July 12, 1960 J. H. WILSON 2,944,790

DRUM ASSEMBLY

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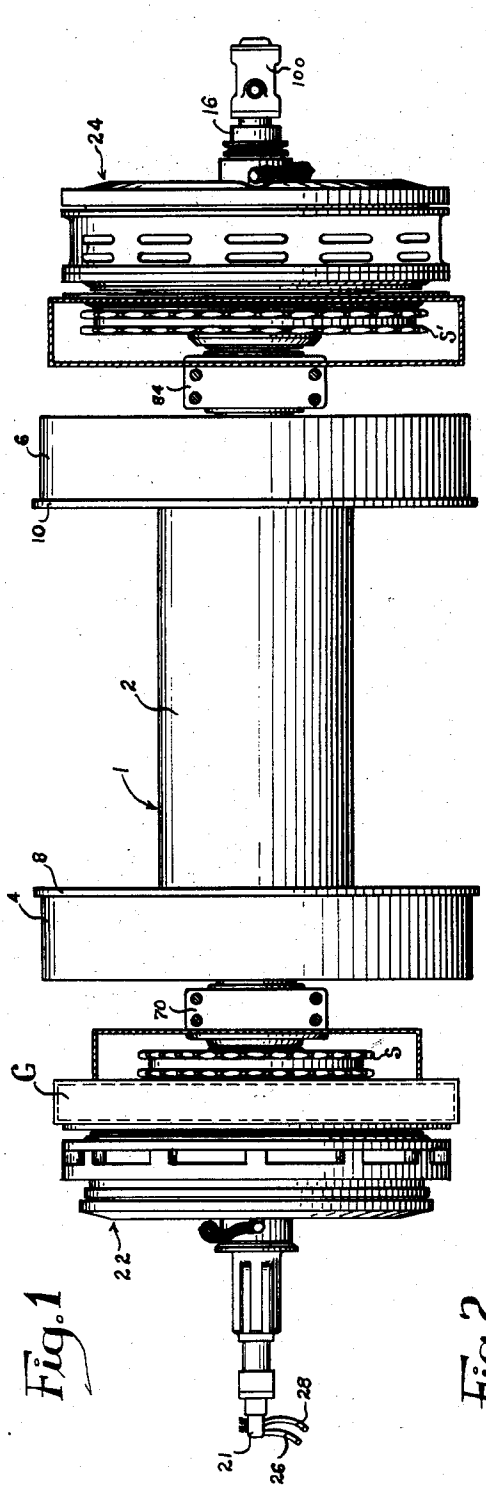


