Aug. 18, 1936. G. H. MAGRATH 2,051,642

SPINNING SPINDLE

Filed Feb. 28, 1935

Fig. 1.

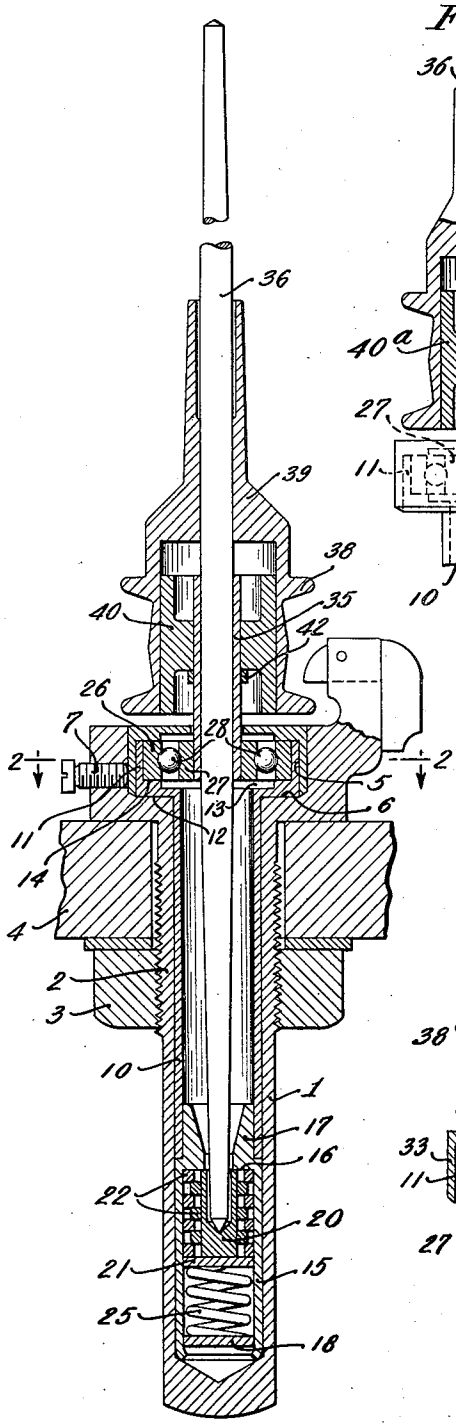


Fig. 3.

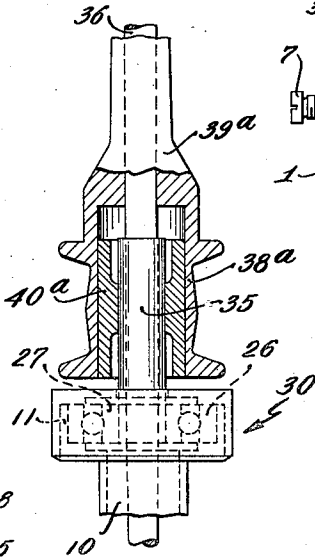


Fig. 2.

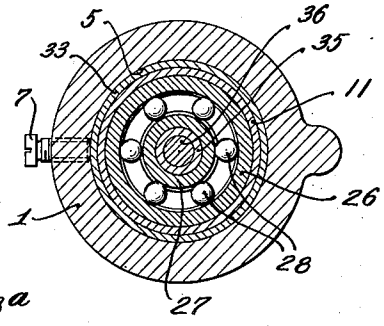


Fig. 4.

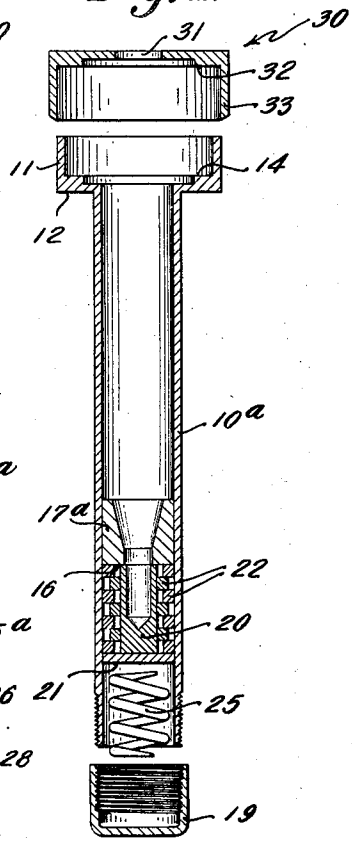
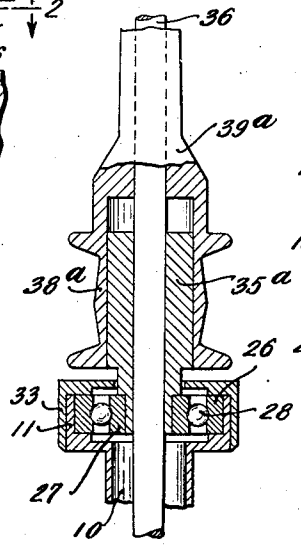


Fig. 5.



