Dec. 27, 1955 W. STAHLECKER 2,728,240

TENSION OR GUIDE PULLEY APPARATUS

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Fig. 1

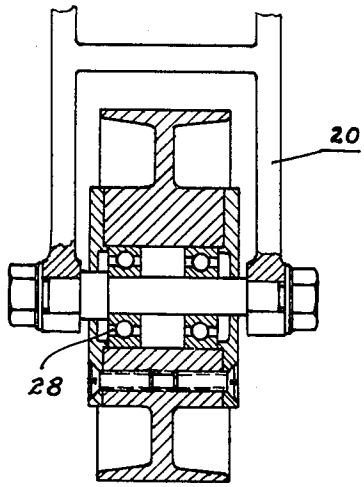


Fig. 2

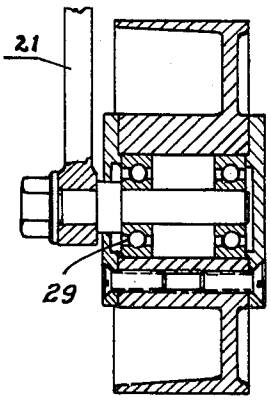


Fig. 3

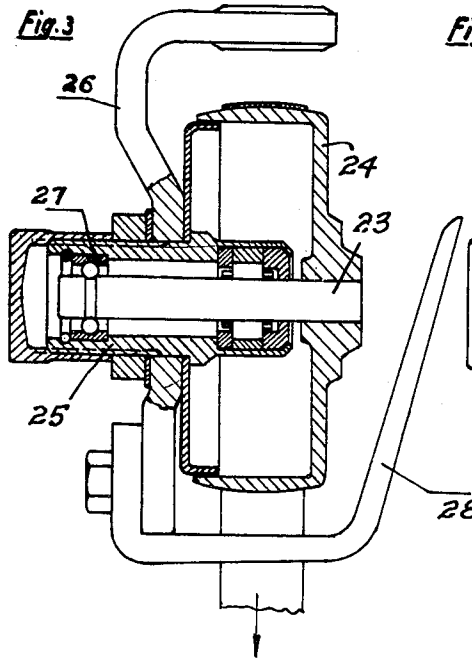
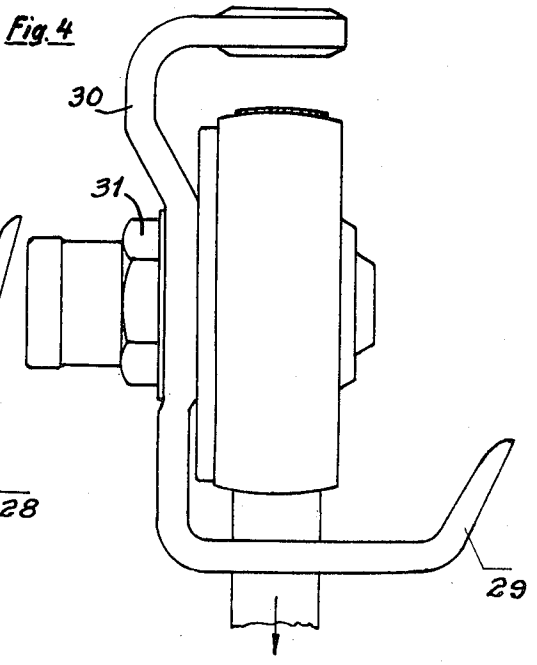


Fig. 4



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TENSION OR GUIDE PULLEY APPARATUS

