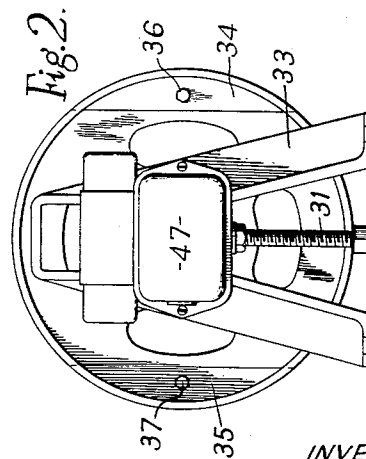
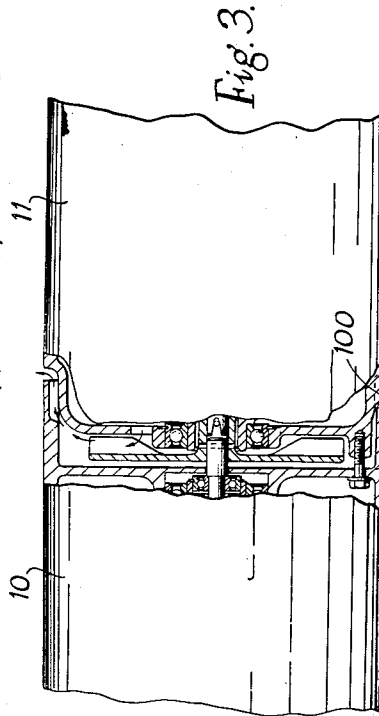
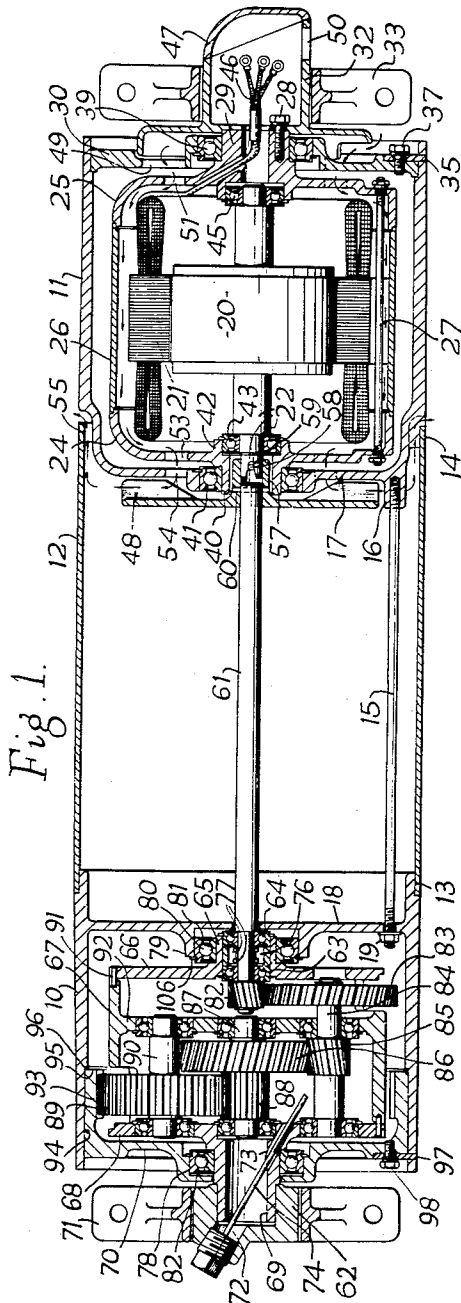


Dec. 27, 1960

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PULLEY WITH TORQUE TUBE

2,966,068

Filed Oct. 12, 1959



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1

2,966,068

PULLEY WITH TORQUE TUBE

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Filed Oct. 12, 1959, Ser. No. 845,913

17 Claims. (Cl. 74—421)

This invention relates to pulleys of the kind which contain their own electric motor and reduction gearing and its main object is to facilitate profitable manufacturing by enabling a range of pulley sizes (especially axial length) and speeds to be obtained by combining a few standard parts. A further object of the invention is to enable the motor and gearing to be readily removed and replaced. Another object of the invention is to provide such a pulley that is well adapted to use under sanitary conditions for conveying food. Further objects are to improve the weight/load ratio, to improve the bearing arrangements to ensure durability, to necessitate only a minimum number of parts, and to facilitate a change of gearing to obtain readily a required variation of gear reduction ratio.

