United States Patent [19]

Nakahara et al.

[11] **3,857,228**

[45] **Dec. 31, 1974**

[54] **TWISTING FRAME**

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[73] Assignee: **Murata Kikai Kabushiki Kaisha,** Kyoto, Japan

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[21] Appl. No.: **407,621**

[30] **Foreign Application Priority Data**

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Feb. 16, 1973 Japan 48-19512
Feb. 22, 1973 Japan 48-21855

[52] **U.S. Cl.** **57/56**
[51] **Int. Cl.** **D01h 11/00**
[58] **Field of Search** ..... 57/34 R, 1 R, 56, 57, 92, 57/104, 136, 137, 34.5

[56] **References Cited**

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Primary Examiner—Donald Watkins

[57] **ABSTRACT**

A twisting frame is provided with a covering duct which covers a running second covering duct which covers a twisting unit provided with a twisting spindle, a main duct which is arranged on, and extends along the whole length of the frame, wherein the belt covering duct, said twisting unit covering duct and the main duct are connected to each other so that fly waste, heat and noise generated by the twisting operation may be delivered to the outside by an air stream which is induced by the running of said belt.

8 Claims, 13 Drawing Figures

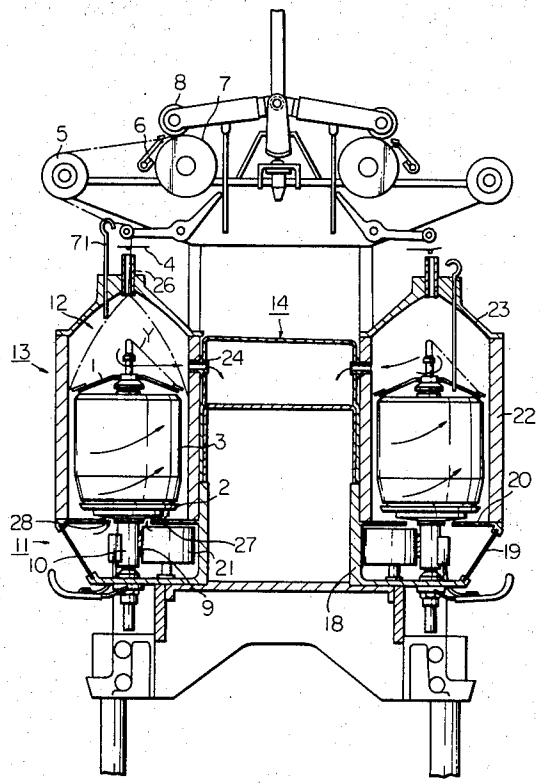
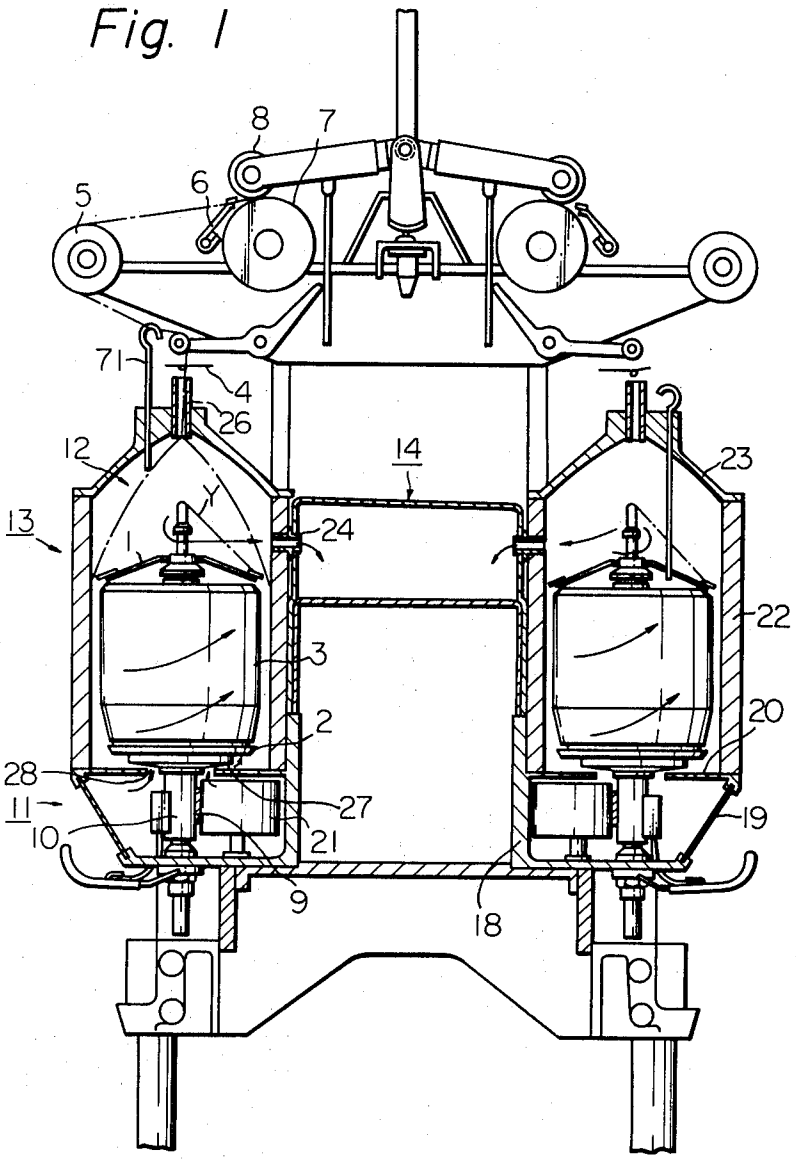