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UNITED STATES PATENT OFFICE

2,051,642

SPINNING SPINDLE

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Application February 28, 1935, Serial No. 8,697

11 Claims. (Cl. 118—66)

This invention relates to spinning machines and more particularly to a spindle mounting and associated mechanism.

In spinning machines of the present day construction it is the usual practice to provide antifriction bearings, such as roller bearings or ball bearings, to support the blade and whirl members for rotation, and with blades which carry small sized whirls it is necessary to use smaller sized bearing members, due to the lack of space. Such small sized bearing members are not generally satisfactory as they do not stand up under the strains imposed upon them during high speed operations, and consequently necessitate frequent repairs and replacements. Moreover, in spinning machines which employ blade and whirl members of different sizes, it is necessary to provide a bolster for each size whirl and in changing over from one size blade and whirl to another, it is necessary to change the bolster and associated parts. The cost of making such changes and the capital investment tied up in bolsters or other types of spindle mountings amounts to an appreciable sum and represents a substantial part of the manufacturing costs.

The principal object of the invention is to provide a spindle mounting which is constructed to accommodate spindles of different sizes, thus dispensing with the necessity of providing a spindle mounting for each size of spindle and of using undersized bearing elements for spindles having small sized whirls.

Other objects are to provide a spindle mounting which is of simple design and of strong and durable construction, embodying a minimum number of parts which may be easily dismembered so that repairs and replacements may be quickly made at a slight expense, and which is reliable and efficient in operation; and to provide a spindle bolster or the like support which includes antifriction bearing members so constructed and arranged that the spindle may center itself when rotating at high speeds, and which permits the spindle to be removed and replaced without dismembering or deranging the associated parts.

Further objects relate to various features of construction and will be apparent from a consideration of the following description and accompanying drawing which shows different embodiments of the invention chosen for the purpose of illustration.

In the drawing:

Fig. 1 is a sectional elevation of a spindle and mounting therefor, constructed in accordance with the present invention;

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

Fig. 3 is a fragmentary elevation, with parts broken away and shown in section, illustrating the use of my improved spindle mounting for supporting a spindle of smaller size than that shown in Fig. 1;

Fig. 4 is a sectional elevation of a bolster and associated parts, illustrating a modified construction; and

Fig. 5 is a view similar to Fig. 3, but showing a modified construction.

The embodiment shown in Figs. 1 and 2 comprises a bolster case 1 or the like tubular member having an exteriorly threaded portion 2 which receives a nut 3 by means of which the bolster may be firmly clamped or otherwise secured to the frame 4 of the spinning machine. The upper end of the bolster case is provided with an enlarged bore 5 which defines a flat annular shoulder 6, and, if desired, a threaded aperture may be provided for the reception of a set screw 7.

A bolster or the like tubular member 10 snugly fits within the bolster case and is provided with an enlarged upper end which terminates in a rim 11, as shown in Figs. 1 and 4. The rim 11 of the bolster provides an annular shoulder 12 which seats squarely on the shoulder 6 of the bolster case when these members are assembled. The diameter of the rim 11 is slightly less than that of the bore 5 so that when the bolster and bolster case are assembled there is an annular space between the rim 11 and the inner wall of the bolster case. The enlarged end of the bolster is preferably provided with a flat annular shoulder 14 which is disposed above the end of the body portion proper so as to provide a slight clearance indicated at 13.

The lower end of the bolster 10 is provided with an extension member 15 which is of the same diameter as the bolster proper and the upper end of this extension is provided with an inwardly stepped portion which defines an annular shoulder or abutment 16 and a neck 17 which has a pressed telescopic fit within the lower end of the bolster proper. The extension 15, in effect, forms an integral part of the bolster and its lower end may be closed by a disk or washer 18 which is firmly held in position and tightly sealed by the inwardly bent or crimped lower ends of the extension 15.