Fig. 1

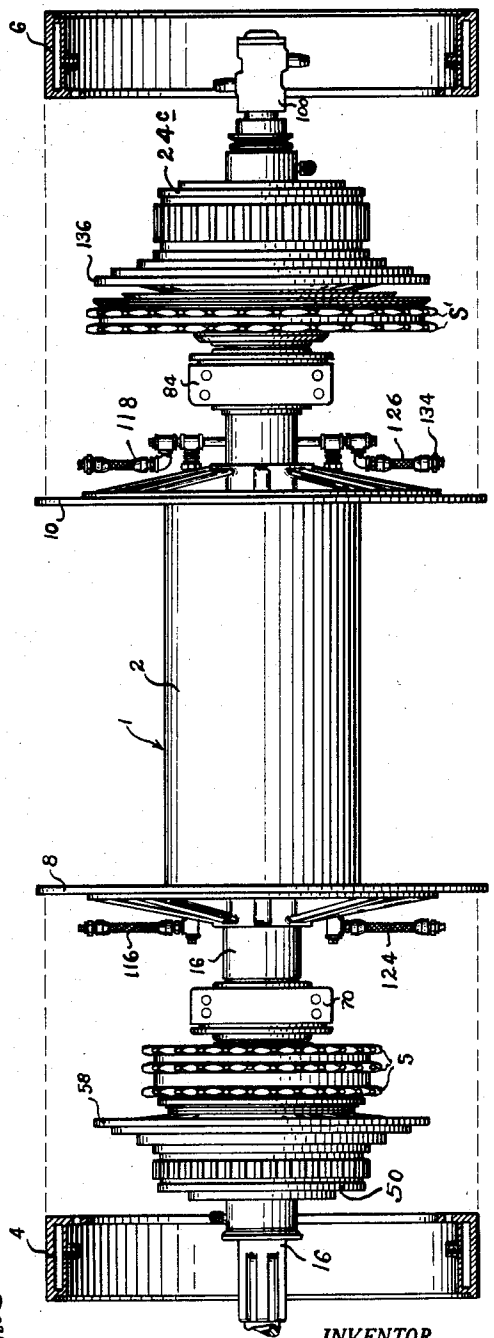


Fig. 2

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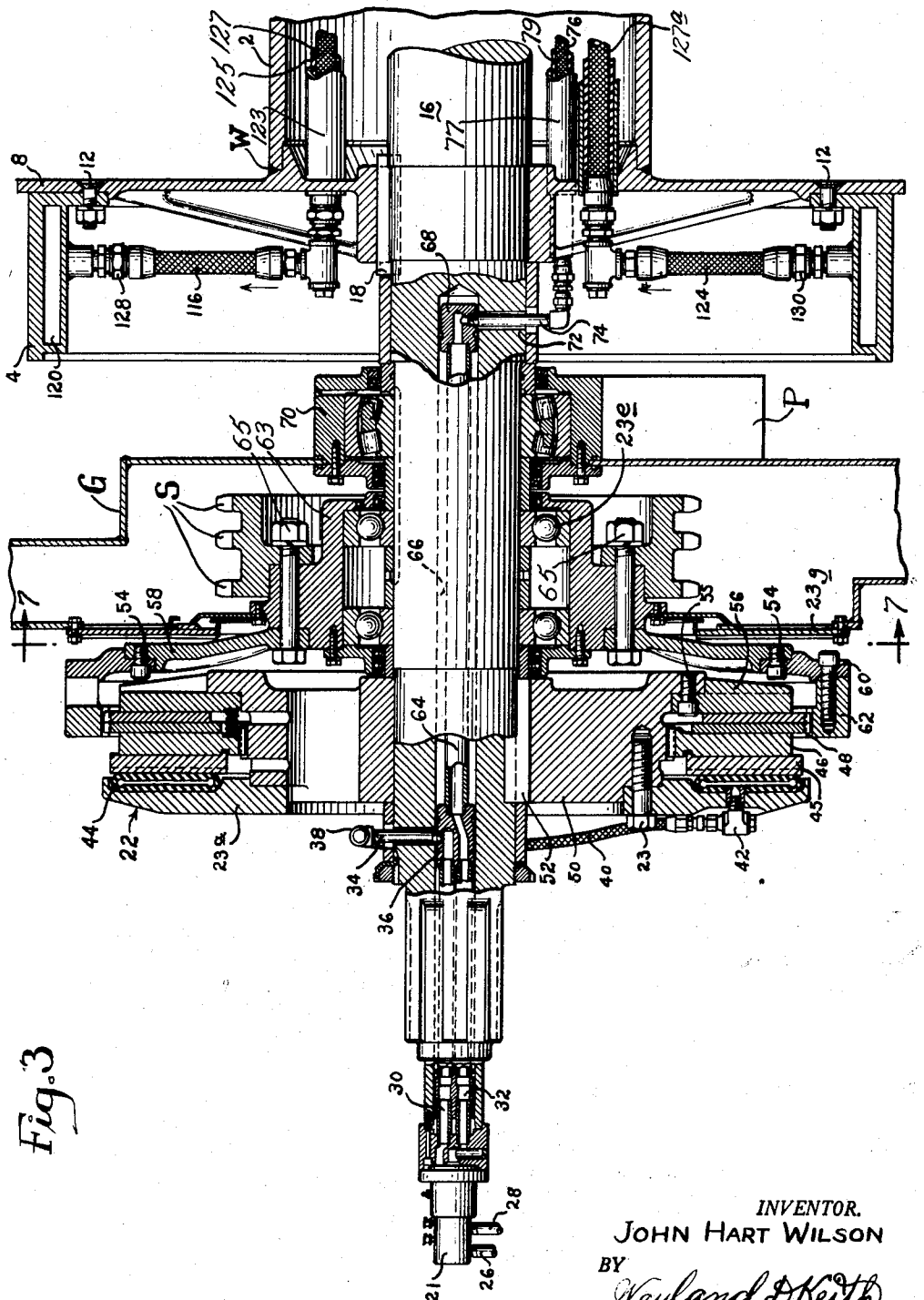


Fig. 3

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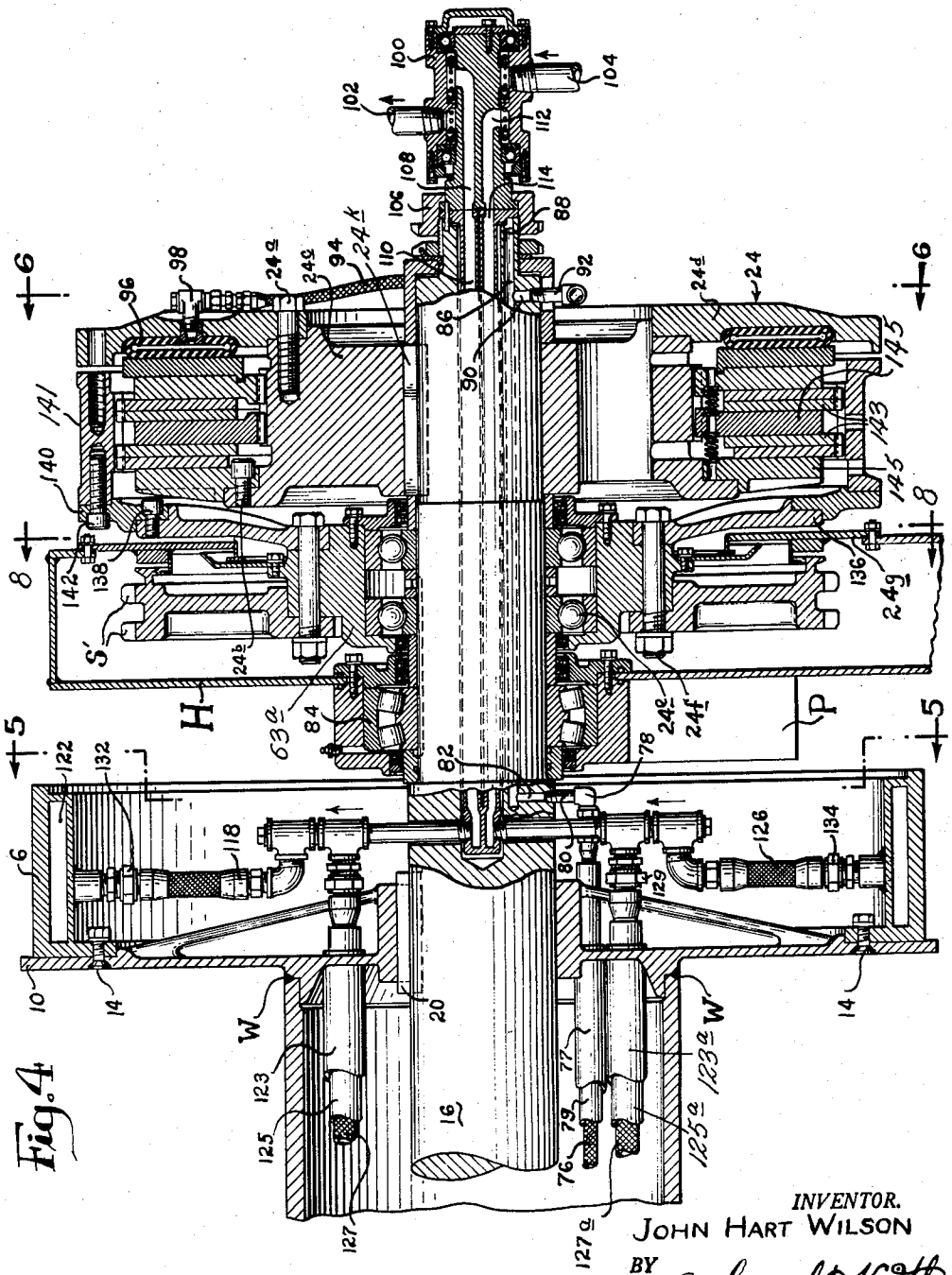