Fig. 1



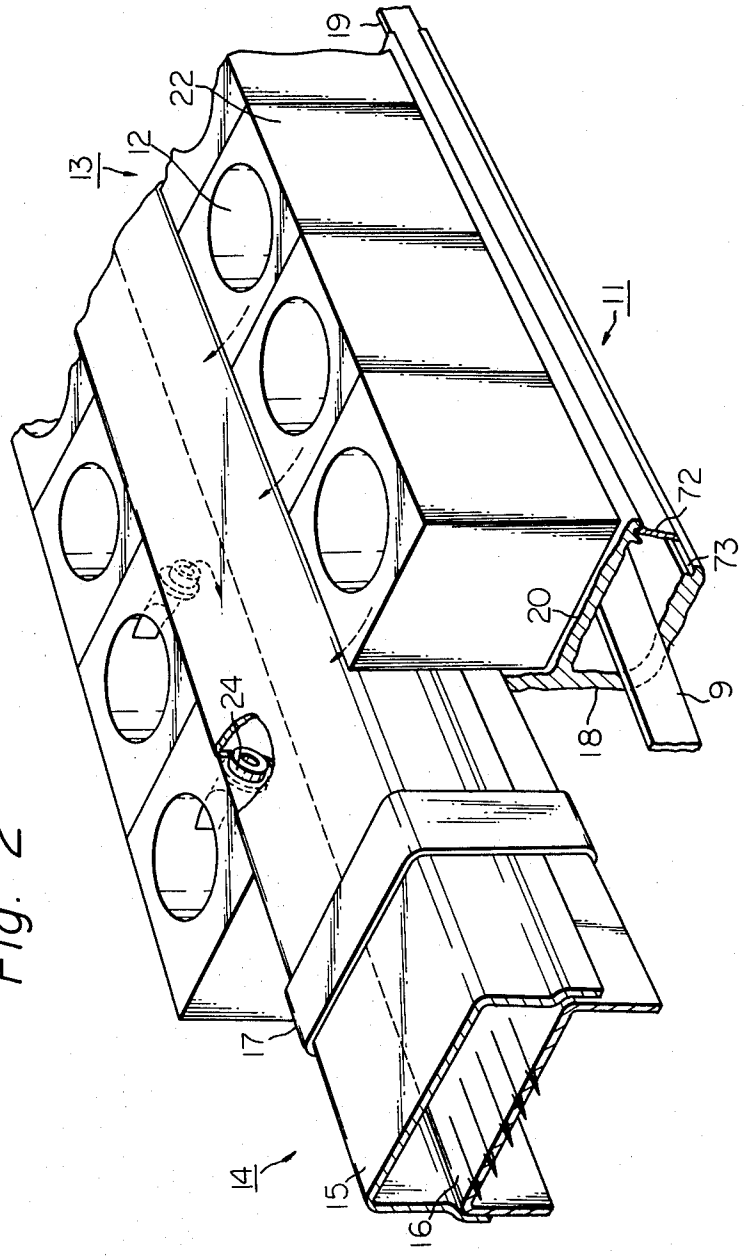


Fig. 2

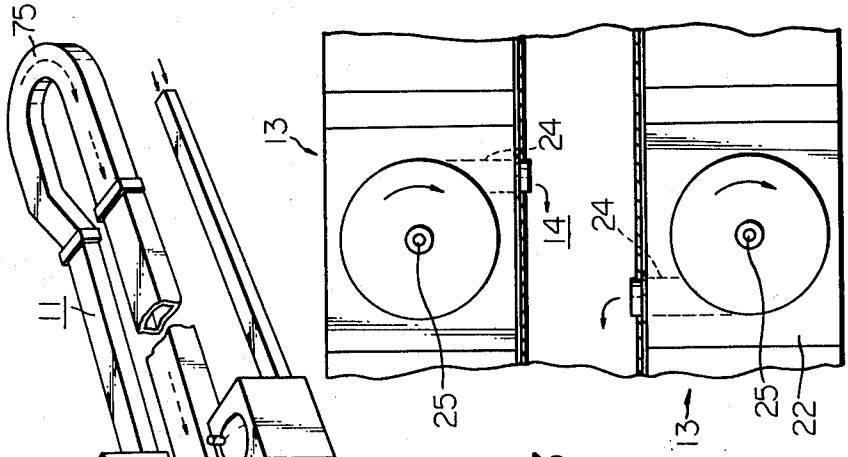


Fig. 3

Fig. 4

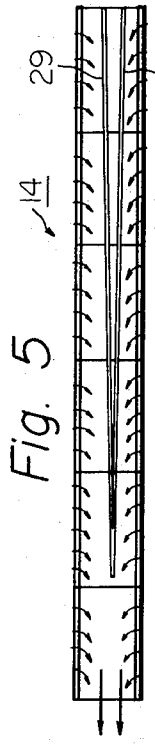


Fig. 5

Fig. 6

Fig. 7

