Oct. 17, 1950 F. J. YOUNG 2,526,525

APPARATUS FOR WATER COOLING BRAKE RIMS

Filed Oct. 17, 1947 3 Sheets-Sheet 1

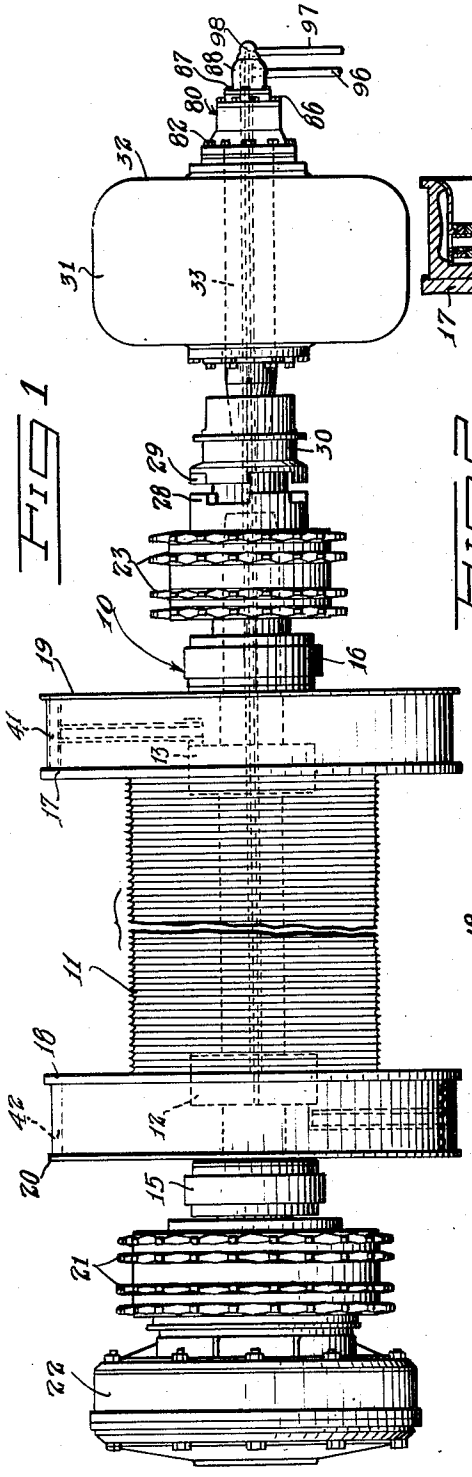


FIG 1

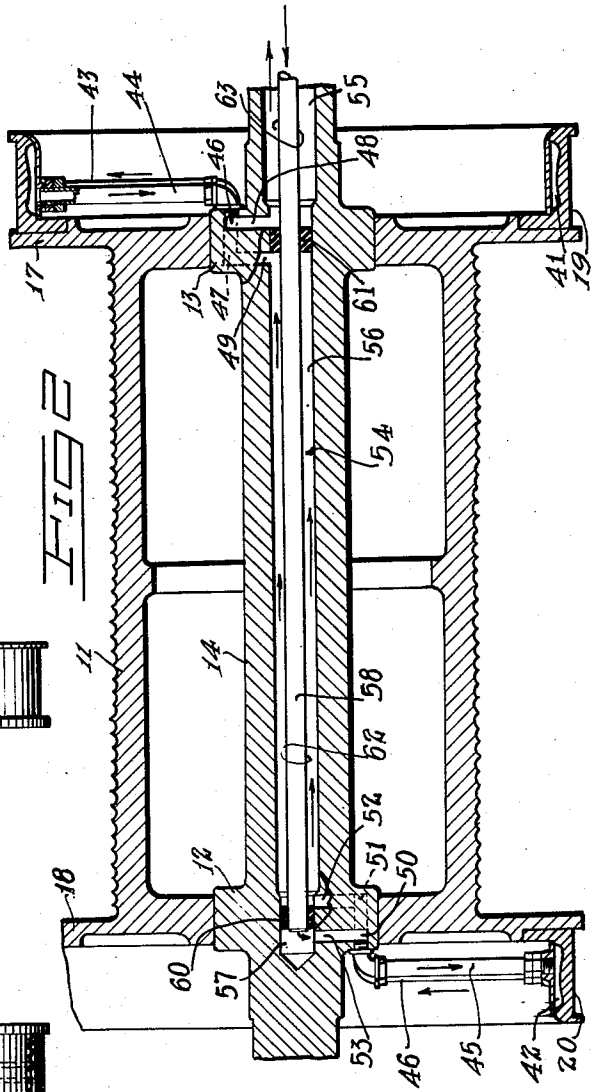


FIG 2

INVENTOR.
Forrest J. Young
BY Lyon & Lyon ATTORNEYS.

