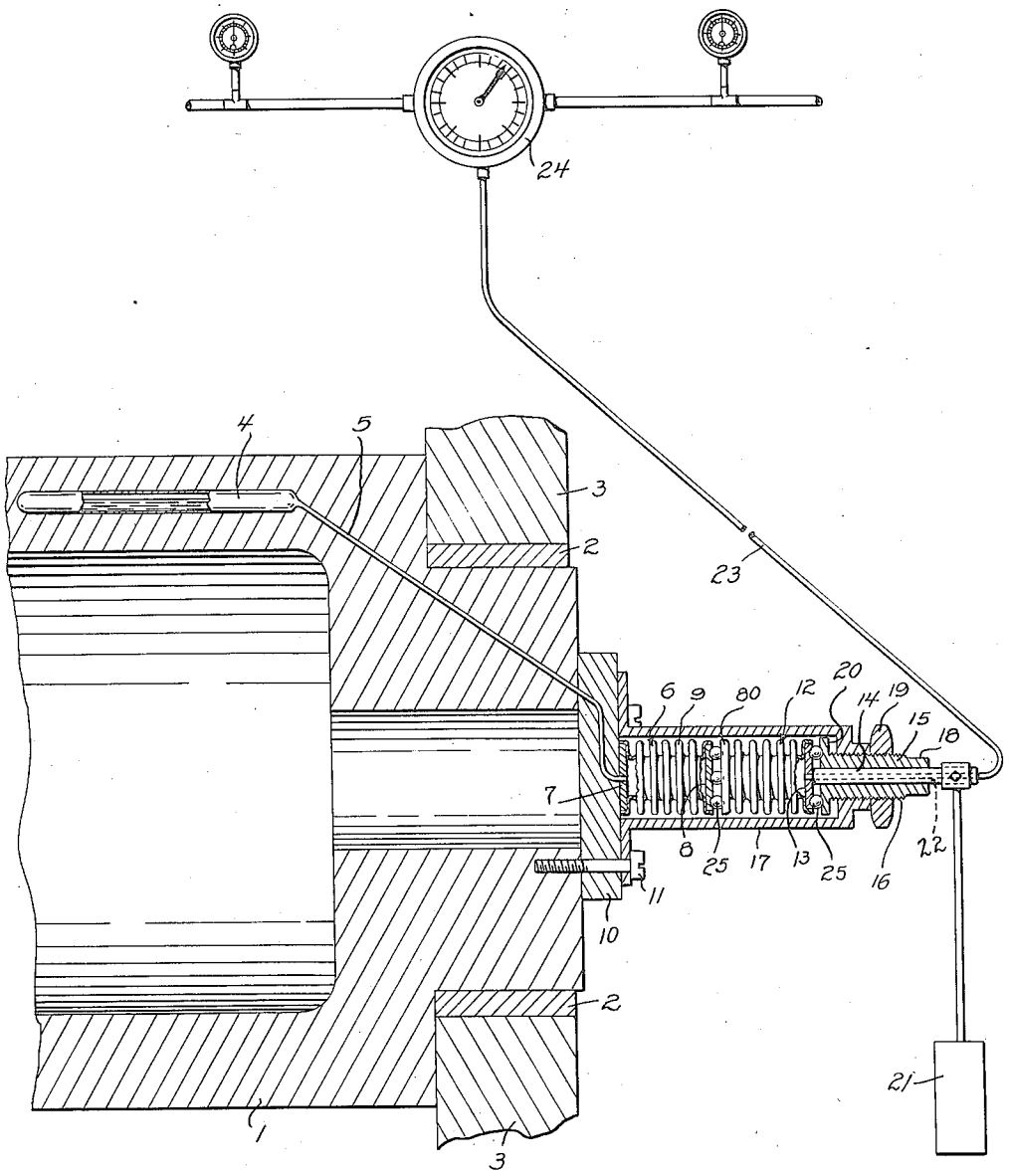
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TEMPERATURE INDICATOR FOR ROTATING BODIES

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TEMPERATURE INDICATOR FOR ROTATING BODIES

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It is frequently desirable to know, or to control, the temperature of a rotating body, such as a mill roll. Heretofore, this has been accomplished by an electrical resistance including a commutator, to which there are objections, especially where the appliance is exposed to dirt, dust and grease.

The present invention aims to provide a simple and reliable apparatus for transferring pressure from a rotating to a relatively stationary instrument so that the temperature of the rotating body (or the pressure within the same) may be either recorded on a gage or kept within very narrow limits of variation, such as possessed by thermostatic controls widely employed in the industrial arts.

With the illustrated embodiment in mind and without intention to limit more than is required by the prior art, the invention may be briefly stated to consist in two non-communicating fluid pressure systems, one adapted to be mounted on a rotatable body, and the other maintained stationary and coupled up to a stationary instrument, such as a gage, the adjacent ends of each system terminating in diaphragmatic containers between the opposed free ends of which are confined thrust members or ball-bearings permitting one container to be rotated and the other to be held stationary, but insuring maintenance of the same pressure within the non-communicating containers.