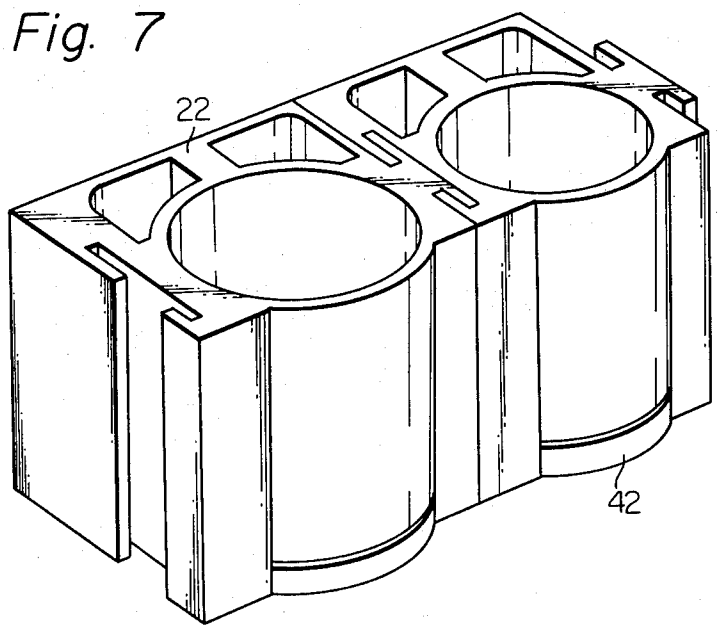


Fig. 8

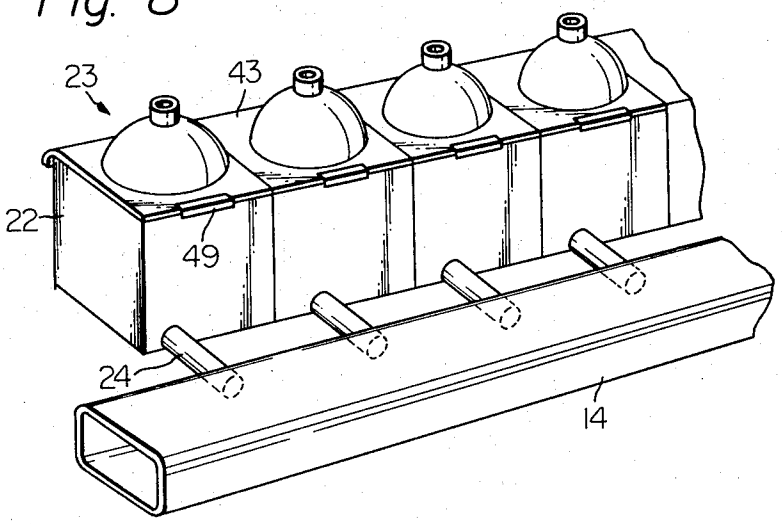


Fig. 9

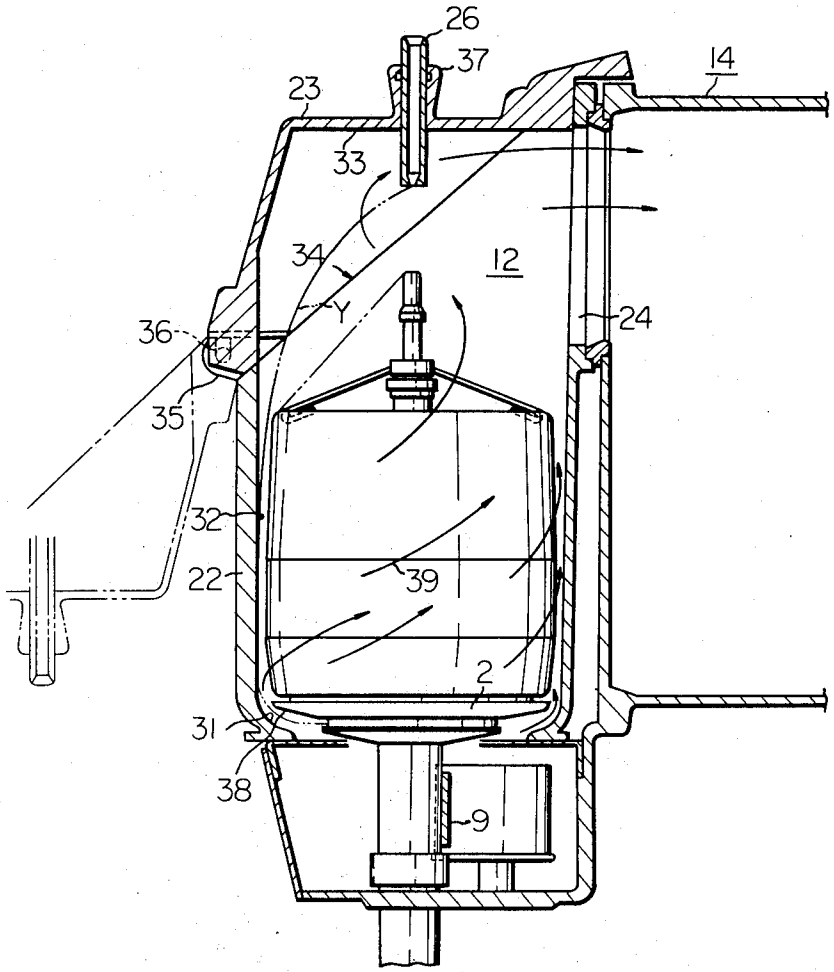
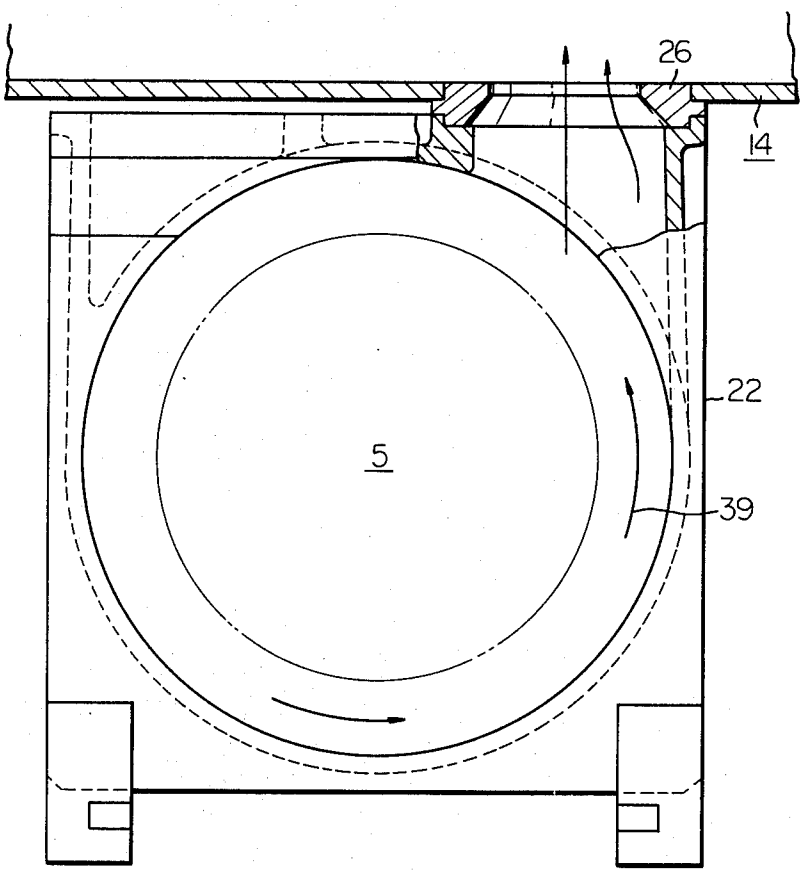