Oct. 17, 1950 F. J. YOUNG 2,526,525

APPARATUS FOR WATER COOLING BRAKE RIMS

Filed Oct. 17, 1947 3 Sheets-Sheet 2

Fig 3

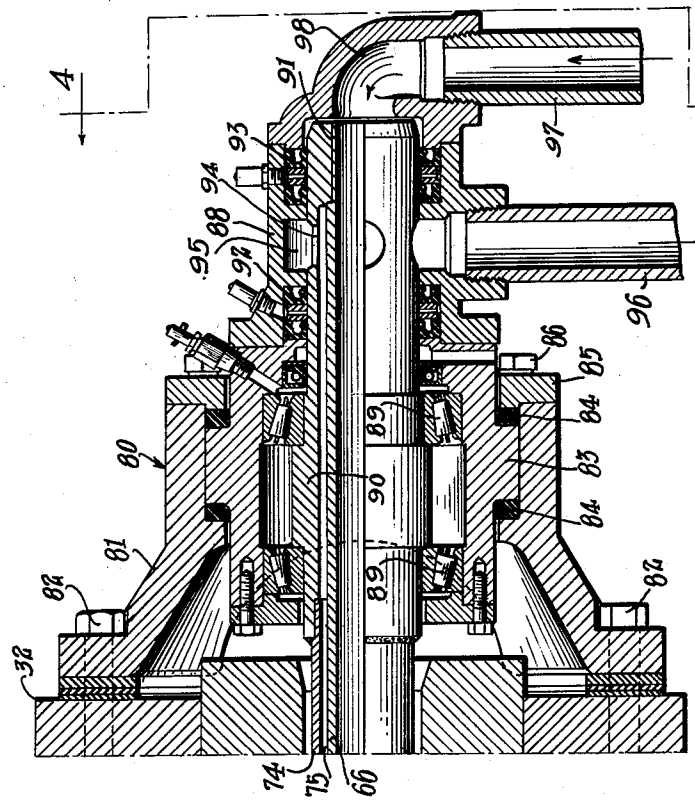
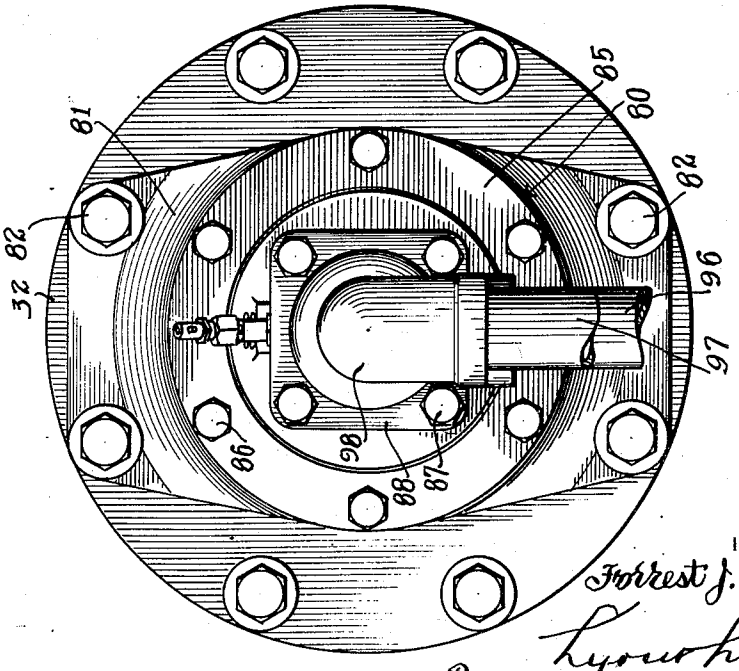