Fig. 4

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Fig. 5

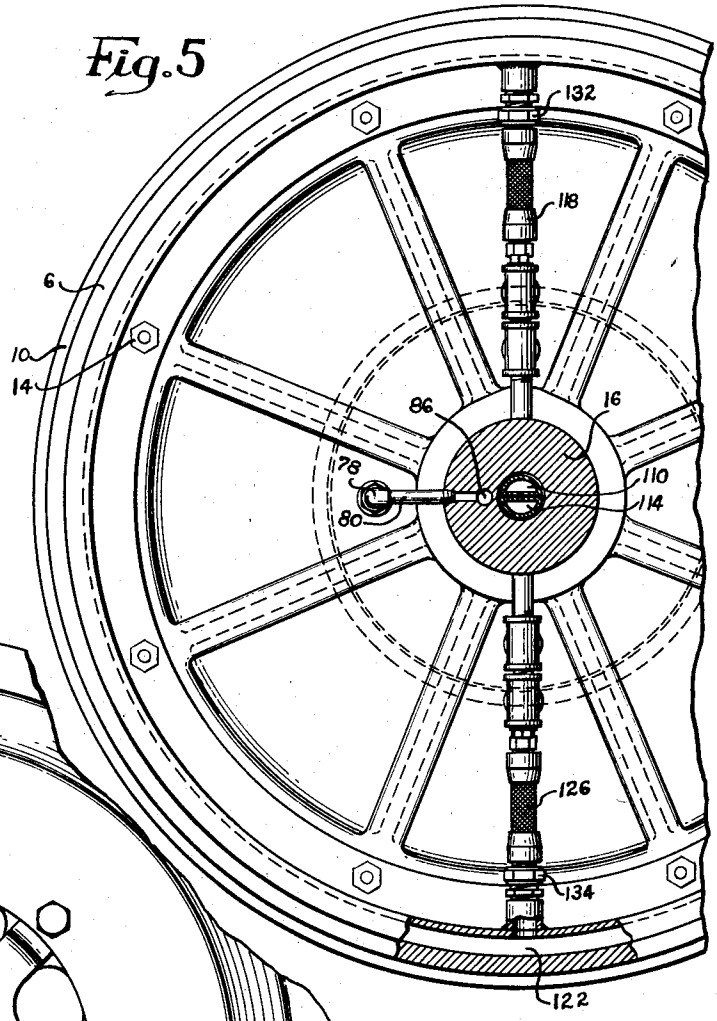
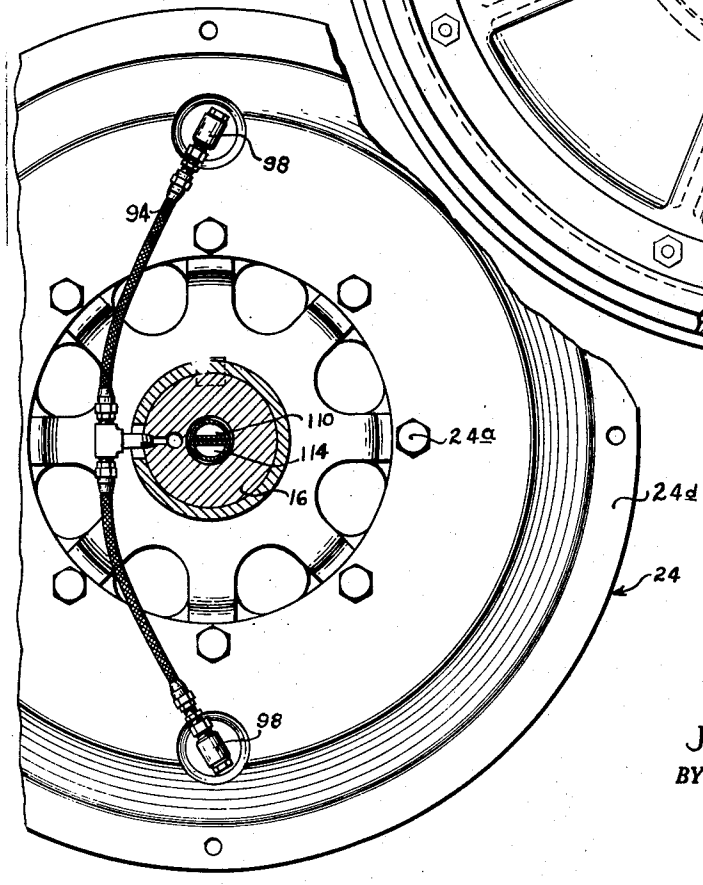