Fig. 10



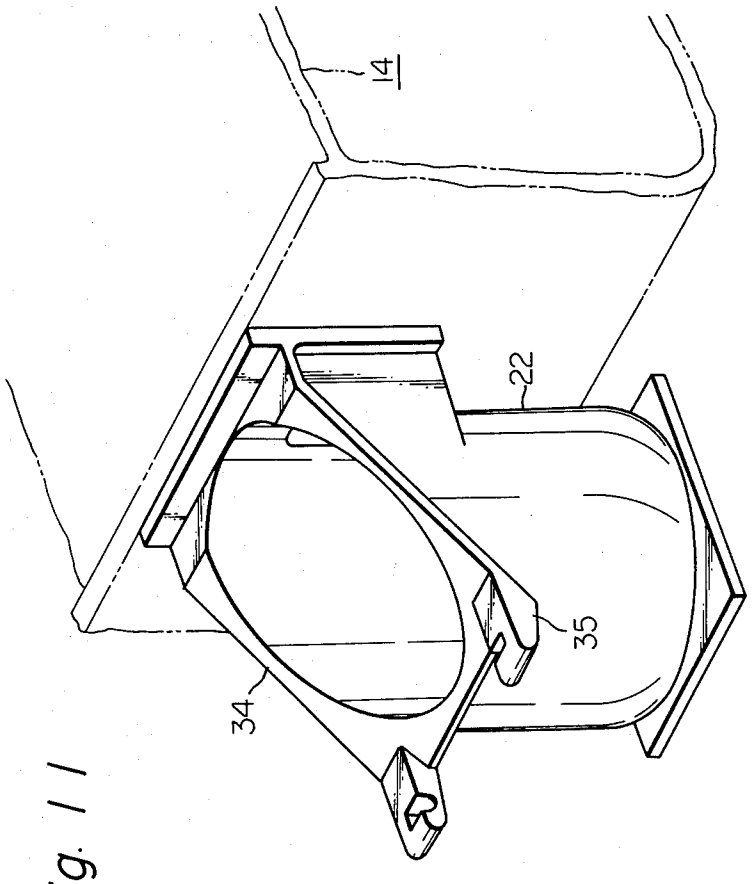


Fig. 11

Fig. 12

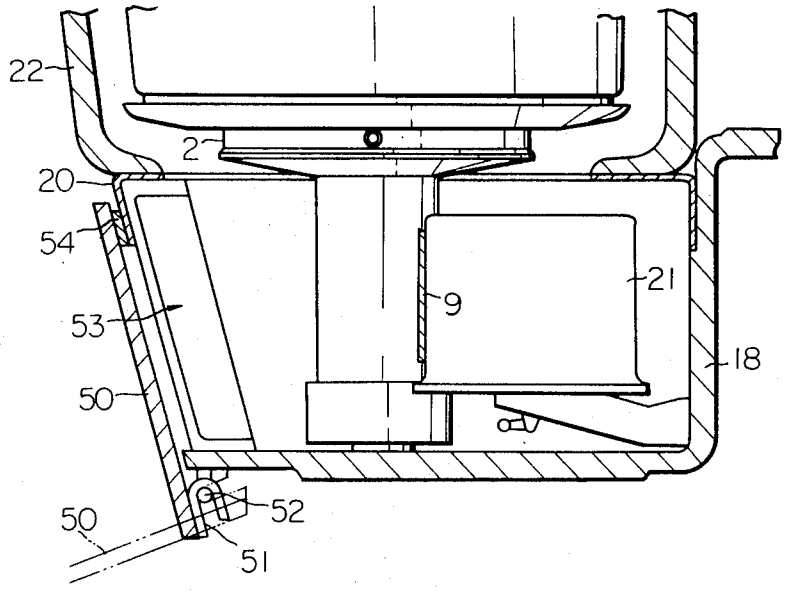
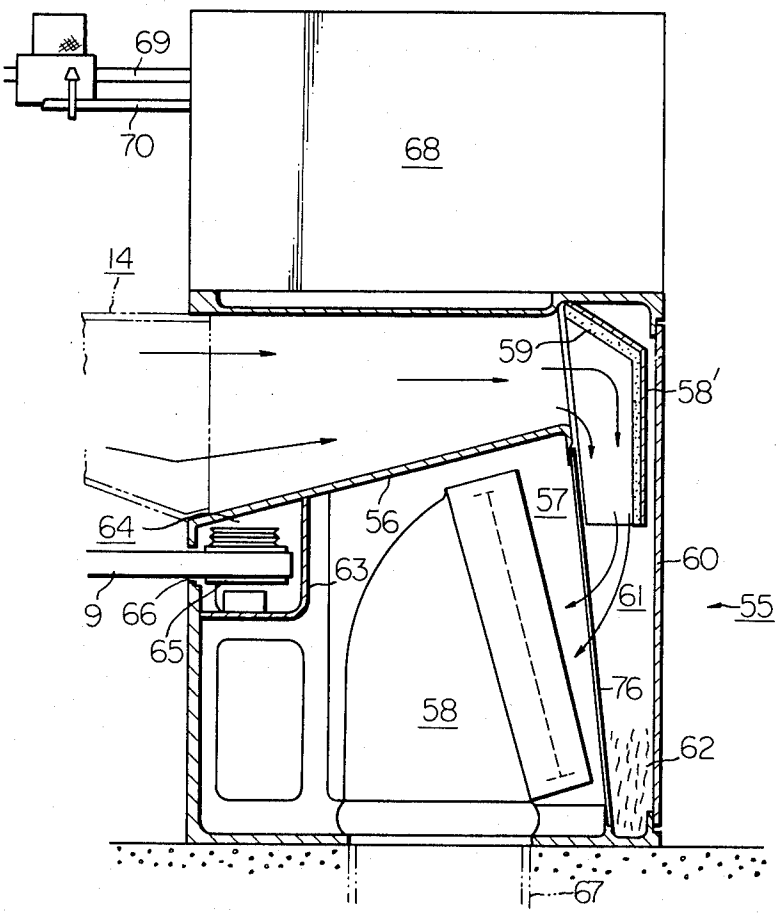


Fig. 13



TWISTING FRAME

The present invention relates to a covering apparatus for the twisting unit of a twisting frame, such as a ring twister, and a two-for-one twister.

A twisting frame, especially of a two-for-one type or doubling and two-for-one type, is provided with a plurality of twisting units arranged in a row along either side of said twisting frame. Also, such a twisting unit comprises a spindle part and a winding up part for the twisted yarn. On twisting a yarn, said spindle is rotated by a common driving source, such as a tangential belt, which runs along said spindle row and is driven by an electric motor at the end of the frame.

In this type of arrangement, when the twisting operation takes place by said twisting unit, some problems are inevitable, such as the generation of a disturbed air stream, irritating noise, and undesirable heat. Still another difficulty is the generation of fly waste in the space surrounding said twisting unit. These conditions are undesirable.

In the conventional twisting frame, especially the two-for-one type which is not provided with a covering for the spindle driving apparatus, generation of a disturbed air stream about the spindle unit and also around the running belt is caused by the high speed linear running of the tangential belt or the high speed ballooning of the yarn being twisted. In addition to this, generation of heat and noise in the area of the driving apparatus for said spindle can occur. This generation of heat affects not only surrounding air conditions but also working conditions, in that the surrounding air temperature is increased. As the surrounding air temperature increases, the yarn being twisted also becomes heated and the resultant twisted yarn is uneven and of a poor quality.

Furthermore, fly waste from a yarn being twisted contaminates the surrounding air. The result is that eventually, the fly waste penetrates the inside of the antifriction bearing. Consequently, the bearing wears out more quickly and has a decreased working life. Also, fly waste can accumulate on the surface of a part of the machine only to be blown away by the disturbed air current resulting from the running of the belt or the rotation of the spindle. This waste can then be entangled on the surface of a yarn being twisted. The resultant yarn may then have slubs thereon and must be considered defective. Obviously, normal operating conditions depend on avoiding the generation of both heat and fly waste.