Fig 4



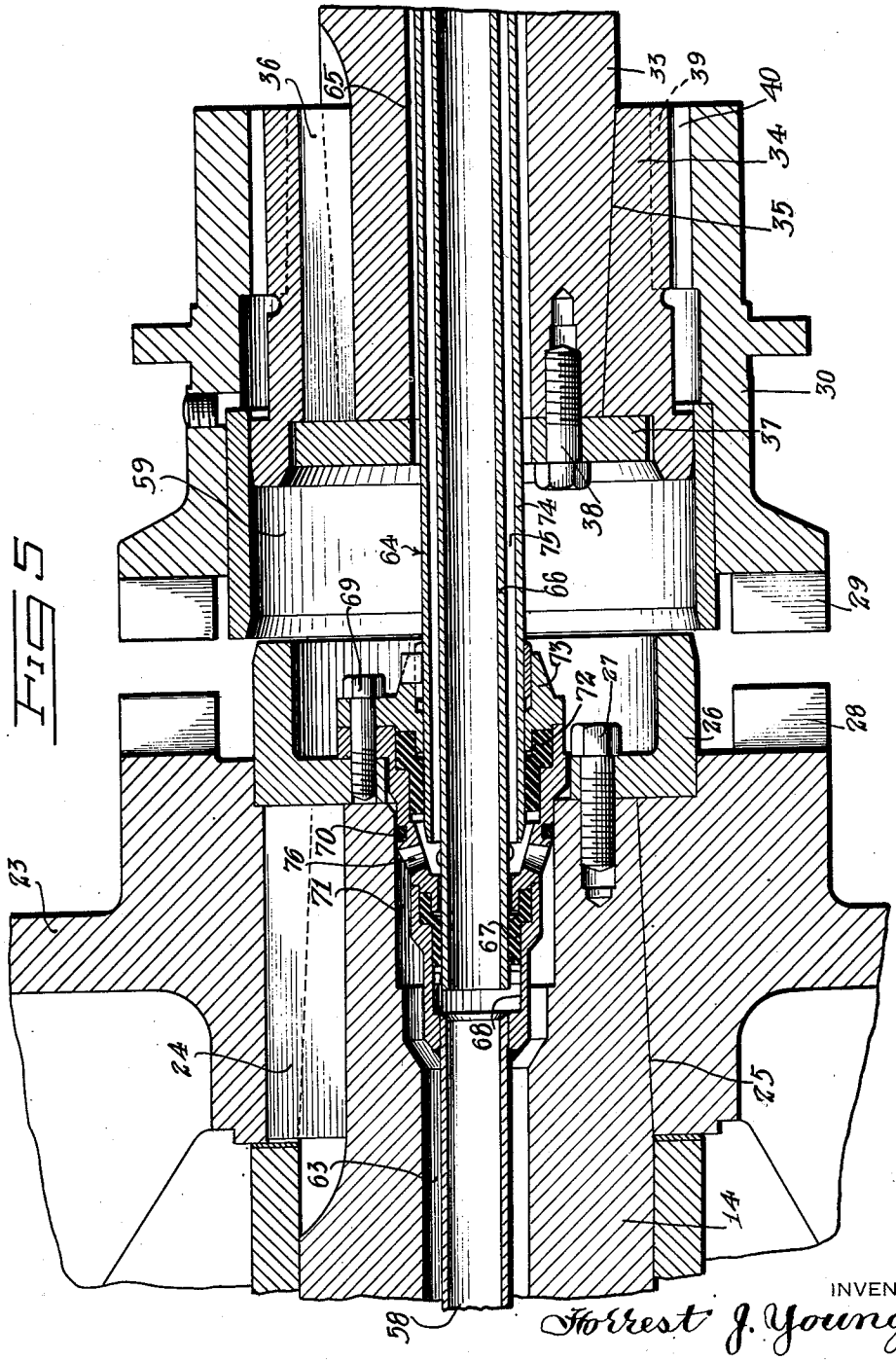
INVENTOR.
Forrest J. Young
By Lyon & Lyon
ATTORNEYS.