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Fig.5

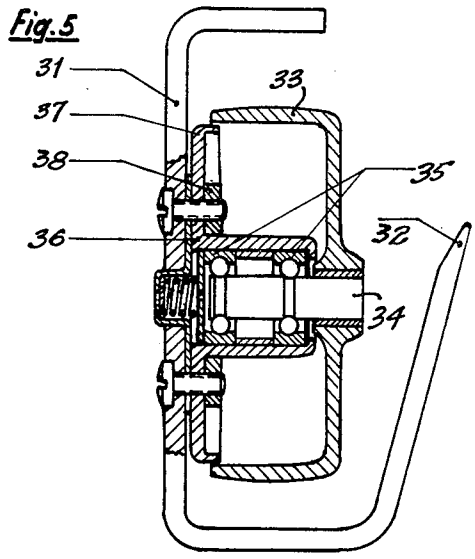


Fig.6

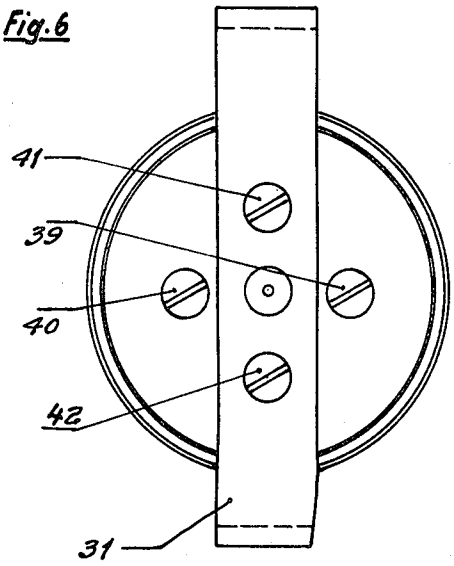


Fig.7

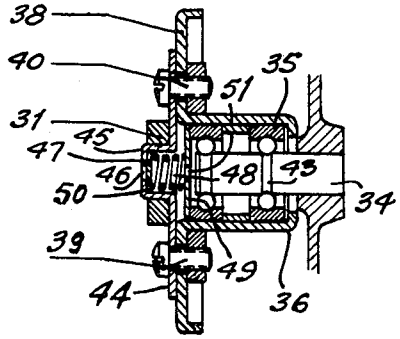
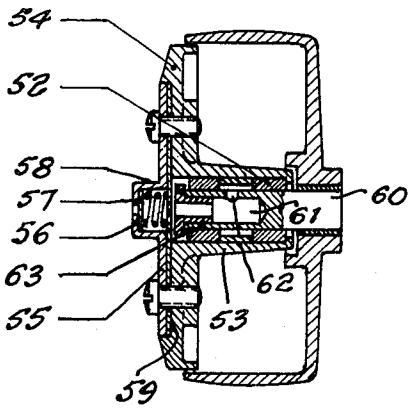


Fig.8



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TENSION OR GUIDE PULLEY APPARATUS