According to the invention the pulley comprises two pulley drums connected together, a shaft disposed between the two drums with its ends respectively located adjacent the drums, a reduction gearing mounted within the first drum so as to be removable from the other end thereof, said gearing having an input part engaged with the adjacent end of the shaft and an output part fixed to the drum; the other end of the shaft having means for attachment thereto of a motor-spindle.

A third pulley drum may be located between the first and second pulley drums so that the three drums form a continuous pulley. The third pulley drum may be of any selected length which may be changed at any time to obtain any required length of the complete pulley, whilst the first and second drums can remain of standard size to contain a standard electric motor in one drum and a standard reduction gearing in the other.

The invention will now be more fully described by way of example with reference to the accompanying diagrammatical drawings wherein:

Figure 1 is a sectional view of a pulley made in accordance with the invention;

Figure 2 is an end view thereof; and

Figure 3 is a sectional view showing a modified construction.

Referring first to Figures 1 and 2, the pulley consists of a first pulley drum 10, a second pulley drum 11 and a third or intermediate pulley drum 12. The drum 10 contains gearing and may be called the gear drum while the drum 11 contains an electric motor and may be called the motor drum. The inner end of the gear drum is reduced to form an annular recess 13 and the inner end of the motor drum 11 has a similar annular recess 14. These recesses are engaged by the ends of the drum 12 so that the three drums form a continuous pulley. The drum 12 may be of any selected length whereby the overall axial length of the complete pulley can be of any required dimension although the drums 10, 11 remain of standard size and contain a standard size of gearing and a standard size of motor. The drums 10, 11 can be conveniently formed by casting and may be made in cast iron, stainless steel or other material, i.e. if lightness is desirable may be made in aluminium or mag-

2

nesium alloys or synthetic plastic. Metal drums may be covered with rubber or other material.

The drums 10, 11 are secured together by bolts 15 which screw into bosses 16 on the inner end wall 17 of the drum 11, this wall being integral with the drum. The bolts 15 pass through holes in an end wall 18 formed integrally with the drum 10 at the inner end thereof and carrying nuts 19 which can be removed to permit withdrawal of the drum 10 from the assembly.

The drum 11 contains an electric motor comprising a rotor 20, a stator 21 and a motor spindle 22. The electric motor is contained in a shell having end walls 24, 25 surrounding the motor spindle and a central sleeve 26. These three parts of the shell are bolted together by bolts 27. The outer end wall 25 has an integral sleeve 29 that projects through a removable end wall 30 located in the outer end of the drum 11. This sleeve 29 is carried by a mounting member 32, which in turn is mounted in a support bracket or pedestal 33 and is secured therein by a bolt 31, by means of which the member 32 can be slidably adjusted to take up the slack in the belt to a required extent. The member 32 constitutes a junction box and is fixed by bolts 28 to the motor shell end wall 25. The end wall 30 is fixed to the drum 11 by segmental key plates 34, 35 and screws 36, 37. The end wall 30 is mounted on a bearing 39 carried by the sleeve 29. The end wall 24 is formed with a sleeve 40 that carries a bearing 41 on which the end wall 17 of the motor drum 11 is mounted. This sleeve also has an extension 42 which carries a bearing 43 in which the motor spindle 22 is mounted. The other end of the motor spindle is mounted in a bearing 45 carried by the sleeve 29. The electrical leads 46 of the motor are taken out from the sleeve 29 into the member 32 which has an oil drip cover 47. A fan 48 is mounted between the drums 10, 11 and adjacent the drum 11 and serves to draw air in through an opening 50 in the member 32, an opening 49 in the wall 30, an opening 51 in the end wall 25, through the shell 24, 25, 26, and out of an opening 53 in the end wall 24 and an opening 54 in the end wall 17 of the motor drum. The fan discharges air from the openings 55 between the drums 11, 12. The air effects a thorough cooling of the motor. If desired, a wall 25 may be used not having an opening 51 so that the motor is closed against ingress of dust. The fan has a hub 57 provided with a cross-pin 58 which engages in a slot 59 in the motor spindle 22 to form a driving connection between them. The fan is pinned by a pin 60 to a shaft 61 which is located coaxially with the pulley drums and extends from the drum 12 to connect to the reduction gearing in the drum 10.