Fig. 6



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Fig. 7

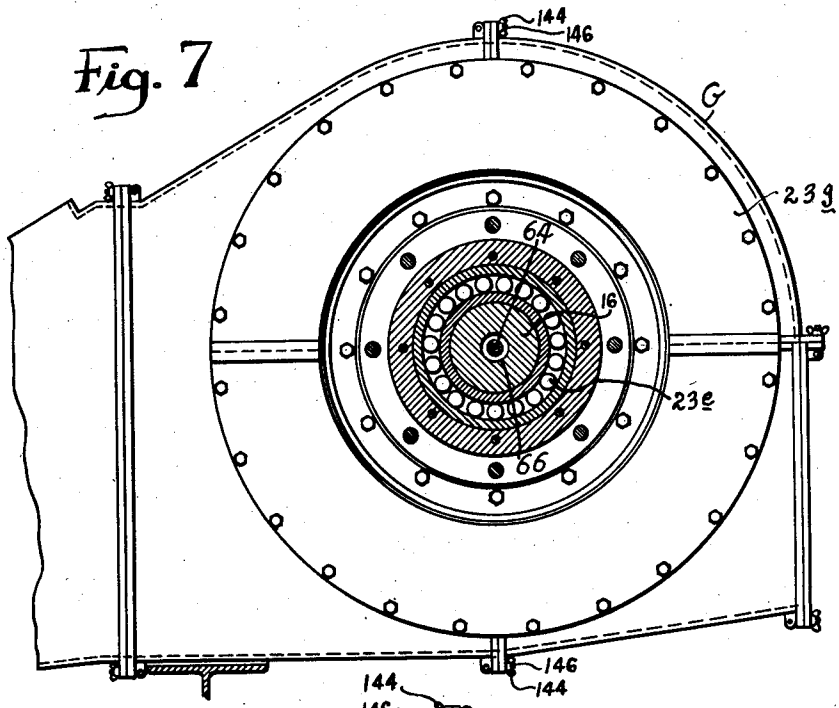
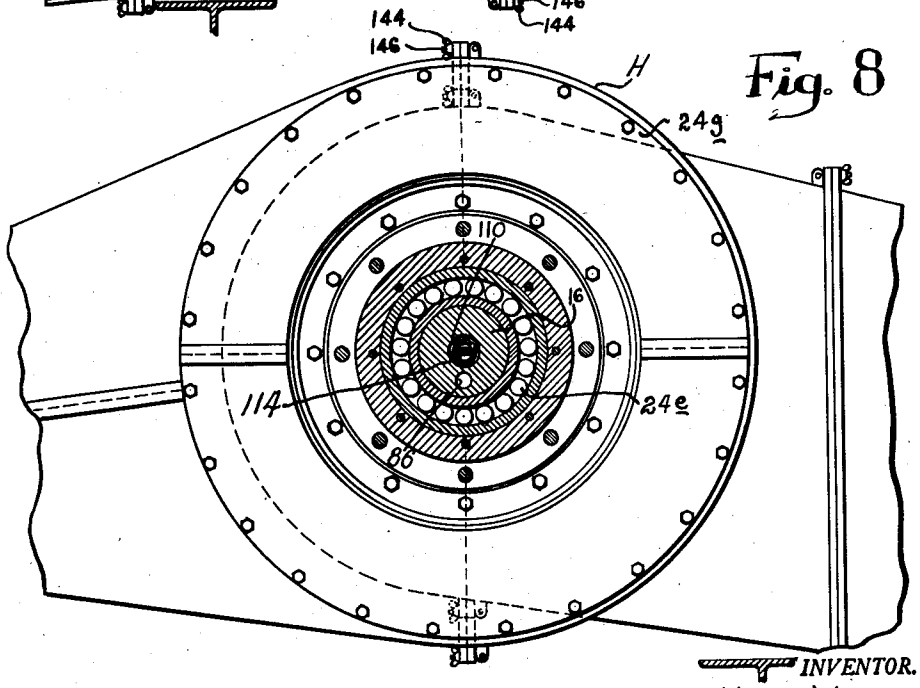


Fig. 8



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Fig. 9

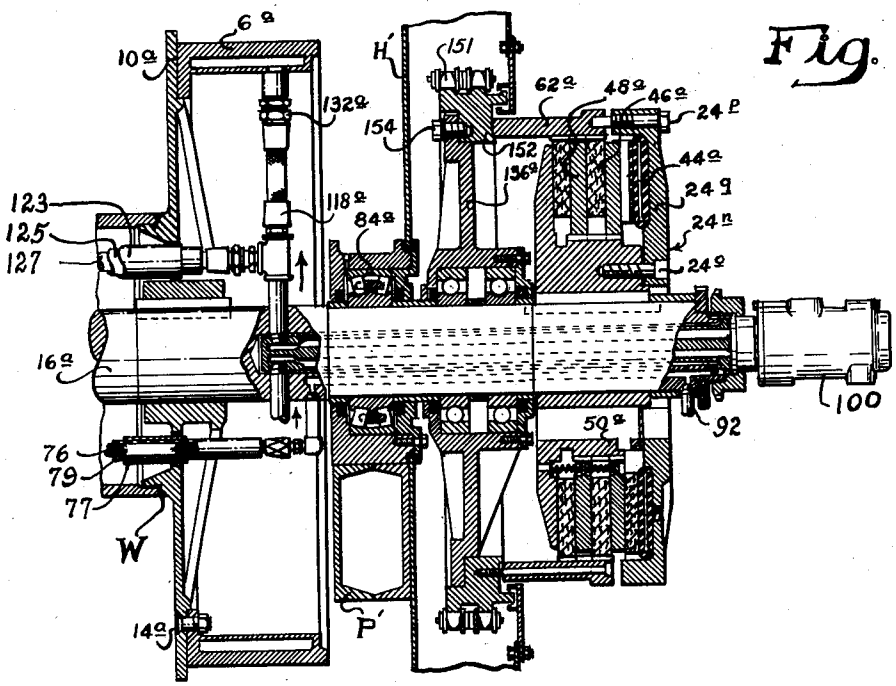
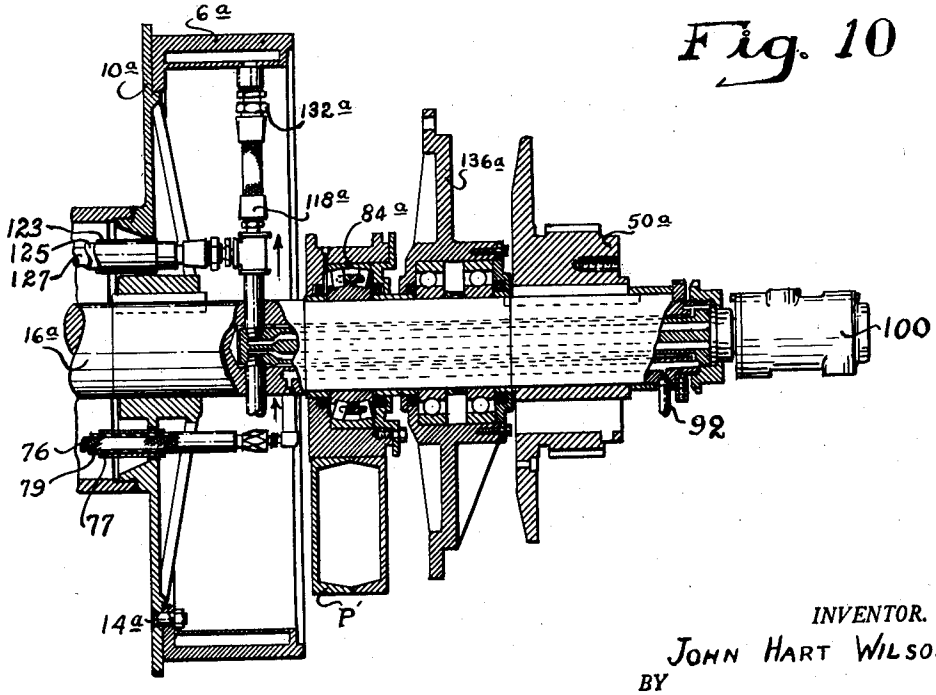


