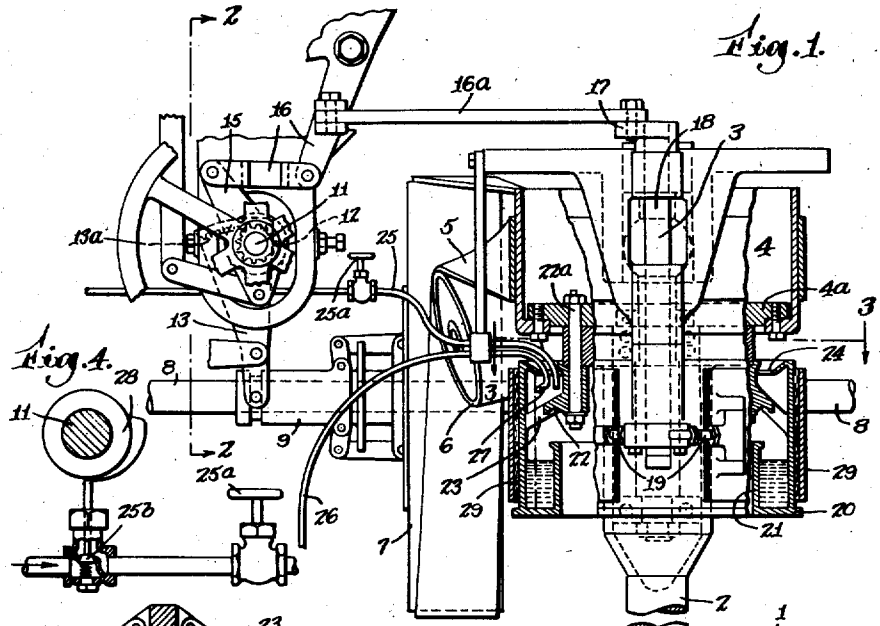
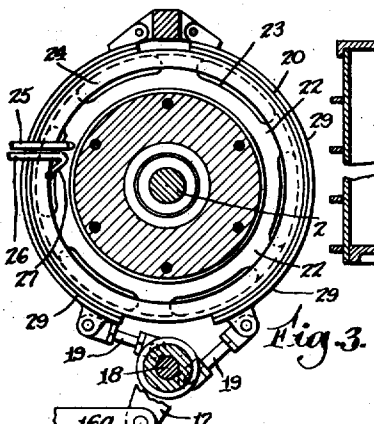
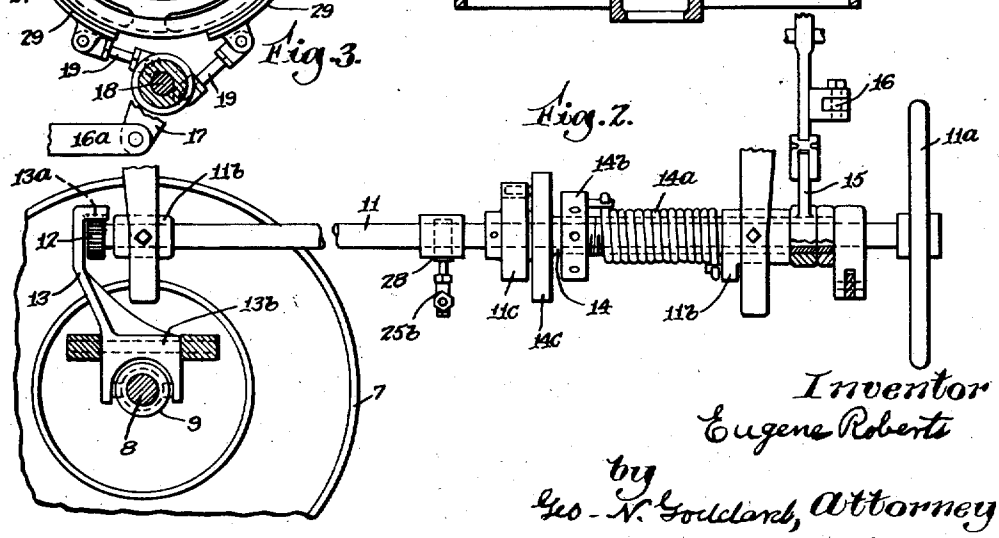
Oct. 19, 1937. E. ROBERTS 2,096,341

BRAKE COOLING FOR CENTRIFUGALS AND THE LIKE

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BRAKE COOLING FOR CENTRIFUGALS AND THE LIKE

Eugene Roberts, Hastings, N. Y.