The present invention is aimed at providing a new type of twisting unit which avoids the aforementioned objectionable features. The twisting unit of the present invention comprises a covering for the running belt, a covering for the twisting unit which is provided with a spindle, an elongated duct extending along the length of the machine frame and several connections between both of said coverings and said duct. The air stream induced by the running belt and the rotation of the spindle conveys fly waste, noise and heat out of the machine and because of this particular arrangement of the twisting unit, the aforementioned difficulties can be avoided, ensuring optimum operation.

Further features and advantages of the present invention will be made clear from the following description, reference being made to the accompanying drawings, wherein:

FIG. 1 shows a sectional view of a two-for-one type of twisting machine,

FIG. 2 shows a partial perspective view of the present assembly,

FIG. 3 shows a plane view of the connection between the main duct and the covering of the twisting unit,

FIG. 4 shows a perspective view of the main duct and the covering of the twisting unit connected to each other,

FIG. 5 shows a sectional plane view of the main duct,

FIG. 6 shows a perspective view of the covering of twisting unit and its cover,

FIG. 7 shows a perspective view of an embodiment of the covering of a twisting unit,

FIG. 8 shows a perspective view of an embodiment of the covering of a twisting unit and a duct,

FIG. 9 shows a sectional view of an embodiment of a twisting assembly,

FIG. 10 shows a plane view of the side wall of the embodiment in FIG. 9,

FIG. 11 shows a perspective view of the side wall of the embodiment in FIG. 9,

FIG. 12 shows a partial sectional view of an embodiment of the twisting unit,

FIG. 13 shows a sectional view of an air suction unit.

Referring to FIG. 1, a yarn Y to be twisted in a known manner, extends from a package to the center hole of a spindle via a tension flyer 1 so that a proper tension can be applied. Twist is applied to said yarn by rotation of the storage disc 2, while yarn ballooning is formed under a lappet 4. Said twisted yarn is finally wound up onto the take-up package 8 driven by a roller 7, together with a feed roller 5 and a traverse guide 6. Said hollow spindle and said storage disc can be turned by power transmission, which takes place between a running belt 9 and a spindle wharve 10. This driving power for the spindle can be transmitted from the belt with the assistance of a tension pulley 21. The belt 9 running lengthwise along the frame is covered by a covering duct 11. A twisting unit 12 of which there are preferably several placed on both sides of the frame as shown in FIGS. 1 and 4, are each provided with a spindle and covered by a covering duct 13. A main duct 14 extending lengthwise along the center of the frame is also provided. The main duct 14, shown in FIG. 2, is made of a plastic material or two metal sheets 15 and 16 of U-shape configuration, with the side portion of one sheet overlapping the other. If the length of the main duct 14 is rather short, and the sheets are connected to each other by butt joints, a band sheet 17 is arranged overlapping the area of said butt joint so as to maintain air tightness. The benefits from said main duct construction are that they can be handled with ease in transportation, and also they can be easily cleaned by any of the cleaning processes. The configuration of the main duct 14 is such that one end of the duct is closed and the other end is opened, thus allowing the air stream to flow through easily. If necessary, an air suction apparatus may be arranged, as described hereinafter, at the open end of the main duct to increase or to maintain air flow through the duct.

The covering duct 11 consists of a spindle rail 18, made of cold drawn aluminum or other suitable material, and a cover sheet 19 made of a flexible sheet, such as plastic or other suitable material. This covering sheet 19 may be assembled into the upper and lower grooves

72 and 73 of the spindle rail 18 after the belt 9 is arranged within the covering duct 11.

The upper wall 20 of the spindle rail 18 also constitutes the bottom of covering duct 13 of, as more fully described hereinafter. A plurality of round openings are provided on the upper wall 20, so that a spindle assembly can be inserted into one of said openings and fixed to said wall in a given arrangement. One end of the belt covering duct 11, through which said end belt 9 enters may be open. If desired, the belt 9 can be connected to the fan duct.

Covering duct 13 covers the twisting unit 12 and is provided with a rectangular side wall 22 which constitutes a part of the covering duct 13. A cylindrical cavity, which contains a twisting zone 12, is placed in the side wall 22 and extends therethrough. A top cover 23 is placed over said covering duct 13. The arrangement of the plurality of side walls 22 is such that they are arranged in order, side by side in close relation and are also fixed onto said upper wall 20 of the spindle rail 18. One modified embodiment of the side wall 22 may have a bottom wall on which a round hole of proper diameter is provided.

As shown in FIG. 3 an air pipe 24 is connected between said main duct 14 and the side wall 22, so that the cylindrical cavity in side wall 22 can communicate with the main duct 14. Pipe 24 is arranged with its center line tangential to the helical air flow path, which air flow is generated by the rotation of the spindle 25. At the top center of the top cover 23 in FIG. 1, a yarn outlet pipe 26 is provided, through which a twisted yarn can be delivered to the winding unit.

As the belt 9 enters and runs within the length of said belt covering duct 11, an air stream will be directed with it into said duct 11 from the open end and at the same time the storage disc 2 is turned by the belt 9. Thus, air within said covering duct 11 will flow in the direction indicated by arrow 27, i.e., from the cavity of the covering duct 11 into the cylindrical cavity of said wall 22 via a space 28 defined by the opening of the upper wall 20 and the outer surface of the spindle wharve 10, as well as by the upper surface of the upper wall 20 and the lower surface of the storage disc 2.