Fig. 10



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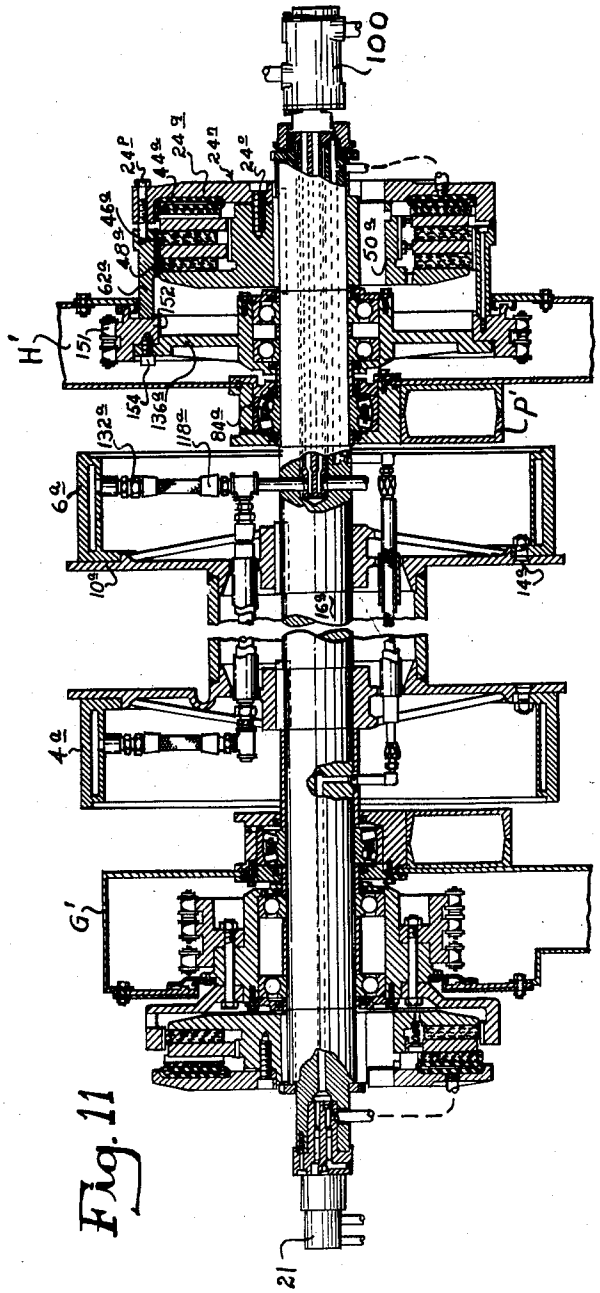


Fig. 11

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United States Patent Office 2,944,790 Patented July 12, 1960

2,944,790

DRUM ASSEMBLY

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Filed Nov. 27, 1956, Ser. No. 624,593

6 Claims. (Cl. 254—187)

This invention relates to improvements in drum assemblies, and more particularly to drum assemblies using fluid actuated clutches on each end of the drum shaft thereof to engage the drum with the prime mover.

Various drum assemblies have been proposed heretofore, but these for the most part, required a rotatable fluid connection on each end, so as to direct the fluid actuating media for the clutches, from a source of pressure to each clutch.

Drum assemblies in use heretofore, have required the removing of each fluid clutch in order to replace or repair the brake rings.

In the present invention, the drum structure is so designed that the fluid being directed to the respective fluid actuated clutches, on each end of the drum shaft and exterior of the drum shaft bearings, is conducted into one end of the drum shaft through a rotary fluid connection; thence through the drum shaft only a sufficient distance for the fluid to pass through the bearings, then through auxiliary conduits to a point adjacent and inside of the second drum bearing, where the conduit passes the fluid back through the shaft and beneath the drum bearings to a point exterior of the drum bearings, where a fluid connection is connected between the shaft and the fluid actuated clutch. A further conduit connects the rotary fluid connection to a fluid actuated clutch on the shaft adjacent the rotary fluid coupling.

An object of this invention is to provide a drum assembly, the brake rings of which may be readily removed and replaced without removing the entire fluid clutch unit from the drum shaft, or removing any press fit or shrink fit parts, such as bearings, from the shafts.

Another object of the invention is to provide a drum shaft assembly wherein the fluid actuating media may be directed from one end of the shaft to a fluid actuated clutch, exterior of each of the drum bearings, without the drum shaft being axially drilled from end to end.

Still another object of the invention is to provide a drum and shaft assembly, through one end of which a coolant, such as water is passed, through a rotary coupling at one end of the shaft, then through the water cooled brake rings, and be returned to and through the same rotary coupling to complete the circulation cycle.

A further object of the invention is to provide a drum assembly in which the air for both clutches enters the shaft at one end, the cooling water, both inlet and outlet, for the brake rings enters and leaves the drum shaft at the opposite end, thus avoiding the combination of water and air in the same rotary coupling.

With these objects in mind, and others which will become manifest as the description proceeds, reference is to be had to the accompanying drawings in which like reference characters designate like parts in the several views thereof, in which:

Fig. 1 is an elevational view of a drum assembly with the drum removed from the drum support posts, and showing a rotary fluid coupling at one end for introducing a coolant, such as water, and showing a rotary fluid coupling at the other end of the assembly for introducing a fluid under pressure to actuate the fluid actuated clutches which are on each end of the drum shaft, but exterior of the drum bearings;

Fig. 2 is an exploded view of the drum shaft assembly with parts removed, parts broken away, with other parts shown in section, and with the brake flanges of the drum being shown in exploded relation to show the manner in which the brake rings are assembled over the hubs of the clutch units;

Fig. 3 is a fragmentary, longitudinal, sectional view through an end portion of the drum assembly, on an enlarged scale, showing parts thereof in elevation, and showing the rotary fluid coupling through which fluid clutch actuating media is conveyed;

Fig. 4 is a fragmentary, longitudinal sectional view of the other end portion of the drum assembly from that shown in Fig. 3, and showing parts in elevation to illustrate the details of construction;

Fig. 5 is a sectional view taken on the line **5—5** of Fig. 4, looking in the direction indicated by the arrows;

Fig. 6 is a sectional view taken on the line **6—6** of Fig. 4, looking in the direction indicated by the arrows;

Fig. 7 is a sectional view taken on the line **7—7** of Fig. 4, looking in the direction indicated by the arrows;

Fig. 8 is a sectional view taken on the line **8—8** of Fig. 3, looking in the direction indicated by the arrows;

Fig. 9 is a fragmentary, sectional view of a modified form of the drum assembly embodying the invention, utilizing a drive sprocket of a larger outside diameter than the inside diameter of the brake ring;

Fig. 10 is a fragmentary, sectional view of a portion of a drum assembly, wherein portions of the clutch assembly have been removed; and

Fig. 11 is a sectional view of the modified form of drum.