Application November 30, 1934, Serial No. 755,333

11 Claims. (Cl. 188—264)

This invention relates to the cooling of brake drums, such as are usually attached to the shaft of a suspended centrifugal or other machine, for the purpose of preventing excessive heating of the brake drum due to the frequent application or setting of the braking elements and is intended to provide an improved liquid cooled brake construction and, as an additional feature, an automatic control for the liquid so that during the normal operation of the machine the heat developed by friction may be rapidly conducted away, while the supply of cooling medium may be cut off as the machine slows down and stops in order to avoid spilling of the liquid.

In certain classes of machines, particularly machines of the type of sugar centrifugals whose cycle of operations, through the development of improvements in recent years, has been cut down to a period of only two or three minutes, the frequent starting and stopping of these heavy machines results in excessive heating of the brake drum to which the friction brake element is applied for the purpose of quickly stopping the machine. No satisfactory solution of this problem has heretofore been found.

The present invention solves this difficulty by providing an improved apparatus in the operation of which cooling liquid is supplied to the interior of the brake drum and excess liquid is withdrawn from the interior of the drum while the drum is revolving. The improved apparatus also embodies means for admitting cooling liquid to the interior of the brake drum and means for automatically cutting off the supply of liquid when the brake is applied to stop the revolution of the drum.

These and other features of this invention will be described in the following specification and will be defined in the claims hereto annexed.

In the drawing I have illustrated one form of construction and arrangement embodying the principles of this invention, in which

Fig. 1 is a front elevation showing so much of a centrifugal and its driving, braking and cooling apparatus as is necessary to an understanding of this invention.

Fig. 2 is a side elevation of the control shaft as viewed from sectional plane 2—2 marked on Fig. 1.

Fig. 3 is a sectional plan view on horizontal section plane 3—3 of Fig. 1 to show the construction and arrangement of the revoluble brake drum secured to the vertical shaft of the centrifugal.

Fig. 4 is a detail view showing on an enlarged scale that portion of the cooling liquid supply pipe containing the cut off valve and the regulating valve.

The centrifugal machine to which the brake cooling apparatus is applied in this case for purposes of illustration, comprises the usual centrifugal basket 1 secured to the lower end of a vertical gyratory shaft 2, that is suspended from the hanger 3 by means of the usual and well known ball and socket suspension joint. In this case the centrifugal spindle or shaft carries a belt pulley 4 around which passes a quarter turn driving belt 5, which passes from the clutch driven pulley 7 on the main line drive shaft 8 at the back of the machine and which passes over an intermediate idler pulley 6, all in accordance with well known practice in the case of belt driven machines.

The belt pulley 4, as usual, is secured to apply the belt at the level of the center of gyration of the basket. Below the driving pulley is secured a cylindrical brake drum 20, whose bottom edge is extended by means of an inwardly and upwardly turned flange 21 to form an annular channel or recess for the reception of the cooling liquid. The interior spider 22, which supports the brake drum, is inclined inwardly and upwardly and bolted in this case securely to the bottom spider 4^a of the driving pulley 4, as shown at 22^a. The outer edge portion of this spider 22 is provided at intervals with arcuate openings 23 located above the liquid receiving recess at 21, so that liquid flowing in to the upper portion of the pulley can escape and run down to the bottom recess or chamber of the pulley without being spilled. The upper edge of the pulley is provided with an annular inturned lip or flange 24, which serves to prevent the escape of the liquid over the top when the machine is in operation.

The cooling liquid is supplied by means of a liquid supply pipe 25, which is provided with a regulating valve 25^a that can be set by hand to provide any desired flow of the liquid, and beyond the regulating valve 25^a is located a self-closing spring actuated valve 25^b whose stem extends upward into engagement with an overhead cam, which is secured to the centrifugal horizontal control shaft 11.