Then, said air flow which flows in a helical path, is directed upward, passing through the space arranged between the inside cylindrical surface of the side wall 22 and the outside cylindrical surface of the pot 3. By this helical flow, the air stream may convey fly waste, heat, and noise toward the inside of the main duct 14 via the air pipe 24. According to the revolutional direction rotation of the helical air stream, in addition to the closed condition of one end of the main duct 14, the air stream conveying fly waste, heat and noise can be directed toward the open end of said main duct 14.

The arrangement shown in FIG. 4 comprises a main duct 14, two belt covering ducts 11 and the connecting ducts 75 and 74. Said duct 75 connects the rear end of the main duct 14 to the rear end of one of the covering ducts 11 in accordance with the running direction of the belt 9, while the duct 74 connects the front part of the main duct 14 to the rear end of other covering duct 11. As the belt 9 runs within the covering duct 11, it is accompanied by an air stream, as mentioned above, and said air stream flows out from the rear end of either covering duct 11, so that a smooth flow occcurs within said main duct 14.

Another embodiment of the main duct 14 is shown in FIG. 5 and provides two dividing sheets 29 and 30 inside of the main duct to divide it into two separate ducts along a selected length of the main duct. The ducts increase in cross section toward the downstream end of the main duct. Thus, the downstream air is smooth. Although the dividing sheets are not essential to proper operation of the invention, they are preferred. The dividing sheets prevent opposed air streams entering the duct 14 from two separate groups of twisting units (as shown in FIG. 4) from interfering with each other and disrupting the smoothness of air flow in the main duct.

Other embodiments 13 for the covering duct of the twisting zone are shown in FIG. 6, FIG. 7 and FIG. 8. A covering duct 13, shown in FIG. 6, provides a groove 40 in one of its outer side surfaces and a projection 41 on another outer side surface. Two such ducts 13 can be arranged side by side in closely contacted relation, by inserting the projection 41 of one duct into the groove 40 of the adjacent duct. It is recommended that a window 42, made of a transparent plate as shown in FIG. 7, be provided at the bottom part of said covering duct 13. The provision of said window will enable easy inspection of the helical yarn path, starting from the edge of the storage disc 2.

As shown in FIG. 6, a top cover 23 consists of a square plate 43 with a circular center opening, a hemispherical plate 44 and a yarn outlet pipe 26 at the top of hemispherical plate 44. Above the top surface of wall 22, there is provided a guide plate 46 which has a T-shaped projection 45. When two edges of said square plate 43 are slidably inserted into the guide ways of the T-shaped projections 45 of two adjacent guide plates, the top cover 23 can be easily placed in proper position on the top surface of the side wall 22. The guide plate 46 can be conveniently mounted to the top of the side wall 22 by welding, or, more preferably, guide plate 46 can be mounted to the wall 22 by the provision of spring 48 arranged between the guide plate 46 and a stud 47 mounted on the side wall 22. By this latter arrangement, the guide plate 46 may be urged onto the top surface of the side wall 22 by a spring force. In the embodiment of FIG. 8, the square plate 43 may be mounted onto the side wall 22 by providing a hinge 49 between them. Mounting the square plate 46 onto the side wall 22 by means of either method described above makes replacing the yarn package or mending broken yarn a rather simple procedure. The configuration of the hemispherical plate 44 on the square plate 43 is such that it does not interfere with ballooned yarn.

In FIG. 9, another embodiment of the covering duct 13 for the twisting zone is shown. The side wall 22 of this embodiment has a concave surface 31 which gently tapers off at the bottom of the inside cylindrical surface. Said inside cylindrical surface has a tapered surface 32, the diameter of which is larger at the uppermost portion than that at the lowermost portion as viewed in FIG. 9. The configuration of the side wall 22 is such that, in cross section it is round, but its upper part is cut off by an inclined plane 34. An air opening 24 (air pipe) is provided in the upper portion of the side wall 22 and connects the twisting zone to the main duct 14, the air opening 24 is situated in the side wall 22 at a position far from that portion of the surface of said side wall 22, which a ballooned yarn touches. To cover the top part of a twisting unit 12, as shown in

FIG. 9, a top cover 23 is provided on the inclined plane 34. The top cover 23 can be pivoted to the dotted line position shown in FIG. 9 because of the pivotal connection to side wall 22 by means of pin 36. When this cover is moved aside, replacement of a yarn package or repair of a broken yarn may be effected as indicated by the two dot bar line in FIG. 9. The yarn outlet pipe 26 can be secured to the top cover 23 by means of an O-ring 37, thus making is possible to vary the height of said yarn outlet pipe 26 relative to the cover 23, in order to control the height of the ballooned yarn, and consequently, to control the balloon tension for a twisted yarn.

An air stream 38, induced by the rotation of the storage disc 2, is directed smoothly upward after flowing along the concave surface 31, and continues to flow upward in a helical path. In this case, the helical turning direction of the air 39 is the same as the rotation of the storage disc 2. The upward flowing speed of the air 39 has more force because of the tapered surface configuration 32 of the cavity. When the air flow finally enters the under surface 33 of the top cover 23, it is then delivered into the main duct 14 via the opening 24.

In FIG. 12, another embodiment of the belt covering duct 11 is shown. The front opening 53 of the spindle rail 18 is covered by means of a pivotable cover 50. A U-shaped hook 51 is attached to the underside of said cover 50, and can be pivoted freely around the bent bar 52. By this connection, said cover 50 can be moved away from the opening 53. A magnet 54 extending lengthwise, is covered by rubber and glued to the top of the cover 50. The attractive force of said magnet to the metal upper wall will close the opening by holding said cover 50 against the angled portion of the upper wall 20, as shown in FIG. 12.