If desired, the bolster may comprise a single piece of tubing 10a, as shown in Fig. 4, in which case its lower end may be screw threaded to receive a cap 19, and a ring or the like member 17a, having a pressed fit within the tube 10a in spaced relation to its lower end, provides an annular

shoulder or abutment 16 within the body portion of the bolster, as in the embodiment shown in Fig. 1.

A step bearing 20 loosely fits within the lower end of the bolster, or the extension member, as shown in Figs. 1 and 4 respectively, and this step bearing is supported on a washer 21 which has a sliding fit within the bolster. Guiding means for confining the movement of the step bearing 10 to paths extending transversely of its axis are provided, and, as here shown, may comprise a series of superposed centralizing rings 22, alternate rings having their outer peripheries snugly fitting against the inner wall of the bolster, or the extension member, and their inner peripheries spaced from the bearing 20, and the other rings snugly fitting about the bearing 20 with their outer peripheries spaced from the inner wall of the bolster, or the extension member, as shown in Figs. 1 and 4. The parts are constructed and arranged so that the upper edge of the step bearing and the uppermost centralizing ring contact the lower end of the shoulder 16, and a coil compression spring 25, interposed between the lower end of the bolster and the supporting disk or washer 21, holds the parts in assembled relation and yieldingly restrains the freedom of movement of the step bearing.

An antifriction bearing, including an outer race ring 26, an inner race ring 27 and circumferentially distributed bearing elements 28 interposed between the inner and outer race rings, is disposed in the enlarged end of the bolster, outer race ring 26 tightly fitting within the rim 11 of the bolster and resting upon the shoulder 14, as shown in Fig. 1. The upper surface of both the inner and outer race rings are preferably flush with the upper end of the rim 11, and by reason of the clearance 13 the lower edge of the inner race ring 27 is held spaced from the end of the body portion of the bolster proper, thus providing a free communication between the annular chamber defined by the inner and outer race rings and the interior of the body portion of the bolster. A cap 30 (Fig. 4) having a concentric opening 31 and an interior shoulder 32, fits tightly about the upper end of the bolster with its depending rim portion 33 disposed in the annular space between the rim 11 of the bolster and the wall of the bore 5 with its shoulder 32 engaging the upper end of the outer race ring 26 and rim 11. The assembled bolster, bearing member and cap may be securely locked within the bolster case by the set screw 7.

A collar 35 which may be either integral with or rigidly secured to the inner race 27 in any suitable manner, projects upwardly through the opening 31 in the cap 30, the diameter of the opening 31 being slightly greater than the diameter of the collar 35 so as to provide a slight clearance. The inner diameter of the collar 35 corresponds to the diameter of the central part of a standard spindle or blade so that when the blade 36 of the spindle is inserted in the bolster with its lower end supported in the step bearing 20, its central portion has a snug sliding fit within the collar 35 and the depending driving flange 38 of the whirl 39 is held in spaced relation to the collar and upper end of the bolster case, as shown in Fig. 1.

A sleeve 40 is interposed between the inner periphery of the driving flange 38 and the collar 35, this sleeve preferably having a tight fit about the collar 35 and a snug sliding fit against the inner periphery of the driving flanges so that the blade and whirl may be easily removed without dismembering or deranging any of the parts. If desired, a small ring 42 having a pressed fit about the collar 35 may be provided to hold the sleeve in place, thus preventing the sleeve from creeping downwardly. As previously noted, the driving flange, sleeve and collar closely fit about one another and hence rotate as a unit in the same manner as if they were actually secured together and integral with the inner race of the bearing member.

When a spindle having a smaller or larger sized whirl is used, it is, of course, necessary to provide a sleeve 40^a (Fig. 3) of corresponding size, and this sleeve may be retained in position either by a ring secured to the collar, as in the embodiment shown in Fig. 1, or, as shown in Fig. 3, the inner periphery of the sleeve 40^a and the outer periphery of the collar 35 may be slightly tapered so that the end of the sleeve is held spaced from the cap 30; otherwise no further adjuncts or changes are necessary in changing over from one size spindle to another.