With more detailed reference to the drawing, the numeral **1** designates generally a drum assembly, which comprises a drum barrel **2**, and brake ring members **4** and **6**. The brake ring members **4** and **6** are bolted onto the respective drum flange members **8** and **10**, by means of bolts **12** and **14**, respectively. The drum barrel **2** is secured to the respective flanges, at each end thereof, as by welding, as indicated at W. The drum flanges **8** and **10** are each keyed to the drum shaft by keys **18** and **20**, respectively. The drum flanges **8** and **10** are spaced apart a sufficient distance to provide for a drum barrel of a size to spool the desired amount of cable.

Each end of the drum shaft is provided with a rotary fluid coupling, designated at **21** and **100**, respectively. Coupling **21**, as shown at the extreme left in Figs. 1 and 3, is a rotary fluid coupling for conveying a fluid media selectively, under pressure, to the respective fluid actuated clutches designated generally by the numerals **22** and **24**. The fluid is passed into and through rotary fluid coupling **21** by conduits **26** and **28**, respectively. The fluid passing through rotary fluid coupling **21** passes into conduits **30** and **32**, respectively, with the conduit **30** interconnecting with a conduit **34** which is secured in the inner end of fitting **36**. The conduit **34** has a fitting **38** thereon, which fitting interconnects with flexible hose **40** and which leads to a quick release valve **42**, so fluid under pressure can be directed from conduits **26**, **30**, and **34** and hose **40** into axially expansible clutch actuating tube **44**, which tube expands axially to cause interengagement of clutch plates **46** and **48**, as will best be seen in Fig. 3.

The clutch shown in Fig. 3 is of the character which has a hub portion **50** keyed to the shaft **16**, by a key **52**, while the key and hub can be removed, this is quite difficult to do in the field, and requires hours of work and special tools, whereas, to remove the bolts **23**, which bolt

the annular clutch ring to the air tube holding plate 23*a*, which, upon disconnection of air hose 40 from quick release valve 42, may be removed longitudinally from hub 50, whereupon, annular ring 45 and friction elements 46 and 48 may be removed to give access to cap screws 55 which bolt annular clutch back plate 56 to hub 50. With these cap screws and the clutch back plate 56 removed, access is had to cap screws 54 which bolt annular adapter ring 60 to adapter plate 58, which will enable the removal of adapter ring 60 and annular drive ring 62, as a unit, which is a simple operation as compared to that of removing the hub and the entire clutch assembly.

Bearings 23*e* are mounted on shaft 16 adjacent hub 50 (Fig. 3) and are fixed against longitudinal movement relative to the hub 50. A second hub 63 is mounted on bearings 23*e*, which hub 63 is journaled on said bearings for rotation on shaft 16. Adapter plate 58 is bolted to hub 63 by means of bolts 65, which bolts also secure sprocket S to the hub 63. The adapter plate 58, adapter ring 60 and drive ring 62, together with friction element 48 and sprocket S will rotate in unison with rotatable hub 63. When air tube 44 causes engagement of friction elements 46 and 48, hubs 50 and 63 will turn in unison, however, when friction elements 46 and 48 are out of engagement, hub 50 will rotate with shaft 16, and the shaft 16 will turn in bearings 23*e* within hub 63.

Bearings 24*e* are mounted on shaft 16 adjacent hub 24*c* and are fixed against longitudinal movement relative to hub 24*c*. A second hub 63*a* is journaled on bearings 24*e*, which hub 63*a* is journaled on said bearings for rotation on shaft 16. Adapter plate 136 is bolted to hub 63*a* by means of bolts 24*b*, which bolts also secure sprocket S' to hub 63*a*. The adapter plate 136, adapter ring 140, and drive ring 141, together with friction elements 143 and sprocket S' will rotate in unison with rotatable hub 63*a*, when air tube 96 causes engagement of friction elements 143 and 145, hubs 24*c* and 63*a* will turn in unison, however, when friction elements 143 and 145 are out of engagement, hub 24*c* will rotate with shaft 16 and shaft 16 will turn in bearings 24*e* within hub 63*a*.

The adapter plate 58 has a smaller outside diameter than the smallest inside diameter of the annular brake ring 4, so upon removing the split chain guard elements G from around sprockets S and removing the drum assembly from the drum support post P, and with the annular drive rings 60 and 62 removed, and with the chain guard G removed, and upon removal of bolts 12, the brake ring 4 may be passed over the clutch hub 50 and easily removed, as shown in Fig. 2.

The rotary fluid coupling 21 has dual conduits 26 and 28 leading thereinto for supplying air to the respective clutches 22 and 24. The conduit 28 connects with conduit 32, through which air passes, which conduit interconnects with a pipe 64, which pipe is secured into an adapter fitting 36 which is fitted within an axial bore 66 in drum shaft 16. The pipe 64 has a fitting 68 on the end thereof which is axially and transversely drilled to interconnect the pipe 64 with pipe 74. However, the bore 66 need only be in the end of the drum shaft a sufficient depth to pass through bearing 70. The shaft 16 is transversely drilled, as indicated at 72, so the transverse hole will register with the transverse hole drilled in fitting 68, whereupon, the pipe 74 is screw threaded into fitting 68 so as to convey air thereinto and into a conduit 76 which leads longitudinally along shaft 16 and through drum flange 10, thence through L 78 and into a pipe 80, which pipe is screw threaded into a transverse hole 82 formed in shaft 16 inward of bearing 84.