The front end of the shaft 61 is mounted in bearings 63, 64 located within a sleeve 65 forming part of an end cap 66 of a fixed cage 67, the other end of which has an end plate 68 formed with a sleeve or hollow spigot 69 that extends through a removable end cap or plate 70 of the drum 10 and into a mounting member or slide block 62 which is slidably adjustable in a support bracket or pedestal 71 by means of a bolt similar to bolt 34 to take up the slack in the belt. The bracket 71 is bored at 72 in line with a drilling 73 in the sleeve 69 to receive a dip stick 74 which can be removed for oil filling or to receive a syphon draining tube. Between the bearings 63, 64 is a back stop 76 or uni-directional clutch which may be set to act in either direction of rotation, and packing rings 77. The end plate 70 is mounted on a bearing 78 carried by the sleeve 69. The end plate 18 of the drum 10 has a sleeve 79 mounted on a bearing 80 carried by the sleeve 65. The bearings 78, 80 have dust cover rings such as 81, 82.

The end plates 18, 70 together with the bearings and packing rings completely enclose the reduction gearing

in a dust proof manner and serve to contain oil for lubrication.

The reduction gearing has three reduction stages, the first of which consists of a pinion 82 in mesh with a gear-wheel 83 on a layshaft 84. The pinion 82 forms an input member of the gearing and is mounted fast on the end of the shaft 61 within the shell 67. The second stage of the reduction is provided by a pinion 85 on the layshaft 84 meshing with a gear-wheel 86 on a central shaft 87. The third stage consists of a pinion 88 fixed to the gear-wheel 86 and meshing with a gear-wheel 89 on a layshaft 90. The shafts 84, 87, 90 are mounted in bearings carried at one side by the end plate 68 and on the other side by an integral wall 92 of the shell 67. The plate 68 and wall 66 are attached to the cage by dowel pins 91 to facilitate detachability for servicing the gearing. The gear-wheel 89 meshes with an internal ring gear 93 formed integrally on the end plate 70. The end plate 70 with its ring gear 93 has an exterior cylindrical surface 94 that fits with a sliding fit within the outer end of the drum 10, and is located against an annular shoulder 95. A packing ring 96 is provided at the shoulder to ensure a dust tight connection.

The end plate 70 is fixed to the drum 10 by a segmental key plate 97 and screws 98.

In order to change the pulley speed the key plate 97 is removed and the end plate 70 is withdrawn from the drum 10 together with cage 67 and the pinions and gear-wheels except for the pinion 82. The pinion 82 and gear-wheel 83 are then replaced by another pinion and gear-wheel of the required ratio according to the desired pulley speed. The reduction gearing assembly is then replaced within the drum 10. Thus, all the pinions and gear-wheels can be of standard form for all pulley speeds except for 82, 83.

The motor can equally be readily removed by first removing key plate 35 and end plate 30. On replacing the motor the motor spindle can easily be re-engaged with the pin 58.

If it is desired to change the length of the pulley this can readily be done by replacing the third drum 12, shaft 61 and bolts 15 by corresponding parts of greater or less length without requiring any change of the standard drums 10, 11 or gears and motor within them.

As shown in Figure 3, the third drum 12 may be omitted altogether, and in this case the drums 10, 11 are merely in abutment against each other and, if desired, one may have a reduced diameter portion 100 engaged within the end of the other.

Any of the types of motors normally available can be used, namely single phase, three phase, direct current or special motors for hazardous conditions. Capacitor start motors may have the capacitor mounted outside of the motor on the support bracket 33. The motor may be ventilated or totally enclosed.

The gears 82, 83 are preferably helical gears.

The drums 10, 11 may be slightly tapered with their tapered ends of smaller diameter than their inner ends.

The bearings are located by split spring rings 106 to minimize machining costs and for easy control of axial tolerances.

The cover 47 serves as a splash proof shield to prevent splashing water from entering the motor.

I claim:

1. A pulley comprising two rotatable pulley drums, connected together, a connecting shaft disposed between the two drums, a reduction gearing mounted within the first drum so as to be removable from the outer end thereof, said gearing having an input part engaged with the adjacent end of the connecting shaft and an output part fixed to the drum; an electric motor mounted within the second drum, means for connecting the other end of the connecting shaft to the spindle of the motor and stationary means within the second drum, and extending outside the drums for mounting the electric motor within

the second drum with the motor housing fixed while the drums and motor spindle rotate.

2. A pulley comprising two pulley drums connected together, a connecting shaft disposed between the two drums, a reduction gearing mounted within the first drum so as to be removable from the outer end thereof, said gearing having an input part engaged with the adjacent end of the connecting shaft and an output part fixed to the drum; means for mounting an electric motor within the second drum with the motor housing fixed while the motor spindle rotates, the other end of the connecting shaft having means for attachment thereto of the motor shaft, and a third pulley drum located between the first and second pulley drums and connected thereto so that the three drums form a continuous pulley.