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Fig. 9

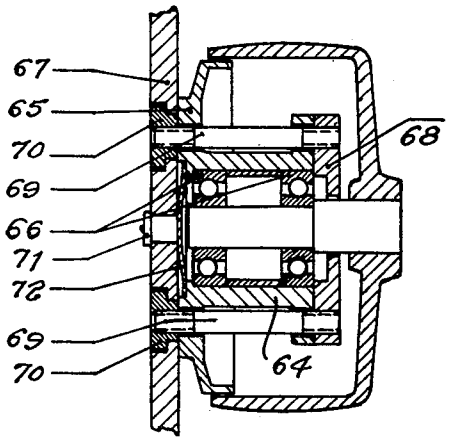


Fig. 10

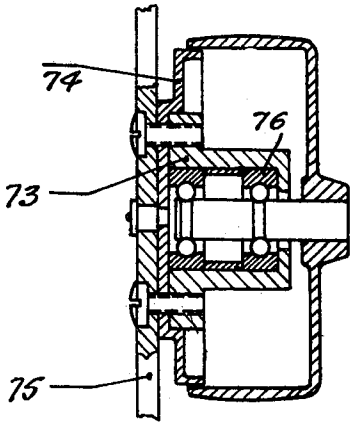


Fig. 11

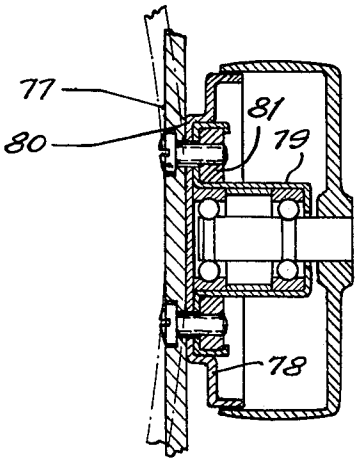
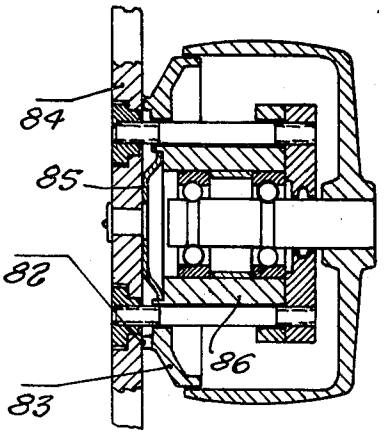


Fig. 12



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Fig. 13

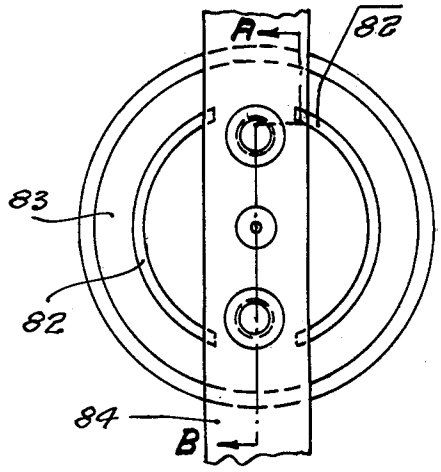


Fig. 14

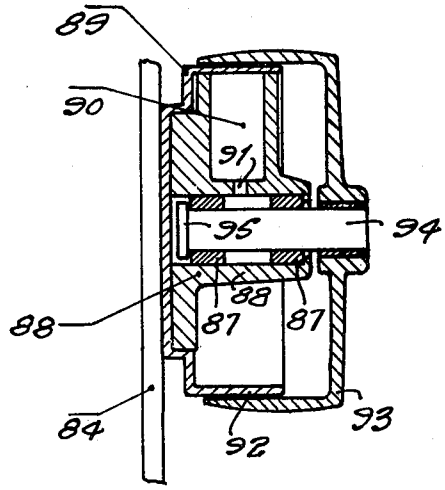


Fig. 15

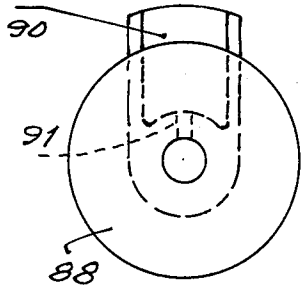
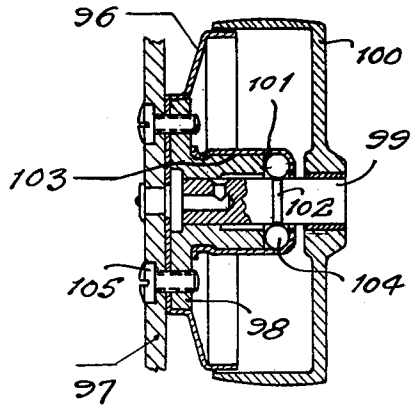


Fig. 16



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United States Patent Office 2,728,240 Patented Dec. 27, 1955

2,728,240

TENSION OR GUIDE PULLEY APPARATUS

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Application January 2, 1951, Serial No. 203,859
In Germany February 24, 1949

Public Law 619, August 23, 1954
Patent expires February 24, 1969

4 Claims. (Cl. 74—230.01)

My present invention relates to a pulley apparatus.

The pulley apparatus of my present invention is particularly suited for belt drives for textile spindles, although it is not necessarily limited to such a use.