As the centrifugal control mechanism forms no part of the invention herein claimed, only so much of the construction as may be needed to understand the present improvement will be described. As shown in Fig. 1, the horizontal control shaft 11 extends alongside of the upper portion of the centrifugal in a fore and aft di-

rection perpendicular to the driving or line shaft 8 at the back of the machine. It carries a hand wheel 11a at the front end and is supported in front and rear stationary aligned bearing members 11b. Intermediate of its ends it carries a loose sleeve 14, around which is coiled a helical spring 14a whose forward end is anchored to the stationary supporting bearing 11b and whose rear end is secured to a circumferentially adjustable tensioning nut 14b mounted on the sleeve. To the sleeve is also rigidly secured a disc 14c having a projecting pin engaged by a shoulder on a cam-like disc 11c, which is pinned to the shaft 11. Secured to the rear end of this shaft is a pinion 12 intermeshing with a toothed arcuate sector member 13a forming part of a clutch shipper fork 13, which is fulcrumed at 13b to shift to and fro a clutch controlling sleeve 9 slidably keyed to the line shaft 8. It will suffice to say that when the control shaft 11 is rotated clockwise it acts, through the shipper fork connection 13, to throw the clutch from the position shown in Fig. 1, and places the centrifugally actuated clutch shoes in active position with respect to the driving pulley 7 on line shaft 8. The reverse or counterclockwise rotation of the shaft 11, induced by the helical spring 14a when the control shaft is released from its clutch engaging position, causes the clutch to become inactive.

At the forward end of the sleeve 14 there is secured a lever 15 having link connections at 16 and 16a with an arm 17 secured to a brake spindle 18, to which are secured toggles 19 in such relation that movement of the brake spindle 18 in one direction contracts the friction shoes 29, forming the braking element, upon the brake drum 20.

About midway of the centrifugal control shaft 11 is secured a cam 28 directly above the cut-off valve 25b so that, as is best shown in Fig. 4, clockwise rotation of the control shaft, which acts to release the brake and start the centrifugal by throwing in the clutch, serves to depress the valve 25b to open position and allow the cooled liquid to flow through supply pipe 25 to the interior of the pulley. The high speed of rotation of the centrifugal causes the liquid supply to build up in a ring-like wall against the inside of the brake drum 20, as indicated by vertical dotted line in Fig. 1. At a convenient distance inward from the inside face of the brake drum 20 is located the end of a discharge or draw-off pipe 27, which is turned to face the direction of revolution of the brake drum and acts as a scoop to carry off the excess of water beyond a predetermined vertical line, so that not only is the liquid prevented from overflowing or escaping from the pulley otherwise than through the pipe, but since the water heated by contact with the drum becomes less dense than the cooler entering water and therefore moves to the inside, this off-take pipe 26 serves to remove the heated water and retain a supply of cool water constantly against the inner face of the brake drum. Accordingly, the heat is continuously abstracted from the brake drum while the machine is in operation and when the machine stops the liquid then collects in the receptacle of the drum, while at the same time through the counterclockwise rotation of the cut-off valve 28 the supply of water is cut off due to the fact that the same rotative movement of the control shaft 11 that releases the clutch and sets the brake acts to allow the spring applied to the valve 25b to close the valve. The hand valve 25a permits complete regulation of the supply of cooling liquid.

The above arrangement not only provides a very effective and simple means for rapidly conducting away the heat developed by the friction of the brake element on the brake drum, but it provides a fool-proof arrangement preventing the spilling of the liquid into the basket by reason of the fact that when the machine is running the off-take pipe 26 will limit the accumulation of liquid to a predetermined point, while on the other hand the very act of throwing out the clutch and setting the brake necessarily results in cutting off any further supply of liquid. The liquid retained inside the brake rim after the supply has been cut off prevents overheating of the pulley and brake pads 29 during the last stages of a single braking operation. The flow of cool liquid in intimate contact with the inner periphery of the rim during a subsequent rotation of the pulley completely cools the rim preparatory to another braking operation.

It will be understood of course, that the invention is not restricted to use on a vertical shaft nor to these special features of construction and operation that are of particular utility in the centrifugal field, the true measure of the invention being the spirit of the disclosure and the requirements of the claims but not the illustrative details mentioned hereinabove.

What I claim is:

1. A brake drum adapted to be secured to a vertical shaft and provided with upper and lower liquid retaining flanges, and an intermediate connecting spider arranged to direct inflowing liquid toward the rim of the brake drum, a liquid supply pipe, means for regulating the rate of flow of liquid through the supply pipe to the interior of the drum, and a draw-off pipe having its intake end inclined opposite the direction of rotation of the drum, said intake end being arranged at a distance from the inside face of the drum rim to maintain an annular wall of liquid of predetermined thickness inside said drum while the drum is rotating at operable speed.

2. A centrifugal machine having a central basket shaft provided with a driving pulley and a brake drum having an annular trough for cooling liquid adjacent the inner periphery thereof, means including a control shaft by which the energizing of the driving pulley and the energizing of the brake is alternatively effected, and means for supplying cooling liquid into said trough, said liquid supplying means being responsive to movement of said control shaft to supply liquid while the driving means is active and to cut off the liquid supply when the brake is active.

