The present invention relates to machines including a relatively long driving shaft made of a plurality of shaft sections mounted end to end and at least substantially in line with one another. This is particularly true of some spindle spinning, twisting or similar machines, of the direct drive type, that is to say textile machines having a multiplicity of spindles, imperatively driven by at least one driving shaft extending substantially over the whole length of the machine. The present invention is more especially but not exclusively concerned with machines of this type in which the spindles are driven by worm wheels fixed on a common driving shaft which extends perpendicularly to the axes of the spindles, said worm wheels meshing with worms carried by the respective spindles.

The chief object of this invention is to provide a machine of this type which is better adapted to meet the requirements of practice than those existing at the present time.

For this purpose, according to the present invention, the coupling means which are interposed between the adjacent ends of every two successive shaft sections include, first, between said ends, two circular discs at right angles to the direction of said shaft sections, the distance between said discs being small and said discs being normally coaxial and parallel to each other, secondly non-bending means interposed between the respective central portions of said discs to transmit rotation movement from one to the other about their common axis, and thirdly means interposed between the periphery of each of said discs and the shaft section located adjacent thereto for transmitting rotation about said axis between said last mentioned disc and said last mentioned shaft section, said last mentioned means being further capable of keeping said circular periphery coaxial with said shaft section, the portion of each of said discs between said central portion and said periphery thereof being bendable.

It should be noted that the periphery of a disc is considered as in coaxial relation with the corresponding shaft section when the circumference corresponding to said periphery is constantly held in a plane perpendicular to the axis of said shaft section, the center of said circumference being located on said axis.

A preferred embodiment of the present invention will be hereinafter described with reference to the accompanying drawing, given merely by way of example and in which:

Fig. 1 is a longitudinal sectional view, with parts cut away, of the spindle rail of a spindle spinning machine of the direct drive type made according to the present invention.

Fig. 2 is a section on the line II—II of Fig. 1.

The invention will be described as applied to a spinning machine intended to include a multiplicity of (for instance about 450) spindles driven through worms and worm wheels carried by the driving shaft.

This machine includes in conventional fashion a spindle rail the casing 1 of which is advantageously constituted by a plurality of elements (for instance from ten to fifteen) disposed end to end and assembled together by connecting rings 2, each of said elements having for instance a length ranging from 100 to 150 cm.

A horizontal driving shaft 3 is mounted in this casing and it carries, to drive the spindles 4 of the machine, as many worm wheels 5 as there are spindles, each of said worm wheels meshing with a worm 6 carried by the corresponding spindle.

In the construction illustrated by Fig. 1, the driving shaft 3 operates two rows of spindles disposed on either side of the vertical plane passing through the axis of said shaft.

Shaft 3, the total length of which is substantially equal to that of the machine, is made of a plurality of shaft sections (advantageously as many shaft sections as they are casing elements) mounted end to end and coupled together through coupling means which are interposed between the adjacent ends A and B of two successive shaft sections.

Every shaft section is supported by at least two bearings (not shown), for instance ball bearings, disposed at a distance from the coupling means provided at the ends of said shaft section, said bearings holding the shaft section in position in the corresponding casing element 1.

According to the present invention, each of the coupling means to be provided between the adjacent ends of two successive shaft sections is made as follows:

Two discs 7a and 7b at a short distance from each other, for instance at a distance equal to about 1/5 of their diameter, are provided between said two shaft section ends.

These two discs 7a and 7b are coupled in rotation by means of a rigid element extending between their two central portions, for instance by means of a cylindrical rigid member 8 which is preferably integral with discs 7a and 7b.

Means are provided for coupling in rotation the periphery of each disc 7a, 7b with the corresponding shaft section and A, B, said means being arranged to hold the peripheral zone of the disc constantly coaxial with the corresponding shaft section.

The portion v of each disc located between its central portion (which carries element 8) and its periphery is made of a thickness such that it can be bent sufficiently to permit a slight lack of alignment between the two shaft sections connected together by the coupling means.

The means for coupling the periphery of each disc 7a, 7b with the end A, B of the corresponding shaft section are advantageously made as shown by Figs. 1 and 2.

In this case, each end A or B is cut so as to have a semi-circular cross-section at A1 or B1.