One of the objects of my present invention is to provide a pulley apparatus which does not require strong structural materials.

Another object of my present invention is to provide a pulley apparatus which requires a relatively small amount of space, which is made of simple, inexpensive parts, and which may be easily assembled.

An additional object of my present invention is to provide a very efficient lubricating means for the bearing of the pulley apparatus.

A further object of my present invention is to provide an efficient and economical bearing means for a pulley apparatus.

A still further object of my present invention is to provide a relatively simple pulley apparatus which is well adapted to withstand relatively large shock loads.

With the above objects in view, a preferred embodiment of my present invention mainly consists of a pulley apparatus provided with a hollow pulley having an open side, a shaft fixedly connected to the pulley so as to rotate therewith, bearing means on which the shaft is rotatably mounted, means for lubricating the bearing means, a bearing casing portion in which the bearing is located, a cover plate portion connected to the bearing casing portion and substantially covering the side of the pulley, and support means fixedly connected to the cover plate portion for supporting the cover plate portion, bearing casing portion, bearing means, shaft and pulley, whereby the cover plate portion and bearing casing portion are maintained stationary while the shaft and pulley connected thereto rotate in the bearing means, the cover plate portion, bearing casing portion, bearing means, shaft and pulley all being located in their entirety on one side only of the support means.

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, in which:

Fig. 1 is an elevational view, partly in section of a known pulley apparatus;

Fig. 2 is an elevational view, partly in section, of another known pulley apparatus;

Fig. 3 is an elevational view, partly in section, of a further known pulley apparatus;

Fig. 4 is an elevational view, of a slightly modified embodiment of the apparatus shown in Fig. 3;

Fig. 5 is an elevational view, partly in section, of one embodiment of a pulley apparatus constructed in accordance with my present invention;

Fig. 6 is an elevational view of the structure shown in Fig. 5 as viewed from the left hand side thereof;

Fig. 7 is a sectional view of one type of bearing construction used in the pulley apparatus of my present invention;

Fig. 8 is a sectional view of another type of bearing construction which may be used in the pulley apparatus of my present invention;

Fig. 9 is a sectional, elevational view of a further embodiment of a pulley apparatus constructed in accordance with my present invention;

Fig. 10 is a sectional, elevational view of a still further embodiment of a pulley apparatus constructed in accordance with my present invention;

Fig. 11 is a sectional, elevational view of still another embodiment of a pulley apparatus constructed in accordance with my present invention;

Fig. 12 is a sectional, elevational view of a still further embodiment of a pulley apparatus constructed in accordance with my present invention and is taken along line A—B of Fig. 13;

Fig. 13 is an elevational view of the structure shown in Fig. 12 as viewed from the left hand side thereof;

Fig. 14 is an elevational view, partly in section, of yet another embodiment of a pulley apparatus constructed in accordance with my present invention;

Fig. 15 is an elevational view of part of the structure shown in Fig. 14; and

Fig. 16 is a sectional, elevational view of a still further embodiment of a pulley apparatus constructed in accordance with my present invention.

Known constructions of pulleys are illustrated in Figs. 1–4. Fig. 1 shows a pulley supported on both sides which is essentially used for heavy loads. The known pulley construction shown in Fig. 2, which is supported on only one side, is generally adapted for use only with light loads and may be used, for example, in a belt drive for textile spindles. The pulley shafts shown in Figs. 1 and 2 are fixedly connected to the supporting brackets **20** and **21**, respectively.

For many purposes it has been found desirable to fixedly connect the shaft to the pulley so that it rotates therewith, and such a construction is shown in Fig. 3 where the shaft **23** is fixedly connected to the pulley **24**. In the construction shown in Fig. 3, the casing **25** for the pulley bearings is fixedly connected to the support **26** and the outer races **27** of the ball bearing are fixedly mounted in the bearing case **25**. In contrast to this, in the construction of Figs. 1 and 2 the outer races of the ball bearings **28** and **29**, respectively, are mounted so as to rotate with the pulley, whereas the inner races of bearings **28** and **29** are fixedly mounted on the pulley shafts.