In Fig. 5 I have shown a modified construction wherein a collar 35^a having an enlarged upper end is used. The lower end of the collar has a forced fit within the inner periphery of the inner race ring 27 and its enlarged upper end has a sliding fit against the inner periphery of the driving flange 38^a, the blade 36 preferably having a sliding fit within the bore of the collar, as in the embodiments shown in Figs. 1 and 3. This construction is particularly advantageous for supporting spindles having whirls of small size as the use of a sleeve is dispensed with. In such cases the collar 35^a may be designed to fit within the smallest size whirl to be used and a set of sleeves, each adapted to fit about the collar, may be provided to support spindles having whirls of larger size.

If desired, the sleeves may be secured to the whirls, in which case they should have a snug sliding fit about the collar so that the blade and whirl members may be easily and quickly removed and replaced. It is therefore preferable that both the inner periphery of the sleeve and the outer periphery of the collar be made with a slight taper. Irrespective of the size of the whirl or the manner in which the sleeves are carried, the whirl, blade, sleeve and collar rotate as a unit with the inner race and are supported so that they do not come in contact with any stationary part of the mechanism. The ball bearing elements 28 permit a slight rocking movement of the spindle about axes which extend transversely through these bearing elements and as the construction and arrangement of the step bearing 20 and its associated parts is such as to permit the end of the blade to move in paths extending transversely of the axis of the bearing, the spindle is allowed to center itself when rotating at high speeds.

The bolster may, of course, be filled with lubricant and as there is a free communication between the interior of the bolster proper and the bearing elements 28, proper lubrication of the rotating parts is assured, and as the cap 30 closely surrounds the collar 35 it provides a cover or shield which prevents the lubricant from being thrown out of the bolster.

While I have shown and described different desirable embodiments of the invention it is to be understood that this disclosure is for the purpose of illustration only and that various changes in shape, proportion and arrangement of parts, as

well as the substitution of equivalent elements for those herein shown and described, may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. In a spinning machine the combination with a blade having a whirl provided with a depending driving flange, of means for supporting said blade and whirl for rotation, said means comprising a tubular member having at its upper end antifriction bearing members operative to support said whirl for rotation about a fixed axis, an abutment on the interior of said tubular member and spaced from its lower end, a step bearing loosely mounted in the lower end of said tubular member below said abutment, said step bearing being constructed and arranged so that its upper end contacts the lower edge of said abutment, a plurality of centralizing rings circumposed about said step bearing and operative to confine the movement of said step bearing to paths extending substantially at right angles to its axis, and resilient means acting against said step bearing and operative yieldingly to restrain its freedom of movement.

2. In a spinning machine the combination with a blade having a whirl provided with a depending driving flange, of means for supporting said blade and whirl for rotation, said means comprising a tubular member having at its upper end antifriction bearing members operative to support said whirl for rotation about a fixed axis, an abutment on the interior of said tubular member and spaced from its lower end, a step bearing loosely mounted in the lower end of said tubular member below said abutment, said step bearing being constructed and arranged so that its upper end contacts the lower edge of said abutment, a plurality of centralizing rings circumposed about said step bearing and operative to confine the movement of said step bearing to paths extending substantially at right angles to its axis, a washer disposed below said rings and step bearing, and a compression spring interposed between said washer and the lower end of said tubular member and operative yieldingly to restrain freedom of movement of said step bearing.

3. A spindle construction comprising a tubular member having at its upper end an enlarged bore, antifriction bearing members including inner and outer race members and a plurality of circumferentially distributed bearing elements between said inner and outer members, the outer race member being secured within said enlarged bore, a collar secured to one of said race members and operative to support the central portion of a spindle for rotation, a step bearing loosely mounted in the lower ends of said tubular member for supporting the lower end of the spindle, an abutment on the interior of said tubular member above the upper edge of said step bearing, the upper edge of said step bearing contacting with the lower edge of said abutment, a plurality of centralizing rings circumposed about said step bearing and operative to confine the movement of said step bearing to paths extending substantially at right angles to its axis, and resilient means acting against said step bearing and operative yieldingly to restrain its freedom of movement.

4. A spindle construction comprising a tubular member having at its upper end an enlarged bore, a bearing mounted in the lower end of said tubular member, an anti-friction bearing including inner and outer race members and a plurality of circumferentially distributed bearing elements interposed between said inner and outer race members, the outer race member fitting within said enlarged bore, one of said race members having a collar projecting upwardly beyond the upper end of said tubular member, a blade fitting within the end of said collar and having its lower end supported in said bearing, and a whirl secured to said blade, the whirl having a depending driving flange fitting about said collar.