Oct. 17, 1950 F. J. YOUNG 2,526,525

APPARATUS FOR WATER COOLING BRAKE RIMS

Filed Oct. 17, 1947 3 Sheets-Sheet 3

Fig 5



INVENTOR.
Forrest J. Young

BY Lyon & Lyon ATTORNEYS.

Patented Oct. 17, 1950

2,526,525

UNITED STATES PATENT OFFICE

2,526,525

APPARATUS FOR WATER-COOLING BRAKE RIMS

Forrest J. Young, Los Angeles, Calif., assignor to The National Supply Company, Pittsburgh, Pa., a corporation of Pennsylvania

Application October 17, 1947, Serial No. 780,337

8 Claims. (Cl. 188—264.2)

1

This invention relates to fluid cooled brake rim assemblies of the type employed in hoists and drawworks and is particularly directed to new and improved apparatus for circulating a coolant in series flow through a pair of brake rims.

In the drilling of wells a spooling drum is employed for winding a cable, which cable is rove between blocks for supporting a drill stem which extends into the bored hole. Brake rims secured to the spooling drum cooperate with brake bands to hold the drum against rotation and to feed off the cable from the drum for advancing the drill stem into the hole. These brake rims are subjected to very severe service and the friction lining on the bands develops heat which raises the temperature of the rims to objectionable levels.

Accordingly, it has been the practice to provide a means of spraying a coolant onto the rims or of circulating a coolant through them. In general, two types of cooling have been employed. The first circulates a coolant in parallel flow through both rims and the second uses series flow in which the discharge from one rim is used as the inlet for the second rim. The coolant, such as, for example, water, is ordinarily admitted through passages provided in the drum shaft and in a common form of drawworks now in use the water is admitted into one end of the shaft and discharged from the other end. An advantage of the parallel flow system is that a coolant of the same temperature is admitted into both rims, and therefore the cooling of the rims is equalized. The series flow arrangement, on the other hand, uses the heated water from the first rim as the inlet for the second rim; therefore, the cooling effect on the second rim is not as efficient as that of the first rim. The series flow arrangement, however, has an outstanding advantage in that the same quantity of water is passed through both rims and hence the possibility that one rim might become plugged and all the coolant pass through the other is avoided.

It is the principal object of my invention to provide a system of coolant flow for two brake rims in which the advantages of both the series flow and parallel flow arrangements are retained while avoiding the objectionable features of each.

Another object is to provide a series coolant flow system for a pair of brake rims in which the inlet and outlet coolant temperatures for the two rims are substantially equalized.

Another object is to provide coolant apparatus of this type in which the coolant enters

2

and leaves the drumshaft assembly from the same end of the drumshaft.

Another object is to provide apparatus for circulating a coolant through a pair of brake rims mounted on a drumshaft assembly, the conduits for conveying the coolant between the rims being concentric with the shaft axis, thereby avoiding off-center loads and contributing to static balance of the assembly.

Other objects and advantages will appear hereinafter.

In the drawings:

Figure 1 is a front elevation partly broken away showing a drawworks drumshaft assembly embodying my invention.

Figure 2 is a sectional elevation on a large scale of a portion of the drumshaft spooling drum and brake rims shown in Figure 1.

Figure 3 is a sectional elevation of the stuffing box assembly shown at the extreme right end of Figure 1.

Figure 4 is an end view taken substantially on the lines 4—4 as shown in Figure 3.

Figure 5 is a sectional elevation partly broken away showing a preferred construction for conveying a coolant to and from concentric passages in the drumshaft.

Referring to the drawings, the drumshaft assembly generally designated 10 includes a cable spooling drum 11 fixed on collars 12 and 13 which are integrally formed on the drumshaft 14. Axially spaced bearings 15 and 16 are provided on each side of the drum for rotatably supporting the drumshaft assembly. Fixed on the end flanges 17 and 18 of the spooling drum 11 are brake rims 19 and 20. The brake bands (not shown) are trained over the brake rims 19 and 20 to prevent rotation of the spooling drum or to allow it to feed off under load as will be readily understood by anyone skilled in the art.

Means are provided for driving the drumshaft assembly, and as shown in the drawings this means includes a multiple tooth low speed sprocket member 21 adapted to be placed in driving relation with the drumshaft 14 by means of the pneumatic sprayed friction clutch 22. A high speed multiple tooth sprocket member 23 is fixed on the shaft by means of a key 24 and is seated on a frustoconical surface 25 provided on the end of the drumshaft 14. A keeper member 26 is removably secured to the end of the shaft by means of the cap screws 27 and serves to maintain the sprocket member 23 in operative position.