Where the clutch actuating fluid passes through the drum barrel, a steel tube 77 is welded to each drum end, so as to form a passage therethrough. The high pressure hose 76, which conducts this clutch actuating fluid, is surrounded by a rubber or rubber and fabric sleeve 79, which sleeve fills the space between the high pressure hose 76 and the steel tube 77 which supports it, and forms a conduit through which it can be drawn. The rubber sleeve 79 over the high pressure hose is of such thickness that it will approximately fill the space in the steel tube and the inside of the steel tube is sufficiently large that the hose connection on the end of the high pressure hose 76 can be drawn through the steel tube 77, thus it can be withdrawn for repairs without removing the drum from the rig.

It is preferable to have a longitudinal bore drilled in shaft 16 at the end opposite rotary fluid seal 21, so that the longitudinal hole 86, which is preferably drilled off center, will pass interiorly of bearing 84 and intersect transverse hole 82. A plug 88 closes the outer end of bore 86, as will best be seen in Fig. 4, and a further transverse hole 90 is drilled into shaft 16 so as to intersect longitudinal bore 86 exterior of air actuated clutch 24. A pipe 92 is screw threaded into transverse hole 90 and has a flexible hose 94 connected thereto, which hose conducts air under pressure through quick release valve 98 into axially expansible tube 96, which actuates clutch 24. The quick release valve 98 is provided on clutch 24 to quickly release air from axially expansible tube 96, as will best be seen in Fig. 4.

A rotary fluid seal 100 is secured to the end of shaft 16 opposite the rotary fluid coupling 21. The rotary fluid seal 100 has inlet pipe 104 leading thereinto and outlet pipe 102 leading therefrom. The rotary coupling 100 is held on the shaft 16 by union connection 106, which causes passage 108 in rotary seal 100 to register with passage 110 in shaft 16, and passage 112 in rotary seal 100 to register with passage 114 in shaft 16, so a coolant, such as water, may be passed through pipe 104 into passage 108, then through passage 110, out through lateral conduits 116 and 118 into annular passages 120 and 122 of the respective brake rings 4 and 6, with the outlet water returning through conduits 124 and 126, which interconnect with the opposite side of the respective annular passages 120 and 122, into pipe 127*a*, thence into passage 114 and out through pasages 112 into outlet pipe 102. Conduits 124 and 126 are connected to the annular passage formed in the brake ring by the respective unions 130 and 134.

It will be seen that air is directed to a clutch on each end of said drum shaft, without drilling the drum shaft from end to end, and that water is directed from one end of the drum shaft into both brake rings without drilling the shaft from end to end, and yet the systems are so correlated that, by removing unions 128 and 130, and by removal of bolts 12, which bolt the brake ring 4 to flange 8, and by removing chain guards designated at G, the brake ring 4 may be passed over clutch adapter plate 58, from which component parts of the clutch have been removed, without disturbing the hub portion 50 of the clutch which is keyed to the shaft 16, it being necessary only to remove the chain from the sprockets and to remove the drum from the support posts upon which it is mounted, likewise, the brake ring 6 may be removed by removing bolts 14, and unions 132 and 134. After the brake ring 6 is removed, it may be passed over the adapter plate 136, after the friction element assembly of the clutch 24 has been removed from the adapter ring 136, by removal of bolts 138, which hold the annular ring 140 to clutch assembly 24, substantially in the same manner as set out for clutch 22. Ring 140 is bolted in place by means of bolts 142, thereby enabling the removal of the brake ring, the bore of which is slightly larger than the drive sprocket thereon, without having to dismantle the entire clutch assembly.

Steel tubes 123 are fitted between drum flanges 8 and 10 and are secured thereto, interior of the drum barrel 2, as by welding, to form longitudinal conduits through the drum flanges 8 and 10. The steel tubes are of such diameter as to enable the passing of flexible conduits or hose 127 and 127*a* through the respective tubes, and with sufficient space between the conduits 127 and 127*a* so

that a rubber or rubber and fabric sleeve **125** may be fitted within the respective steel tubes, and substantially fill the annular space between the respective conduits **127** and **127***a* and steel tubes **123**. Conduits or hose **127** and **127***a* each have fittings on the ends thereof, which fittings are of a size that may be passed through the steel tubes **123**. The rubber or rubber and fabric sleeves **125** form an insulating and cushioning means intermediate the respective hoses and the respective steel tubes.

Fig. 2 shows an exploded view of the brake ring removed from the hoisting drum and showing the inner portions of the clutches remaining on the shaft **16**, thereby enabling the change to be made in a fraction of the time that would be required to change a brake ring, which necessitates the dismantling of the clutch members and the reassembly thereof.

It is also to be pointed out, that the high pressure hoses which carry both air and water through the drum, can be removed, repaired and/or replaced without removing the drum from the rig, because the flexible hoses and the rubber sleeves surrounding the respective hose is contained within a steel support tube and is flexible enough so that it can be bent around and withdrawn from inside the guard H, by disconnecting the unions.

The chain guards G and H are split transversely, as will best be seen in Figs. 7 and 8, and it is preferable to use quickly separable wing nuts **144** and hinge bolts **146** to secure the portions thereof together, so as to enable the chain guards to be separated quickly, so as not to retard or hinder the removal of the brake rings.

Modified form of invention

A modified form of the invention is shown in Figs. 9 and 10, wherein the clutch drive sprocket **151** is of a larger external diameter than the largest internal diameter of the brake ring **6***a*, and wherein provision is made to remove the annular sprocket **151**, together with the clutch elements, as will be more fully set out hereinafter, to enable the removal of the brake ring **6***a* from the drum flange **10***a*, and to enable the brake **6***a* to be passed outward off the end of shaft **16***a* without having to remove the clutch hub **50***a* from the shaft **16***a*.

The present device has a clutch, designated generally at **24***n*, and which, by removing bolts **24***o* and **24***p* will enable the removal of an air tube holding plate **24***q*, whereby the friction plate elements **46***a* and **48***a*, as well as the expansible clutch tube **44***a* may be removed, if desired.

Then, by removing cap screw **154**, the sprocket **151** and clutch drive ring **62***a* may be removed longitudinally off the end of shaft **16***a*. Whereupon, by disconnecting hose connections **118***a* and **132***a*, as well as bolts **14***a* which bolt the brake ring **6***a* to drum flange **10***a*, and with the bearing **84***a* disconnected from the support post P' and with the chain guards H' removed, the brake ring **6***a* may be moved off the end of shaft **16***a* for repair or replacement.