Although the construction shown in Fig. 3 is preferred under some circumstances to that shown in Figs. 1 and 2, nevertheless the construction shown in Fig. 3 is not used in tension and guide pulleys for heavy loads because the bearing case **25** requires a specially constructed support **26** for its mounting. Also, the construction shown in Fig. 3 requires a considerably greater width than a pulley such as that illustrated in Fig. 2, for example, so that such pulleys do not generally lend themselves to use in spinning machines where space is at a premium. A further drawback of the construction shown in Fig. 3 resides in the fact that support **26** and pulley belt guard **28** cannot be constructed as one unit because guard **28** would prevent the mounting of the pulley on support **26**, due to the limited space provided between support **26** and guard **28**, unless the support **26** is made of a considerably elaborate construction which would include an open slot, for example, to permit the mounting of the pulley on the support.

In order to provide a unitary construction of the sup-

port 26 and guard 28, shown in Fig. 3, it would be necessary to provide a guard member such as guard 29, shown in Fig. 4, which is necessarily quite short and spaced at a relatively large distance from the support 30 in order to provide sufficient space for the mounting of the pulley on the support 30. It is evident, however, that the guard 29, shown in Fig. 4, is very undesirable because it cannot effectively prevent the pulley belt from being thrown off the pulley.

A further drawback of the construction shown in Figs. 3 and 4 resides in the fact that very heavy nuts 31 are required to effectively mount the bearing casings on the support. This construction therefore requires materials of relatively high mechanical strength even though a light operating load may be applied on the pulley.

The pulley apparatus of my present invention overcomes all of the above-mentioned defects and provides a pulley which may have a unitary support and guard member, which is constructed of light, inexpensive materials, and which may withstand relatively heavy loads.

The embodiment of my present invention which is illustrated in Figs. 5 and 6 comprises an elongated support member 31 which is formed integrally with the pulley belt guard member 32. Located in the space between elements 31 and 32 is the pulley 33 which has an open side and which is fixedly connected to the shaft 34 so that the shaft 34 is rotatable with the pulley 33. Roller bearings 35 are mounted about the shaft 34 so that the shaft may rotated. The bearings 35 are located in a bearing casing portion 36 which has formed integrally therewith a cover plate portion 37 which substantially covers the open side of pulley 33.

A ring member 38 is fixedly connected to the inner side of cover plate portion 37 by means of bolts 39 and 40 which extend through openings in the cover plate portion 37 and threadedly engage the ring member 38. Bolts 41 and 42 extend through openings in support member 31 and in cover plate portion 37 so that they also threadedly engage ring member 38 so as to support the pulley on the supporting member 31. It will be noted that these bolts 40 and 41 are located in a diametral plane which passes transversely through the pulley and support member 31 and are located at equal distances from the center of the pulley.

It is evident that this arrangement of the pulley apparatus provides practically no stress on the bearing casing portion 36. Also, this construction provides a light and economical bearing casing and support member construction in that the casings can be made in one piece with the cover plate portion, in contrast to the multi-piece construction shown in Fig. 3, and since the stress on the casing is relatively slight it may be made of an inexpensive plastic material such as Bakelite, or the casings may be made of sheet metal or from castings or die castings. Tension pulleys constructed in the above described manner are very light particularly if the belt carrying part of the pulley is made of a light material such as bakelite, for example.