A plurality of clutch jaws 28 are provided on

the sprocket member 23 and are adapted to be engaged by the complementary jaws 29 provided on the shiftable clutch 30. Auxiliary brake means 31 which may be of any suitable or desirable type such as, for example, hydraulic or electric, includes a housing 32 through which a hollow brake shaft 33 extends. A collar 34 seated on the frustoconical surface 35 provided at the end of the brake shaft 33 is keyed to the hollow shaft 33 by means of the key 36. A keeper member 37 removably secured to the brake shaft 33 by means of the cap screws 38 is adapted to maintain the collar 34 in operative position. A series of external splines 39 on the collar 34 engage within a complementary series of internal splines 40 on the clutch so that the clutch 30 may move axially relative to the collar 34 but is prevented from rotating relative thereto. From this description it will be understood that engagement of the jaws 28 and 29 serves to rotate the brake shaft 33 from the drumshaft 14.

The brake rims 19 and 20 are each provided with an annular chamber 41 and 42 through which a coolant may be circulated. An inlet pipe 43 and an outlet pipe 44 are connected for communication with the annular chamber 41, and similarly, the inlet pipe 45 and outlet pipe 46 are connected for communication with the annular chamber 42. The inner ends of the pipes 43 are each connected with a lateral port 46 and 47, and these ports in turn communicate with radial passages 48 and 49 formed in the collar 13. In like manner the inner ends of the pipes 45 and 46 are connected with lateral ports 50 and 51. These ports intersect radial passages 52 and 53 provided in the collar 12. A central bore 54 is provided in the drumshaft 14 and extends axially thereof from the end 59 within the sprocket member 23. The other end of the drumshaft 14 is not available for injection of coolant since the other end of the shaft 14 is used for admitting air for operation of the pneumatic clutch 22. The axial passageway 54 in the drumshaft 14 may be of progressively reduced diameter as indicated at 55, 56 and 57. A spear tube 58 is insertable into the shaft passageway 54 from the shaft end 59, and this spear tube carries a packing ring 60 adjacent its far end and a second packing ring 61 axially spaced therefrom. The sealing ring 60 is adapted to be received within the portion 57 of the central passageway 54 at a location between the position of the axially spaced passages 52 and 53. The sealing ring 61 is adapted to be positioned within the portion 56 of the shaft passageway 54 at a location between the axially spaced passages 48 and 49. The radial passages 48, 49, 52 and 53 each communicate with the shaft passageway 54 but the sealing members 60 and 61 act as barriers to divert the flow of coolant into the desired path.

The spear tube 58 is open at its ends so that cooling fluid introduced into the tube 58 passes outwardly into the radial passage 53 through the port 50 and into the pipe 45. The cooling fluid circulates through the annular passage 42 within the brake rim 20 and the discharge fluid returns through the pipe 46, port 51 and passage 52 into the annulus 62 within the shaft passage 54 and encircling the spear tube 58. The cooling fluid thus discharged from the rim 20 passes through the annulus 62 and outwardly through the passage 49, port 47 and into the pipe 43. The cooling fluid then circulates through the annular passage 41 and returns through pipe 44, port 46 and passage 48 into the annular discharge passage 63.

The spear tube 58 is formed of metal or other material having high heat conductivity in order that the heated fluid in the annular space 62 may be cooled in heat exchange relationship by the relatively cold fluid passing through the inside of the tube 58. From this description it will be understood that the coolant discharged from the rim 20 is cooled in heat exchange relationship within the annular space 62 before entering the inlet pipe 43 to the brake rim 19.