Cover 50 is a plate made of molded, transparent plastic. Therefore, when said cover 50 is placed over the opening 53, the inside of the duct is still visible. Through this transparent cover 50, one can easily inspect the yarn angle storage from the edge of the starling disc, as well as the running condition of the belt 9 and the pulley 21. Furthermore, repairs involving elements or operation can be effected by a worker with ease.

FIG. 13 shows an embodiment of the air suction apparatus arranged at the end of the twisting frame.

The downstream end of the main duct 14 is attached to the front end of the dust collecting dust 56 of the air suction unit 55, and at the rear end of said duct a filter 76' is provided. An air suction apparatus 58 is assembled within the cavity of the air chamber 57, and by means of suction force generated by said air suction apparatus 58, an air stream conveying dust can flow in the direction of the arrows. An air guide plate 58' is provided with a sound proof material 59, made of a soft material such as felt or sponge. This sound proof agent 59 acts to lower the noise carried by said air stream it passes through said apparatus 58. Between the filter 76, which forms a wall of the air chamber 57, and the door 60, which is arranged outside of the frame end, is waste-collecting chamber 61. Dust particles, unable to pass through which the filter, accumulate on the floor of said chamber 61. This accumulated waste 62 can be removed from said waste collecting chamber 61, by opening said door 60. A division wall 63 is also arranged within said air chamber 57, and it separates a pulley chamber 64 from the main part of said air chamber 57. Within said pulley chamber 64, a follower pulley assembly 65 is provided, from which a driving force can be transmitted to each twisting unit via belt 9 which runs through the opening 66 provided in the wall of the pulley chamber 64.

When the air suction apparatus 58 is operated, the air stream within the main duct 14 can be directed as the arrows indicate in FIG. 13, and said stream with wastes passes through the filter 76 via dust collecting duct 56 and waste collecting chamber 61. The air filter 76 cleans the air stream by filtering the wastes and only clean air enters the underground pit via a delivery duct 67. Circulation and filtering of the air take place as long as the frame is running. The waste 62 accumulated in the waste collecting chamber 61 can be removed by a cleaner. A gear box 68, which contains a gear train for driving a driving shaft 69 and also a traverse rod 70, are situated above the end of the main duct 14 and the air chamber 57.

A stopping rod 71, as shown in FIG. 1, is movably assembled in the hole of the top cover 23, so as to drop and project from the top cover 23 when yarn breakage occurs. When said stopping rod 71 drops into the top cover 23, said rod acts to stop the rotational movement of the ballooning yarn.

What is claimed is:

1. A twisting frame provided with a plurality of twisting spindles, each of said spindles being driven by a tangential belt running along the length of the frame, wherein a duct assembly comrises a belt covering duct (11), which covers said tangential belt;
   - a plurality of twisting units;
   - a twisting zone covering duct (13) for each said twisting unit, said twisting units each being provided with a twisting spindle;
   - a main duct (14) mounted on and extending along the whole length of the frame;
   - first means for connecting said belt covering duct to said twisting unit covering duct of the twisting zone; and second means for connecting said twisting zone covering ducts to said main duct.

2. A twisting frame as claimed in claim 1, further comprising means for connecting an end of said belt covering duct, to said main duct.

3. A twisting frame as claimed in claim 1, wherein said belt covering duct and said twisting unit covering duct having a common wall, and wherein said means for connecting said belt covering duct and said twisting unit covering duct comprises an opening (28) in the common wall of the said two covering ducts.

4. A twisting frame as claimed in claim 1, wherein said means for connecting said twisting unit covering duct and said main duct is an air pipe (24), the center line of which is arranged parallel to a line tangential to a helical flow path of air flowing within said twisting unit covering duct.

5. A twisting frame as claimed in claim 1, wherein said twisting unit covering duct has a tapered cylindrical cavity (32), the diameter of the upper part of said tapered cylindrical cavity being larger than that of the lower part, the bottommost part of said cylindrical cavity forming a concave surface.

6. A twisting frame as claimed in claim 1, wherein the outer surface of each of said twisting unit covering ducts is square, a projection (41) is provided on one side of said square, and on the opposite side of the

square a groove (**40**) is provided for accepting the projection of an adjacent twisting unit covering duct.

7. A twisting frame as defined in claim **1**, wherein the inside of said main duct is provided with two dividing sheets (**29, 30**), the space between the said dividing sheets being wider at their upstream portions than at their downstream portions.

8. A twisting frame as defined in claim **1**, wherein an air suction apparatus is provided, said air suction apparatus comprising a collecting duct (**56**) and a filter (**76**), said filter being mounted in said collecting duct, said air suction apparatus being connected to the air outlet end of said main duct.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,857,228 Dated December 31, 1974

Inventor(s) Teiji Nakahara et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Abstract of the Disclosure, line 2: after "running" add --belt a--.

Column 5, line 40: change "storage" to --starting--.

change "star-" to --storage--.

line 41: delete "ling".

line 50: change "76'" to --76--.

the address of one of the inventors has been misspelled, that is, "Nagoakakyo" should read -- Nagaokakyo --

Signed and sealed this 17th day of June 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks

FORM PO-1050 (10-69)

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