Two different bearing constructions for the pulley apparatus of my present invention are illustrated in Figs. 7 and 8, respectively. In the embodiment shown in Fig. 7 the casing 36 which is integral with the cover plate portion 38 supports the roller bearing 35 therein and the shaft 34 has ball races 43 formed therein. Overlying the bearing and located between the cover plate portion 38 and the support member 31 is the plate member 44 which has a projecting portion 45 extending through an opening in the support 31 and provided with an opening 46. Supported against the opening 46 so as to cover it is the plate 47 which is urged toward the opening 46 by the spring 48 which bears at its end distant from plate 47 against another plate 49 which seals the bearing. The plate 47 is provided with cut away portions 50 at its outer periphery, and the plate 49 has an opening 51 formed therein. By means of this construction grease for lubricating the bearing may be supplied through the opening 46, the grease flowing around plate 47 through the cut away portions 50 provided therein and through the opening 51 in plate 49 to the bearing. Plate 47 is pushed away from opening 46 a slight distance by the grease gun used to supply grease to the bearing 35.

In the embodiment shown in Fig. 8, the pulley apparatus is provided with a plain bearing 52. In this embodiment the bearing casing portion 53 is also constructed integrally with the cover plate portion 54, and the plain bearings 52 are supported within the bearing casing portion 53. Connected to cover plate portion 54 is the plate 55 having a projecting portion 56 which is adapted to extend through an opening in the support member. The plate 55 is substantially similar to the plate 44 in the embodiment shown in Fig. 7. Mounted within the hollow projection 56 is a plate 57 and spring 58 which are substantially similar to plate 47 and spring 48 shown in the embodiment illustrated in Fig. 7. Spring 58 bears against a perforated plate 59 which corresponds to plate 49 in the embodiment of Fig. 7 but is different therefrom in that it is mounted between the cover plate portion 54 and plate 55. The projecting portion 56 is provided with an opening and the plates 57 and 59 and spring 58 function to admit the lubricant to the bearing and to seal the bearing in the same manner as described in connection with the structure illustrated in Fig. 7. The shaft 60 is provided with a bore 61 and a passageway 62 in order to admit grease to the bearing 52.

Fixedly connected to the inner end of shaft 60 is the flanged tubular member 63 which, as is evident from Fig. 8 has a limited amount of play between bearing 52 and plate 59, so that the play of shaft 60 in the bearing 52 is limited by the flanged member 63.

A pulley apparatus which is particularly well adapted to withstand heavy loads and shock loads without providing any substantial stress on the bearing casing and at the same time requiring only a minimum of space is illustrated in Fig. 9. In this construction the bearing casing 64 is integrally formed with the cover plate portion 65 and supports therein the roller bearings 66. The cover plate portion 65 is mounted against the support member 67 which corresponds to the support member 31 in the embodiment shown in Figs. 5 and 6. On the side of the bearing casing 64 which is distant from the support 67 there is located a plate member 68 which is provided with threaded openings. A pair of elongated studs 69 threadedly engage these last mentioned threaded openings in member 68 and extend through openings provided in the cover plate portion 65. The support member 67 is provided with a pair of openings in which the nut members 70 are located, and these nut members threadedly engage the ends of studs 69 which are distant from plate 68.

In the construction shown in Fig. 9 the grease fitting 71 is mounted in a recess in a support member 67 and a perforated resilient plate 72 is provided in order to permit proper lubrication and sealing of the roller bearings to which the pulley shaft shown in Fig. 9 is connected.

Due to the long and substantial construction of studs 69, the construction shown in Fig. 9 may withstand relatively heavy loads as well as shock loads while at the same time substantially eliminating any stress from the bearing casing 64 so that in this embodiment also the bearing casing 64 need not be made of a particularly strong material.

The embodiment illustrated in Fig. 10 is substantially similar to the embodiment shown in Figs. 5 to 8, except that the bearing casing portion 73 is made separately from the cover plate portion 74 and is connected thereto by the bolts which mount the cover plate and remaining pulley apparatus on the support 75. In this embodiment the cover plate portion 74 is made of resilient metal so

that, in addition to functioning as a cover plate for the open side of the pulley, it also functions as a sealing plate for the bearing **76** and thereby eliminates the requirement of separate individual sealing plates, as are required in the embodiments shown in Figs. 7 and 8.