3. A pulley comprising two pulley drums connected together, a connecting shaft disposed between the two drums, a reduction gearing mounted within the first drum so as to be removable from the outer end thereof, said gearing including a pinion on the adjacent end of the connecting shaft and, an output part fixed to the drum; a gear-wheel meshing with said pinion, and reduction gearing drivably connecting said gear-wheel with said output part; means for mounting an electric motor within the second drum with the motor housing stationary while the motor spindle and pulley drums rotate, means for connecting the other end of the connecting shaft to the motor shaft, said pinion and gear-wheel being arranged at one end of said gearing accessibly for replacement for changing the ratio.

4. A pulley comprising two pulley drums connected together, a connecting shaft disposed between the two drums, an internally toothed ring gear fixed within the first drum, a pinion fixed on the connecting shaft and located within said first drum, a reduction gearing located within said first drum and meshing respectively with said ring gear and said pinion, a gearing casing for said gearing, a spigot carried by said gearing casing, said spigot extending out of the first drum and serving as a support for the rotation of the drum, means for supporting an electric motor in the other of said drums with its shaft connected to said connecting shaft, a motor housing for said electric motor located in said second drum, and a spigot carried by said motor housing extending out of said second drum and serving to support said second drum rotatably.

5. A pulley comprising two pulley drums, a connecting shaft disposed between the two drums with its ends respectively located adjacent said drum, an internally toothed ring gear fixed within the first drum, a pinion fixed on the connecting shaft and located within said first drum, a reduction gearing located within said first drum and meshing respectively with said ring gear and said pinion a gearing casing for said gearing, a spigot carried by said gearing casing, said spigot extending out of the first drum and serving as a support for the rotation of the drum, means for supporting an electric motor in the other of said drums with its shaft connected to said connecting shaft, a motor housing for said electric motor located in said second drum, a spigot carried by said motor housing extending out of said second drum and serving to support said second drum rotatably, and a third pulley drum located between the first and second pulley drums so that the three drums form a continuous pulley.

6. A pulley as claimed in claim 4 wherein the internal ring gear serves as an end cap to said second drum.

7. A pulley as claimed in claim 4 wherein reduction gearing includes a gear-wheel meshing with said pinion; a layshaft carrying said gear-wheel, a second pinion fixed on said layshaft, a second gear-wheel meshing with the second pinion, a third pinion fixed to the second gear-wheel, a second layshaft, an idler wheel on the second layshaft meshing with said third pinion, said idler gear-

wheel driving said ring gear, said layshafts being mounted in said gearing casing.

8. A pulley as claimed in claim 7 wherein the gearing casing has end plates attached to the cage by dowel pins.

9. A pulley as claimed in claim 4 wherein the spigot is hollow and is mounted in a mounting member, said spigot and mounted member having aligned apertures to receive a dip stick.

10. A pulley as claimed in claim 4 wherein the inner end of the gearing casing has a sleeve which carries a bearing on which an end wall on the pulley is mounted and contains a bearing for the adjacent end of the shaft.

11. A pulley as claimed in claim 4 wherein the second drum has a removable end wall fitted therein mounted on a bearing carried by the motor.

12. A pulley as claimed in claim 4 wherein the motor housing has end walls surrounding the motor spindle, the outer end wall carrying said spigot while the sleeve on the other end wall bearings carried by said sleeve, for the motor housing and the motor spindle.

13. A pulley as claimed in claim 4 wherein the motor housing has end walls surrounding the motor spindle, the outer end wall carrying said spigot, a sleeve on the other end wall, bearing carried by said sleeve for the motor housing and the motor spindle, and a mounting member supporting said spigot rotatably, said mounting member being formed as a junction box.

14. A pulley as claimed in claim 4 having a fan mounted on the shaft between the drums and withdrawing air from the motor drum.

15. A pulley as claimed in claim 14 wherein the bearings are located axially by split spring rings.

16. A pulley as claimed in claim 14 wherein the mounting member is adjustable in a support for tightening the belt.

17. A pulley comprising two end drums and an intermediate drum between said end drums all three said drums being connecting together to form in effect a single rotatable member, a connecting shaft disposed in the intermediate drum, a reduction gearing mounted within the first end drum so as to be removable from the outer end thereof, said gearing having an input part engaged with the adjacent end of the connecting shaft and an output part fixed to the drum; an electric motor, said motor including a housing and a rotary spindle, means for mounting said motor housing in stationary condition within the second end drum, there being an air passage around the housing between the housing and second drum; means for connecting the shaft to the motor spindle and a fan on said connecting shaft between said motor and gearing for drawing air through said air passage.

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