3. In a brake cooling device for centrifugals and the like the combination of a brake drum rigidly connected with a vertical rotary shaft and having at its lower end an interior annular liquid containing trough, a supply pipe for discharging cooling liquid into the interior of said drum, and an offtake pipe projecting inside said drum with its open intake end turned opposite the direction of rotation of the drum at a predetermined distance from the inside face of the brake drum whereby the inside portion of the cooling liquid is continuously drawn off to prevent overflow of the liquid from the trough.

4. In combination, a rotatable brake flange, a brake rim thereon, an annular trough formed on the inner periphery of said brake rim, a conduit adapted to introduce a cooling fluid into said

trough, and a second conduit extending into said trough and adapted to remove fluid from said trough.

5. In a water cooled brake rim the combination of an annular water-receiving trough, means for introducing water into said trough during rotation of said rim, and means extending into said trough for removing all but a predetermined quantity of water from said trough.

6. In combination, a rotatable brake flange, a brake rim thereon, an annular trough formed on the inner periphery of said brake rim, means to supply water to said trough whereby water may be displaced about the inner periphery, and means to remove water from said trough; said means being adapted to limit the quantity of water annularly displaced in said trough to an amount within the static capacity of said trough.

7. In combination, a rotatable brake flange, a brake rim thereon, an annular fluid channel formed within said rim and adapted to receive cooling fluid, means to supply fluid to said channel whereby fluid may be annularly displaced about said channel by centrifugal force, and means for removing fluid from said channel faster than it is supplied by said first mentioned means comprising an inlet so positioned in said channel that the quantity of fluid displaced in said channel is limited to an amount within the static capacity of said channel.

8. A liquid cooled brake including a brake rim and means forming with said rim an inwardly facing annular trough for retaining a body of liquid inside the rim while the same is rotating, means for drawing off excess liquid from a location spaced inwardly from said rim during rotation of the rim to maintain a predetermined volume of liquid therein, and means cooperating with the first recited means to form a receptacle receiving and preventing the spilling of said liquid while the rim is at rest.

9. A liquid cooled brake including a brake rim and means forming with said rim an inwardly facing annular trough for retaining a body of liquid inside the rim while the same is rotated, means for supplying cooling liquid into said trough, means for drawing off excess liquid during rotation of the rim to maintain a predetermined volume of liquid therein, and means for interrupting the operation of said liquid supplying means before the rim is brought to rest.

10. A liquid cooled brake drum adapted for attachment to a vertical shaft, said drum being provided with means at top and bottom defining an inwardly facing annular trough for retaining a body of liquid inside the drum while the drum is either rotating or at rest, means for drawing off excess liquid to maintain a predetermined volume of cooling liquid inside the brake drum while the shaft is rotating, and means for cutting off a fresh supply of liquid to the drum when the brake is applied.

11. A method of cooling an annular brake rim which comprises revolving the rim, introducing cooling liquid inside the rim at a regulated rate and forming an annular wall of liquid against the rim by centrifugal force, and withdrawing excess liquid from said wall during revolution of the rim.

EUGENE ROBERTS.

DISCLAIMER

2,096,341.—*Eugene Roberts*, Hastings, N. Y. BRAKE COOLING FOR CENTRIFUGALS AND THE LIKE. Patent dated October 19, 1937. Disclaimer filed May 24, 1939, by the assignee, *The Western States Machine Company*.

Hereby enters this disclaimer to claims 4, 5, and 11 in said specification.

[*Official Gazette, June 20, 1939.*]

trough, and a second conduit extending into said trough and adapted to remove fluid from said trough.

5. In a water cooled brake rim the combination of an annular water-receiving trough, means for introducing water into said trough during rotation of said rim, and means extending into said trough for removing all but a predetermined quantity of water from said trough.

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10. A liquid cooled brake drum adapted for attachment to a vertical shaft, said drum being provided with means at top and bottom defining an inwardly facing annular trough for retaining a body of liquid inside the drum while the drum is either rotating or at rest, means for drawing off excess liquid to maintain a predetermined volume of cooling liquid inside the brake drum while the shaft is rotating, and means for cutting off a fresh supply of liquid to the drum when the brake is applied.

11. A method of cooling an annular brake rim which comprises revolving the rim, introducing cooling liquid inside the rim at a regulated rate and forming an annular wall of liquid against the rim by centrifugal force, and withdrawing excess liquid from said wall during revolution of the rim.

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