Means are provided for injecting cooling fluid into the spear tube 58 and as shown in the drawings this means includes a double conduit member 64 which extends axially through the bore 65 of the hollow brake shaft 33. The inner tube 66 of the double conduit member 64 extends into a resilient seal ring 67 carried in a fitting 68 which is secured to the spear tube 58 and to the keeper member 26 by means of the cap screws 69. A seal ring 70 is provided between the fitting 68 and an enlarged bore 71 of the shaft 14. A second seal ring 72 carried by the fitting 68 and maintained in place by the follower 73 is adapted to receive the forward end of the outer tube 74 which encircles the inner tube 66 to define an annular passage 75 therebetween. The annular passage 75 is in communication with the annular space 63 via the enlarged bore 71 and the ports 76 provided in the fitting 68. The interior of the tube 66 is in communication with the interior of the spear tube 58. The double conduit member 64 rotates with the shaft 14; therefore the seal rings 71 and 72 need not accommodate relative rotary movement of the parts.

Means are provided at the outer end of the double conduit member 64 for injecting a coolant into the tube 66 and providing a discharge passage for the annular passageway 75, and as shown in Figure 3 of the drawings this means includes a stuffing box assembly generally designated 80. This assembly 80 includes a stationary housing 81 which may be attached to the brake housing 32 by means of threaded elements 82. A nonrotary shell 83 is provided within the housing 81 and adapted for limited self-aligning movement relative thereto, spaced resilient elements 84 being provided to accommodate such movement. End plate 85 secured by threaded elements 86 is adapted to hold the shell 83 in operative position. Secured to the shell 83 by means of threaded elements 87 is a stationary packing carrier 88. Rotatably mounted on spaced bearings 89 within the shell 83 is a sleeve 90 which is fixed at its forward end to the outer tube 74. The other end of the sleeve 90 is secured to the inner tube 66 at 91. Spaced packing ring assemblies 92 and 93 are provided within the packing box 88. These packing assemblies operate on the surface of the rotary sleeve 90. A port 94 provided in the sleeve 90 between the packing assemblies 92 and 93 communicates with a central chamber 95 in the packing box 88. A discharge pipe 96 also communicates with the chamber 95, and accordingly coolant discharged through the annular passageway 75 passes outwardly through the port 94 into the chamber 95 and out through the discharge pipe 96. Coolant is admitted into the inlet pipe 97 and passes through the elbow 98 directly into the interior of the inner tube 66. A pump (not shown) is provided for introducing a coolant into the inlet pipe 97 under pressure, and means (not shown) are provided for cooling the fluid discharged through the pipe 96 before recirculating into the inlet 97.

Among the advantages of the cooling system

embodying my invention is that no off-center transfer pipe is required for delivering fluid from one rim to the other, and therefore static balance of the drum shaft assembly is not affected. As shown in Figure 2 the pipes **43** and **44** may be placed diametrically opposite to the position of the pipes **45** and **46** to preserve such static balance which is important at high rotary speeds of the drumshaft assembly. The conduit for delivering the discharge fluid from one rim to the inlet of the other rim is concentric with the axis of the shaft, and therefore no off-center load is present.

Having fully described my invention, it is to be understood that I am not limited to any of the details herein set forth except as described in the following claims.

I claim:

1. In a hoist, the combination of a shaft having a pair of spaced brake rims concentrically mounted thereon, the shaft having a central bore, a tube in the bore cooperating therewith to define concentric inlet and outlet passageways and to provide heat exchange means, means for admitting a cooling fluid to one of the brake rims through one of said concentric passageways, means for passing all of the fluid discharged from that brake rim through the other passageway in heat exchange relation, whereby the discharged fluid is cooled, and means for passing all of the cooled fluid directly from said other passageway through the other brake rim.

2. In a hoist, the combination of a shaft having a pair of axially spaced brake rims concentrically mounted thereon, means for circulating a coolant in series flow through said brake rims, said means including concentric inlet and outlet passageways extending within the shaft from one end thereof and cooperating to provide heat exchange means, inlet and outlet branch conduits connecting each brake rim to said passageways, the coolant admitted to the first brake rim and the coolant discharged therefrom passing through said concentric passageways in heat exchange relation, whereby the coolant discharged from the first brake rim is substantially cooled, the branch conduits and passageways causing the coolant flowing from the first brake rim to pass directly to the second brake rim via one of the outlet branch conduits, the outlet passageway in the shaft, and one of the inlet branch conduits.