Fig. 10 shows the clutch friction elements, as well as the annular sprocket **151**, removed from their respective mounting plates, preparatory to the removal of brake ring **6***a*.

Having thus clearly shown and described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A drum assembly comprising a shaft, a drum having at least one water cooled brake ring assembly, which brake ring assembly is attachably connected to said drum, said drum being mounted on said shaft, an air actuated clutch, which clutch has a first hub rotatably mounted on said shaft, which shaft extends axially of said drum assembly and outward from each end thereof, a second hub portion of said clutch being keyed to said shaft adjacent said rotatably mounted first hub of said clutch, a clutch adapter plate mounted on said first hub, the outside diameter of which adapter plate is less than the inside diameter of said brake ring assembly, said clutch adapter plate being attachably secured to the rotatable portion of said first hub of said clutch, an annular adapter ring for said adapted plate, the outside diameter of which adapter ring is larger than the inside diameter of said brake ring assembly, which annular adapter ring is attachably secured to said adapter plate, the inside diameter of said annular adapter ring being larger than said second hub portion of said clutch.

2. A drum assembly comprising a shaft, a drum having water cooled brake ring assemblies, which brake ring assemblies are attachably connected to said drum, said drum being mounted on said shaft, a pair of air actuated clutches, each having a first hub rotatably mounted on said shaft, which shaft extends axially of said drum assembly and outward from each end thereof, a second hub portion of each clutch being keyed to said shaft adjacent said rotatably mounted first hub of each clutch, a clutch adapter plate mounted on each of said first hubs, the outside diameter of the respective adapter plates being less than the inside diameters of the respective brake ring assemblies, the respective clutch adapter plates being attachably secured to the respective rotatable portions of said respective first hubs of said clutches, an annular adapter ring for each of said adapter plates, the outside diameter of each being larger than the inside diameter of the respective brake ring assemblies, which annular adapted rings are each attachably secured to the respective adapter plates, the inside diameter of each adapter ring being larger than the respective second hub portions of the respective clutches.

3. A drum assembly as defined in claim 2, wherein first and second bearings are provided and in which bearings said drum shaft is journaled, said drum shaft being bored axially from one end thereof less than one-half its length, first and second conduits for air within said bore and extending into said drum shaft, a rotary connector on said shaft to convey air into said conduits in said shaft, a first air actuated clutch, a second air actuated clutch, a conduit connected with the first of said conduits and leading outward from and being connected to said first air actuated clutch exterior of said first drum shaft bearing, the second of said conduits passing interiorly through said shaft and said first bearing to a point intermediate said first and second bearings and near said first bearing, a further conduit extending laterally from said second conduit, said further conduit extending outside of said shaft longitudinally through the barrel of said drum to a point intermediate said first and said second bearings and adjacent said second bearing, said shaft having a lateral passage formed therein intermediate said first and said second bearings and near said second bearing, said second conduit being connected with said lateral passage, said shaft having a second bore formed therein, which bore is eccentric with respect to the axis of said shaft and is less than one-half the length of said shaft, which eccentric bore connects with said last mentioned lateral passage and passes through said second bearing to a point longitudinally exterior thereof, said shaft having a further lateral passage formed therein, which passage connects with said eccentric bore, and conduit means connected with said last mentioned lateral passage to direct air from said last mentioned lateral passage to said second air actuated clutch.

4. A drum assembly as defined in claim 3, wherein said shaft has a second axial bore formed therein in the end opposite the end on which first and second conduits for air are fitted, which bore extends to a point intermediate said first and said second bearings, a dual conduit for cooling fluid positioned within said second axial bore, said second axial bore being substantially parallel with said eccentric bore and out of fluid communication therewith, and rotary connector means for conducting cooling fluid into said dual conduits for cooling fluid.

5. In a drum assembly having a brake ring attachably

secured to each end of said drum, a shaft extending through said drum and mounting said drum thereon, a bearing mount on said shaft near each end of said drum, an air actuated clutch mounted near each end of said drum shaft, each of which clutches has an adapter plate mounted thereon, which adapter plates have an outside diameter less than the internal diameter of the respective brake rings, an annular adapter ring, the outside diameter of which is greater that the internal diameter of the respective brake rings, attachably secured to the outside of the respective adapter plates and to the drive ring of the respective air actuated clutches, a pair of toothed sprockets mounted on said shaft, one of which sprockets is connected in driving relation with each of said clutches, the outside diameter of the respective sprockets being less than the inside diameter of the respective brake rings.

6. A drum assembly including a drum shaft, a drum barrel and spaced apart drum ends mounted on said shaft, each of which drum ends has a hollow, annular, water-cooled brake ring mounted thereon, first and second bearings journaling said shaft, said shaft having a bore formed axially therein from one end thereof, which bore is less than one-half the length of said shaft, first and second conduits within said axial bore and extending into said shaft for passage of air therethrough, a rotary connector on said shaft to convey air into said conduits in said shaft, a first air actuated clutch mounted on said shaft exterior of said first bearing, a conduit connected with the first of said conduits and leading outward therefrom and being connected to said first air actuated clutch, the second of said conduits passing interiorly through said shaft and said first bearing to a point intermediate said first and said second bearings and near said first bearing, a further conduit extending laterally from said second conduit, said further conduit extending outside of said shaft longitudinally through the barrel

of said drum to a point intermediate said first and said second bearings and adjacent said second bearing, said shaft having a lateral passage formed therein intermediate said first and said second bearings and near said second bearing, said second conduit being connected with said lateral passage, said shaft having a bore formed therein at the end opposite said axial bore, which bore is eccentric to the axis of said shaft, which eccentric bore extends from a point interior of said second bearing to the end of said shaft, means closing the end of said eccentric bore, said shaft having a further lateral passage formed therein exterior of said second bearing, which further lateral passage connects with said eccentric bore, and still further conduit means connecting with said further lateral passage and extending outward therefrom, and a second air actuated clutch mounted on said drum shaft near the end opposite said first air actuated clutch, said last mentioned conduit being operatively connected to said second air actuated clutch.

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