An embodiment of the invention is diagrammatically illustrated in the drawing in which is shown apparatus suitable for controlling the temperature of a calender or mill roll, the latter and a mounting for the containers appearing in section.

In the drawing, the calender or mill roll is indicated at 1, mounted in a bearing 2, of a frame 3. A vapor tension bulb 4 may be positioned at any desired location in the roll, this bulb being preferably filled with ether, alcohol, or other liquid, which volatilizes at a relatively low temperature. The bulb 4 is preferably connected by a duct 5 with a diaphragmatic container 6, desirably of the construction illustrated comprising rigid end walls 7 and 8, and corrugated flexible side walls 9, which are hermetically sealed to the end walls and which offer substantially no resistance to the almost inappreciable volumetric changes that occur in the fluid pressure filled system when the device is in operation, owing to the fact that only a few drops of liquid are displaced. Preferably, the end wall 7 of the diaphragmatic container is brazed, or otherwise secured, to a plate 10, which is adapted to be fixed, as indicated at 11, to the roll 1 so that the axes of the roll and the containers coincide. A second diaphragmatic container 12 is supported in opposition to the first-mentioned container. These two containers are of substantially duplicate construction but the latter, 12, has fixed to its base or end wall 13, a stem or rod 14, which is journalled in a bushing 15 threaded, as indicated at 16, in the end of a housing 17, which is adapted to be fixed to the roll 1 with the plate 10. The bushing 15 preferably has a square end 18, a lock-nut 19 being also provided to hold its inner flange 20 in proper adjusted position. The stem or rod 14 not only serves as a support for the container 12, but also prevents rotation of the latter with the roll by having fixed to its projecting free end a counterweight 21. As indicated at 22, the stem 14 is bored out so as to place the container 12 in communication with a hollow tube or duct 23, which is adapted to be connected with a gage 24, registering temperatures or pressures, or with any sort of instrument, such as a thermostatic control for governing the supply of steam, or other heating medium, to the rotating body. Between the flanged abutment 20 and the end wall 13, and also between the opposed free end walls 8 and 80 of the two containers, are positioned thrust members 25, preferably in the form of ball-bearings confined in raceways.

While any suitable fluids or liquids may be employed in the two systems, I preferably use a volatile liquid in the rotary system, introducing at least enough volatile liquid to fill the container 6, duct 5, and part of the bulb 4. I preferably completely fill the stationary system both container 12 and duct 23, with an incompressible liquid, water being satisfactory and economical. The duct

23 may be placed in communication with the curved tube in an ordinary pressure gage, such as that illustrated conventionally in the drawing, for the purpose of enabling the temperature (or pressure) to be read at any time, or the duct 23 may be placed in communication with a temperature controlling system of the types illustrated in the patent to Roesch No. 1,333,221, March 9th, 1920, or the patent to Stuart No. 1,353,434, September 21st, 1920. In fact, the duct 23 may be connected up to any suitable stationary instrument for actuating an element, mechanical or electrical, for recording or controlling the heating, or pressure, medium supplied to the rotating body.

While it is preferable to employ a vapor tension bulb, such as that indicated at 4 in the drawing, the duct 5 may be placed directly in communication with a variable source of pressure, such as the hollow space in a steam-heated calender roll, but this is not deemed desirable as it would require precautionary operations, whereas, the illustrated arrangement is practically foolproof.

In operation, when the temperature (or the pressure, if the system is in direct communication with a source of variable pressure) varies, the pressure within the vapor tension bulb 4 is altered and thereby the pressure within the contained 6 is correspondingly altered, but without any substantial change in its volume (i. e., not more than a few drops) as the container 6 is preferably filled with liquid and liquids are practically incompressible. The amount of thrust transmitted through the ball-bearings 25, to the diaphragmatic container 12 is, of course, thereby varied, and likewise also, the pressure within the latter and the duct 23 in communication with it. Correspondingly, the hand on the gage 24, or other instrumentality that may be governed by the line 23, is shifted one way or another, depending upon whether the temperature (or pressure) is raised or lowered.

From the foregoing it will be obvious that the construction of the present invention, at least in its preferred form, is practically foolproof after the initial adjustment of the bushing 15. It affords a simple and reliable means of continuously determining the temperature (or pressure) of a rotating body or, if desired, regulating the temperature of pressure of a rotating body within any desired limits. No stuffing box is necessary to communicate or transmit the pressure from the rotary system to the stationary system, the anti-friction devices 25 interposed between the freely shiftable end walls 8 and 80 of the two systems permitting rotation of one relative to the other but insuring maintenance of the same fluid pressure in the two non-communicating containers, and this, of course, without any possibility of leakage. Any changes that might occur in the distance between the abutment end walls 7 and 13 of the two systems, such, for instance, as those due to changes in temperature, affecting the housing 17, have no effect upon the accuracy of the device since it functions by transmitting pressure, and the vapor pressure within the bulb 4 depends on temperature alone and not on volume.