Each of the discs 7a and 7b includes, at its periphery and over a circular arc of 180°, a semicylindrical sleeve extending over a length l such that it can bear, through its rectilinear edges T, against the flat face M of the portion A1 or B1 of the corresponding shaft section end A or B (see Fig. 2). The periphery of said disc 7a or 7b may include a wholly cylindrical extension 10 but the length l of this extension is smaller than the distance between said disc 7a or 7b and the end of the corresponding shaft portion.

Each semi-cylindrical sleeve 9 is assembled with the corresponding shaft end A1 or B1 through a clamping ring 11 which can be tightened by means of a screw 12.

In order to fix said clamping ring 11 axially with respect to the corresponding shaft section, when the parts are assembled together, there is provided a radial screw 13 screwed in a threaded hole provided in said ring 11, said screw 13 passing through a slot 14 of the semi-cylindrical sleeve 9 and bearing against the flat face M provided in the shaft section end A1 or B1.
Preferably, the whole of the coupling means (that is to say discs 7a and 7b, rigid element 8 and sleeves 9 and 10) constitutes a single piece of the respective portions of which are suitably machined.

It is of interest to leave some play \( j \) between the corresponding edges of the assembling ring 2 and the clamping rings 11, this play \( j \) forming a passage through which, owing to the action of the centrifugal force, oil is prevented from passing from one elementary casing into the adjoining elementary casing.

The coupling device above described enables, owing to the possibility of bending of the portions \( v \) of discs 7a and 7b, the two shaft sections A and B to be slightly out of alignment with each other, for instance as the result of a lowering of the portion of the ground upon which is resting the part of the casing in which the coupling means are housed.

In this case, there is only produced a bending of the matter constituting discs 7a and 7b, but there is no cyclical relative displacement of parts in friction relatively to each other as would be the case in devices including cardan-like arrangements (in such arrangements, the friction risks of producing a considerable wear and tear of the parts).

In a general manner, while I have, in the above description, disclosed what I deem to be practical and efficient embodiments of my invention, it should be well understood that I do not wish to be limited thereto as there might be changes made in the arrangement, disposition and form of the parts without departing from the principle of the present invention as comprehended within the scope of the accompanying claims.

What I claim is:

1. For use in a machine which comprises a frame and a shaft journaled in said frame, said shaft including at least two shaft sections in line with each other a device for coupling together the adjacent ends of said shaft sections, said device comprising, in combination, two circular discs at right angles to the direction of said shaft sections, the distance between said discs being small and said discs being normally coaxial and parallel to each other, non-bending means interposed between the respective central portions of said discs for transmitting rotation movement from one to the other about their common axis, each of said adjacent ends of said shaft sections being of semi-circular cross section over a limited length, with a flat face extending along a diametral plane of said shaft section, sleeves rigid with the peripheries of said discs respectively, said sleeves having semi-cylindrical ends bearing by their rectilinear edges upon said shaft section end flat faces respectively, and a clamping ring extending around each semi-circular shaft section end and the corresponding semi-cylindrical sleeve end applied thereon, for holding said two last mentioned elements assembled together.

2. A device according to claim 1 further including a radial screw, screwed in each of said clamping rings extending through said semi-cylindrical end of the corresponding sleeve and bearing against said flat face of the corresponding shaft section end flat face.

3. For use in a machine which comprises a frame and a shaft journaled in said frame, said shaft including at least two shaft sections in line with each other a device for coupling together the adjacent ends of said shaft sections, said device comprising, in combination, two circular discs at right angles to the direction of said shaft sections, the distance between said discs being small and said discs being normally coaxial and parallel to each other, a cylindrical rigid part integral with the respective central portions of said discs and extending between them, each of said adjacent ends of said shaft sections being of semi-circular cross section over a limited length, with a flat face extending along a diametral plane of said shaft section, sleeves integral with the peripheries of said discs respectively, said sleeves having semi-cylindrical ends bearing by their rectilinear edges upon said shaft section end flat faces respectively, and a clamping ring extending around each semi-circular shaft section end and the corresponding semi-cylindrical sleeve end applied thereon, for holding said two last mentioned elements assembled together.

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