The embodiment of my present invention which is illustrated in Fig. 11 is substantially similar to that illustrated in Fig. 10 except that the support member **77** is itself made of a resilient metal so that it tends to press the resilient cover plate portion **78** toward the bearing and thereby aids in the sealing of the bearing, as is evident from the dotted line position of support member **77** illustrated in Fig. 11. Also, in the embodiment shown in Fig. 11 the bearing casing **79** is provided with a flanged end **80** which receives a ring member **81** to which the supporting bolts for the pulley apparatus are connected.

The embodiment of my present invention which is illustrated in Fig. 12 is substantially similar to that shown in Fig. 9 except that in the embodiment of Fig. 12 projecting portions **82** are provided on the cover plate portion **83** so as to provide a superior contact surface between the support member **84** and the cover plate portion **83**. As is evident from Fig. 12, the sealing plate **85** is bent at its periphery to a greater extent than the sealing plate **72**, shown in Fig. 9, in order to accommodate the greater space between the supporting member **84** and bearing casing portion **86** which is necessary to accommodate the projections **82**. As is evident from Fig. 13, which is an elevation view of the structure shown in Fig. 12 as viewed from the left hand side thereof, the projecting portions **82** on the cover plate portion **83** are arcuate in shape and bear at their end portions against the supporting member **84**.

In the embodiment illustrated in Fig. 14, there is shown a pulley apparatus having a construction comprising a plain bearing **87** similar to the plain bearing **52**, shown in Fig. 8, but provided with a lubricating structure particularly suited for this type of bearing. In this embodiment, the bearing casing portion **88** is made separate from the cover plate portion **89** and has a recess **90** formed therein so as to provide a reservoir for the lubricant. Passageway **91** is provided between the reservoir **90** and the bearing **87** in order to permit the lubricant in reservoir **90** to communicate with the bearing **87**. The cover plate portion **89** is provided with an integral flange **92** which extends inwardly toward the side of the pulley **93** and which is located directly over the outer end of reservoir **90** so as to provide a cover for the reservoir. The structure shown in Fig. 14 may be easily taken apart in order to refill reservoir **90** and in order to clean the bearing structure when required. Also, the shaft **94** is provided with a flanged member **95** at its inner end, which is substantially similar to the flange member **63**, shown in Fig. 8, and which functions in the same way to limit the play of shaft **94** in plain bearing **87** to the space between the bearing **87** and cover plate portion **89**.

Fig. 15 is an elevational view of the bearing casing portion **88**, shown in Fig. 14 and illustrates how the reservoir **90** is formed therein.

A particularly simple and inexpensive construction of a pulley apparatus which possesses all of the advantages of the above-described embodiments is illustrated in Fig. 16. In this embodiment the cover plate portion **96** is connected at one side by a pair of bolts to the support member **97** and is connected at its other side by the same bolts to a bearing member **98**. Within the bearing member **98** is rotatably supported the shaft **99** which is fixedly connected to the pulley **100** so as to rotate therewith. The bearing member **98** is provided at its end distant from the support member **97** with a substantially flat ball race surface **101** which is located in a plane which is substantially perpendicular to the axis of shaft **99**. Shaft **99** is provided with a groove **102** which serves as a ball race, and closely mounted about the bearing member **98** is the member **103** which is curved at one end thereof so as to provide a third race way for the ball members of the bearing and which is bent at its other end so as to closely mate with the outer surface of bearing member **98** and so as to be fixedly connected thereto. The structure shown in Fig. 16 is provided with suitable fittings, apertures and passageways in order to permit proper lubrication of the bearing structure, and is clearly evident from Fig. 16.

In the operation of the structure shown in Fig. 16 the the pull of the belt on pulley **100** will be in substantially a single direction so that the shaft **99** will cause the ball members **104** to bear against only one side of ball race **101** while the other side thereof receives practically no wear. When one side of the ball race **101** becomes sufficiently worn, instead of providing a new bearing member **98**, all that is required is to remove the bolts **105**, to rotate the bearing member **98** through 180° and remount it in this latter position so that the substantially unworn side of ball race **101** will then receive the wear from ball members **104**. Thus the construction shown in Fig. 16 provides an exceedingly simple and economical construction which is adapted to have a long life before new parts are required.