The invention in its broad aspects is not confined to the specific form of diaphragmatic container illustrated. Other forms may be used, but no other is believed to be as efficient as that disclosed.

The invention is primarily intended for mill or calender rolls, which revolve at a relatively slow speed, but it is not confined in its application to such, being useful on bodies revolving at a high rate of speed, such, for instance, as automobile wheels. Pressures and temperatures in tires, for example, may be measured at any rate of speed. The uses or applications of the invention above enumerated illustrate its scope and others will occur to those skilled in various lines.

It is apparent that many changes may be made without departing from the principles underlying the invention. I prefer to employ containers with their copper corrugated side walls housed in a structure so that they can be mounted in opposed axial relation on a rotating body, and one of the containers prevented from rotating. But other materials may be employed and various changes made. These and other changes will be obvious to those skilled in the art and no further elaboration of modifications is deemed necessary. Reference should therefore be made to the accompanying claims for a full understanding of the scope of the invention.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. The combination with a diaphragmatic container adapted to contain fluid and a duct for placing the same in communication with a container the pressure within which may vary, of a separate closed hydraulic system comprising a second diaphragmatic container, a conduit in communication with the said second diaphragmatic container, a registering device connected to said conduit and adapted to be actuated when the pressure in said last named conduit varies, and of means intermediate the diaphragmatic containers for maintaining their internal pressures equal while permitting one of them to be rotated relative to the other.

2. In combination, a plurality of separate and distinct systems adapted to contain fluid and subject to variation of the fluid pressure therein, each system including a diaphragmatic container subject to expansion and contraction by the varying fluid pressure in the systems, and means intermediate

the diaphragmatic containers permitting rotation of one system relative to the other while transmitting change of pressure in one to the other.

3. In combination, a plurality of separate pressure systems each including a diaphragmatic container and adapted to contain fluid, said systems being subject to variation of the fluid pressure therein, means for sustaining the diaphragmatic containers so that one may be revolved and another held stationary, and means intermediate the diaphragmatic containers for transmitting variations of the fluid pressure from one to the other.

4. In combination, separate pressure systems each including a diaphragmatic container and adapted to contain fluid, means for sustaining the diaphragmatic containers so that one may be revolved and the other held stationary relative to a common axis, and rotatable mechanical means intermediate the diaphragmatic containers for transmitting variations in the fluid pressure from one to the other.

5. In combination a plurality of diaphragmatic containers of a fluid containing system the internal pressure of which is variable and a liquid filled system each of which systems is in fluid communication with one of the containers, of means for sustaining the containers so that one may be revolved relative to the other, and of rotatable thrust members operatively interposed between the containers.

6. The combination with a plurality of diaphagmatic containers of a fluid containing system in which the fluid pressure is variable and with a liquid filled system each of which systems includes one of the containers, of means for sustaining the containers so that one may be revolved and the other held stationary and both may be maintained in opposed spaced relation, and of thrust members confined between the containers permitting the internal pressure of one to be transmitted and applied to the other while one of the containers is rotating and the other is relatively stationary.

7. The combination with a plurality of diaphragmatic containers of a fluid containing system in which the fluid pressure is variable and with a liquid filled system each of which systems includes one of the containers, of a rotatable body to which one of said containers is fixed in alignment with its axis, means connected to the rotatable body for supporting the other of said containers in axial alignment with the first-mentioned container but stationary relative thereto, and spherical thrust members confined between the opposed ends of the containers and between one of the containers and the said supporting means for maintaining the same internal pressure within the two containers.

8. The combination with a roll rotatable about a fixed axis, of non-communicating pressure systems, one of said pressure systems comprising a vapor tension bulb, a diaphragmatic container co-axially fixed to said roll, and a duct establishing communication between said vapor tension bulb and said container, and the other of said pressure systems comprising a diaphragmatic container disposed co-axially with the roll, means for supporting said last-named container so as to maintain it adjacent to the container of the first-mentioned system but preventing rotation thereof when the roll is turned, and an instrumentality adapted to be operated by any change of the pressure in the second-mentioned container, said instrumentality and said second-mentioned container together forming a closed fluid containing system, the two containers having adjacent rigid end walls and flexible side walls offering substantially no resistance to change in their volumetric capacity, and ball-bearings confined between the adjacent end walls of said containers so as to transmit thrust from one to the other but permit free rotation of one container relative to the other.

9. In a temperature indicating device, a pair of separate pressure systems each including a diaphragmatic container and adapted to contain fluid, means for sustaining the diaphragmatic containers so that one may be revolved about a given axis and the other held stationary about said axis, and rotatable mechanical means intermediate the diaphragmatic containers for transmitting variations in the fluid pressure from one to the other.

Signed at New York city, county of New York, and State of New York, this 8th day of December, 1922.

ALEXIS W. KEEN.