **15** which is located radially outwardly of the path **31** of air flowing through cavity **4***a*. During continuous rotation of spinning chamber **4**, the air is again recirculated through cavity **4***a*, annular chamber **5**, and conduit portion **13**, carrying fibers produced by combing rollers **8** into the spinning chamber and leaving the same without the fibers.

Fibers collect in the region of the greatest diameter of cavity **4***a* along the fiber collecting face **15** and are spun in a manner well known to those skilled in the art into a yarn withdrawn through the central passage **26** by the pair of transporting rollers **18**. It is evident that the pressure in the annular chamber **5** is greater than the pressure in cavity **4***a* and in the conduit portion **13** so that continuous circulation of air is assured. Channel **26** for the spun yarn **19** is located beyond the end of combing roller **8**.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of spinning apparatus with a rotary spinning chamber supplied with fibers by an airstream differing from the types described above.

While the invention has been illustrated and described as embodied in a spinning chamber whose air inlet and air outlet are connected by a conduit so that the air carrying fibers into the spinning chamber is continuously recirculated along a closed endless path, it is not intended to be limited to the details, shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. Air circulation arrangement for spinning apparatus, comprising, in combination, a spinning chamber driven to rotate about an axis of rotation and being formed with an inner cavity having an inlet and at least one outlet radially outward of said inlet; conduit means connecting said outlet with said inlet and forming with said inner cavity of said spinning chamber a closed path for the circulation of air, said conduit means forming with said spinning chamber a space in which said outlet rotates and including a conduit portion having one end connected with said space and the other end connected with said inlet so that air driven by the action of the centrifugal force out of said outlet into said space flows from said one end of said conduit portion and into said inlet, and is continuously circulated along said closed path; and feeding means for feeding fibers into said conduit portion so that the air stream flowing in the same entrains the fibers and transports the same through said inlet into said chamber where a yarn is spun of the fibers while the air flows out of said outlet and through said space and said conduit portion, and is recirculated through said spinning chamber with new fibers entrained therein.

2. Air circulation arrangement as claimed in claim **1** wherein said space includes an annular air chamber sur-

rounding said spinning chamber in the region of said outlet to receive air discharged from the same, said conduit portion having one end opening into said air chamber.

3. Air circulation arrangement as claimed in claim 2 wherein said conduit portion is formed with a lateral opening between said ends; and wherein said feeding means includes a feeding roller having a peripheral portion located in said opening, and a supply passage for supplying fibers to said feeding roller.

4. Air circulation arrangement as claimed in claim 3 wherein said feeding roller is a combing roller, and comprising a supply roller for supplying a sliver through said supply passage to said combing roller.

5. Air circulation arrangement as claimed in claim 2 wherein said spinning chamber has an outer peripheral surface; wherein said outlet includes a plurality of outlet ducts uniformly spaced about said peripheral surface and surrounded by said annular air chamber.

6. Air circulation arrangement as claimed in claim 5 wherein said cavity of said spinning chamber has a frustoconical inner surface having in the region of the greatest diameter thereof a circular collecting face for collecting and spinning fibers, wherein said outlet ducts have inner ends located radially inward of said collecting face and outer ends located radially outward of the same; and wherein said inlet is located radially inward of said collecting face so that air flows from said inlet to said inner ends of said outlet ducts along a path inward of said collecting face and of fibers deposited thereon.

7. Air circulation arrangement as claimed in claim 1 wherein said conduit means includes a housing and a cover attached to said housing; wherein said cover forms with said housing said space in which said spinning chamber is located so that an annular air chamber communicating with said outlet is formed in said space; wherein said housing is formed with said conduit portion having said one end communicating with said annular air chamber and said other end opening into said inlet so that air discharged through said outlet into said annular air chamber flows through said conduit portion and through said inlet into said cavity of said spinning chamber.

8. Air circulation arrangement as claimed in claim 7 wherein said spinning chamber has a peripheral circular wall having a central opening forming said inlet into said cavity; wherein said housing has a circular projection into said central opening, and a circular recess surrounding said circular projection and receiving the lower portion of said peripheral circular wall; wherein said other end of said conduit portion is located in said circular projection; and wherein said cover is dished to receive the upper portion of said peripheral circular wall.

9. Air circulating arrangement as claimed in claim 7 wherein said conduit portion is formed with a lateral opening between said ends; wherein said housing is formed with a supply passage for a sliver; wherein said feeding means includes a combing roller located in said supply passage and having a peripheral portion located in said lateral opening of said conduit portion, and a supply roller in said supply passage for transporting the sliver to said combing roller.

10. Air circulating arrangement as claimed in claim 7 wherein said spinning chamber has an outer peripheral surface; wherein said outlet includes a plurality of outlet ducts uniformly spaced about said peripheral surface and surrounded by said annular air chamber.

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JOHN PETRAKES, Primary Examiner

U.S. Cl. X.R.

57—58.95