3. In a hoist, the combination of a shaft having a pair of axially spaced brake rims concentrically mounted thereon, means for circulating a coolant in series flow through said brake rims, said means including concentric inlet and outlet passageways extending within the shaft from one end thereof and cooperating to provide heat exchange means, axially spaced pairs of lateral passages in the shaft communicating with said axial passageways and with said brake rims, the coolant admitted to the first brake rim and the coolant discharged therefrom passing through said concentric passageways in heat exchange relation, whereby the coolant discharged from the first brake rim is substantially cooled, the lateral passages and axial passageways causing the coolant flowing from the first brake rim to pass directly to the second brake rim via one of the lateral passages, the axial outlet passageway in the shaft, and another lateral passage.

4. In a hoist, the combination of a shaft having a pair of spaced brake rims concentrically mounted thereon, the shaft having a central bore, a tube in the bore cooperating therewith to define concentric inlet and outlet passageways and to provide heat exchange means, means for admitting a cooling fluid to one of the brake rims through said tube, means for passing the fluid discharged from that brake rim directly to the other brake rim via the said central bore in heat exchange relation, whereby the discharged fluid is cooled, and means for passing the cooled fluid from the central bore through the other brake rim.

5. In a hoist, the combination of a shaft having a pair of axially spaced brake rims concentrically mounted thereon, the shaft having an axial bore provided therein, first and second pairs of lateral passages in the shaft, the inner ends of said lateral passages communicating with the axial bore at axially spaced points, piping means connecting the outer ends of each pair of lateral passages with one of said brake rims, an imperforate spear tube insertable axially into said shaft bore from one end of the shaft, a first seal ring carried on the spear tube adapted to seal within the bore at a location between the first pair of lateral passages, and a second seal ring carried on the spear tube adapted to seal within the bore at a location between the second pair of lateral passages, whereby a coolant supplied under pressure into the interior of the spear tube passes in series flow through one of said brake rims directly to the other via the bore in the shaft.

6. In a hoist, the combination of a shaft having a pair of axially spaced brake rims concentrically mounted thereon, means for circulating a coolant in series flow through said brake rims, said means including an axial bore provided in the shaft, first and second pairs of lateral passages in the shaft, the inner ends of said lateral passages communicating with the axial bore at axially paced points, piping means connecting the outer ends of each pair of lateral passages with one of said brake rims, an imperforate spear tube insertable axially into said shaft bore from one end of the shaft, a first seal ring carried on and encircling the spear tube adapted to seal within the bore at a location between the first pair of lateral passages, and a second seal ring carried on and encircling the spear tube adapted to seal within the bore at a location between the second pair of lateral passages, whereby coolant flows through one of the brake rims and through the shaft bore directly to the other.

7. In a hoist, the combination of a shaft having a pair of axially spaced brake rims concentrically mounted thereon, means for circulating a coolant in series flow through said brake rims, said means including an axial bore provided in the shaft, first and second pairs of lateral passages in the shaft, the inner ends of said lateral passages communicating with the axial bore at axially spaced points, piping means connecting the outer ends of each pair of lateral passages with one of said brake rims, an imperforate spear tube positioned within said shaft bore and defining an annular space therein, a first seal ring carried on and encircling the spear tube adapted to seal within the bore at a location between the first pair of lateral passages to form one end of said annular space, and a second seal ring carried on and encircling the spear tube adapted to seal within the bore at a location between the second pair of lateral passages to form the other end of said annular space, the seal rings being imperforate so that substantially all of the coolant discharged from one brake rim through one lateral passage passes through the annular space

and through another lateral passage to the other brake rim.

8. In a hoist, the combination of a shaft, a spooling drum fixed on the shaft, a pair of brake rims each secured to the spooling drum, means for circulating a coolant in series flow through said brake rims, said means including an imperforate tube positioned within a central axial bore in the shaft to define concentric inlet and outlet passageways, axially spaced sealing rings encircling the tube and sealing within the bore to define the ends of an annular space within the bore and outside the tube, two pairs of lateral passages in the shaft, each pair communicating with one of said brake rims, one passage of each pair communicating with said annular space, the

other passage of each pair communicating with the shaft bore remote from said annular space and at opposite ends thereof, whereby coolant admitted under pressure into the interior of the spear tube is caused to flow serially through one of the brake rims and directly into the other via the axial bore in the shaft.

FORREST J. YOUNG.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,362,581	Newcomb	Nov. 14, 1944