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 pulleys differing from the types described above.

While I have illustrated and described the invention as embodied in a tension or guide pulley apparatus, I do not intend 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 my invention.

Without further analysis, the foregoing will so fully reveal the gist of my 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 and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What I claim as new and desire to secure by Letters Patent is:

1. A pulley apparatus comprising in combination, a pulley having an open side; a shaft fixedly connected to said pulley so as to rotate therewith; bearing means on which said shaft is rotatably mounted; a bearing casing portion in which said bearing means is located; a cover plate portion connected to said bearing casing portion and substantially covering said side of said pulley; support means for supporting said cover plate portion, whereby said cover plate portion and bearing casing portion are maintained stationary while said shaft and pulley connected thereto rotate in said bearing means, said cover plate portion, bearing casing portion, bearing means, shaft and pulley all being located in their entirety on one side only of said support means; and means for fixedly connecting said support means to said cover plate portion comprising a ring member located on that side of said cover plate portion which is distant from said support means and screw means extending through said support means and cover plate portion into said ring member, said screw means being located in parallel relation to said shaft.

2. A pulley apparatus comprising in combination, a pulley having an open side; a shaft fixedly connected to said pulley so as to rotate therewith; bearing means on which said shaft is rotatably mounted; a bearing casing portion in which said bearing means is located; a cover plate portion connected to said bearing casing portion and substantially covering said side of said pulley; support means for supporting said cover plate portion, whereby said cover plate portion and bearing casing portion are maintained stationary while said shaft and pulley con-

nected thereto rotate in said bearing means, said cover plate portion, bearing casing portion, bearing means, shaft and pulley all being located in their entirety on one side only of said support means; and means for fixedly connecting said support means to said cover plate portion comprising a ring member located between said bearing casing and pulley on that side of said cover plate portion which is distant from said support means and bolt means extending through said support means and cover plate portion into said ring member, said bolt means being located in parallel relation to said shaft and comprising a pair of elongated studs each connected at one end to said ring member, extending through said cover plate portion and said support means, and connected at its other end to said support means.

3. A pulley apparatus comprising, in combination, a pulley having an open side; a shaft fixedly connected to said pulley so as to rotate therewith; bearing means on which said shaft is rotatably mounted; a bearing casing portion in which said bearing means is located; a cover plate portion integral with said bearing casing portion and substantially covering said open side of said pulley; support means for supporting said cover plate portion, whereby said cover plate portion and bearing casing portion are maintained stationary while said shaft and pulley connected thereto rotate in said bearing means, said cover plate portion, bearing casing portion, bearing means, shaft and pulley all being located in their entirety on one side only of said support means; and means for fixedly connecting said support means to said cover plate portion comprising screw means extending through said support means at least into said cover plate portion, said screw

means being located at a greater radial distance from said shaft than said bearing casing portion and in parallel relation to said shaft and consisting at least of two screws.

4. A pulley apparatus comprising, in combination, a pulley having an open side; a shaft fixedly connected to said pulley so as to rotate therewith; bearing means on which said shaft is rotatably mounted; a bearing casing portion in which said bearing means is located; a cover plate portion connected to said bearing casing portion and substantially covering said open side of said pulley; support means for supporting said cover plate portion, whereby said cover plate portion and bearing casing portion are maintained stationary while said shaft and pulley connected thereto rotate in said bearing means, said cover plate portion, bearing casing portion, bearing means, shaft and pulley all being located in their entirety on one side only of said support means; said cover plate portion and bearing casing portion being formed integrally with each other; and means for fixedly connecting said support means to said cover plate portion at points located at a greater radial distance from said shaft than said bearing casing portion.

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