5. A spindle construction comprising a bolster case, a bolster within said case, said bolster having an enlarged upper end, a bearing mounted in the lower end of said bolster, anti-friction bearing members including inner and outer races and a plurality of circumferentially distributed bearing elements interposed between said races, the outer race being secured within said enlarged upper end, a collar having its lower end within said enlarged upper end and its upper end projecting upwardly beyond the end of said bolster and case, a blade having its lower end disposed in said bearing, a whirl secured to said blade, said whirl having a driving flange surrounding said collar, and means interposed between said collar and driving flange for rotatably supporting the whirl and blade about said collar.

6. A spindle construction comprising a bolster case, a bolster within said case, said bolster having an enlarged upper end, blade and whirl members, and means for rotatably supporting said blade and whirl means, said means comprising anti-friction bearing members including inner and outer races and a plurality of circumferentially distributed bearing elements interposed between said races, the outer race fitting within the enlarged end of said bolster, a collar projecting upwardly beyond the end of said bolster and case and surrounding said blade, and means interposed between said collar and the whirl for rotatably supporting the whirl and blade about said collar.

7. A spindle construction comprising a tubular member having at its upper end an enlarged bore, blade and whirl members, and means for rotatably supporting said blade and whirl members, said means comprising an anti-friction bearing including an outer race, an inner race and a plurality of circumferentially distributed bearing elements between the inner and outer races, the outer race being secured within said enlarged bore and the inner race engaging the blade member, a collar projecting upwardly beyond the upper end of said tubular member, and means carried by said collar for rotatably supporting one of said members about said collar at a point spaced upwardly from said anti-friction bearing.

8. A spindle construction comprising a tubular member having at its upper end an enlarged bore, a bearing mounted in the lower end of said tubular member, an anti-friction bearing including inner and outer races and a plurality of circumferentially distributed bearing members interposed between said inner and outer races, the outer races fitting within said enlarged bore, one of said races having a collar projecting upwardly beyond the upper end of said tubular member, a blade fitting within said collar and having its lower end supported by said bearing, a whirl secured to said blade and having a driving flange surrounding said collar, and a sleeve interposed between said collar and driving flange, the inner periphery of said sleeve fitting about said collar

and its outer periphery fitting within the inner periphery of said driving flange.

9. A spindle construction comprising a bolster case, a bolster within said case, said bolster having an enlarged upper end, a bearing mounted in the lower end of said bolster, an anti-friction bearing member including inner and outer races and a plurality of circumferentially distributed bearing elements interposed between said races, the outer race fitting within the enlarged end of said bolster, a collar secured to one of said races and projecting upwardly beyond the end of said bolster and case, a blade fitting within said collar and having its lower end supported in said bearing, and a whirl secured to said blade, the whirl having a depending driving flange surrounding said collar.

10. In a spinning machine, a bolster case rigidly secured to the frame of the spinning machine, said bolster case having a cylindrical member which extends upwardly beyond the frame member to which the bolster case is attached and provides an annular support, a bolster within said case, said bolster having an enlarged upper end defining an exterior shoulder mounted on said annular support and an interior shoulder spaced from its upper end, removable blade and whirl members, the lower end of the blade member extending into said bolster, and means for rotatably supporting said members, comprising an anti-friction bearing member having inner and outer races and a plurality of circumferentially distributed bearing elements interposed between said races, the inner race embracing said blade member and supporting the blade and whirl members for a slight rocking movement, and the outer race snugly fitting within said enlarged upper end and being mounted on said interior shoulder.

11. In a spinning machine, a bolster case rigidly secured to the frame of the spinning machine, the upper end of said bolster case having a cylindrical part which extends upwardly beyond the frame member to which the bolster case is attached and which provides an annular support, a bolster within said case, said bolster having an enlarged upper end providing an exterior shoulder spaced from its upper end and seated on said annular support, the interior of the upper end of said bolster being shaped to provide an upper annular shoulder and a lower annular shoulder spaced inwardly of the upper shoulder, removable blade and whirl members, the lower end of said blade member extending into said bolster, and means for rotatably supporting said members comprising an anti-friction bearing member having inner and outer races and a plurality of circumferentially distributed bearing elements interposed between the races, the inner race embracing the blade member and being disposed above said lower annular shoulder so as to define a clearance for the circulation of oil, and the outer race snugly fitting within said enlarged upper end and being seated on said upper annular shoulder.

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