Feb. 19, 1963 C. H. CLEMENT, JR 3,077,965

CENTRIFUGAL BRAKING MECHANISM FOR ROTATABLE MEMBERS

Filed May 20, 1960 2 Sheets-Sheet 1

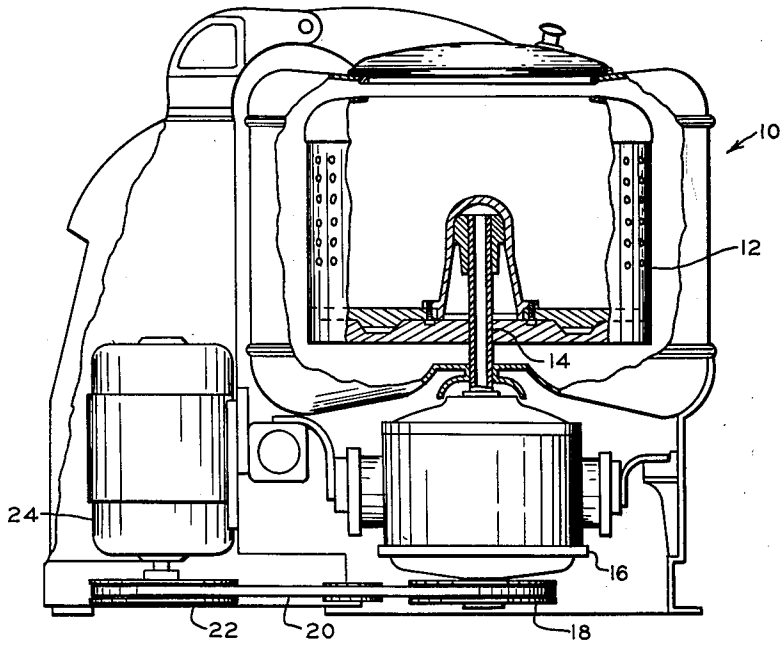


Fig. 1.

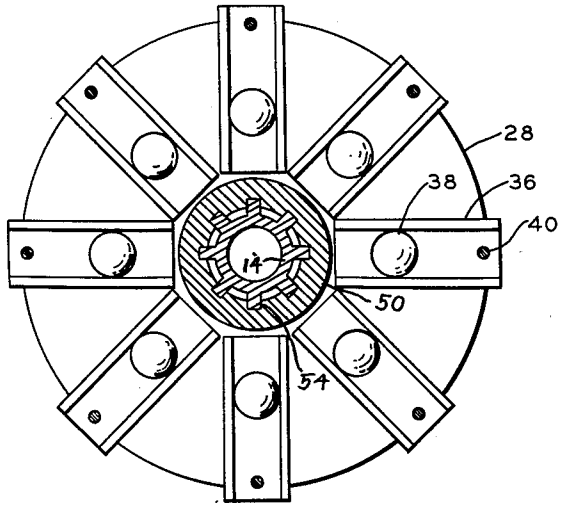


Fig. 2.

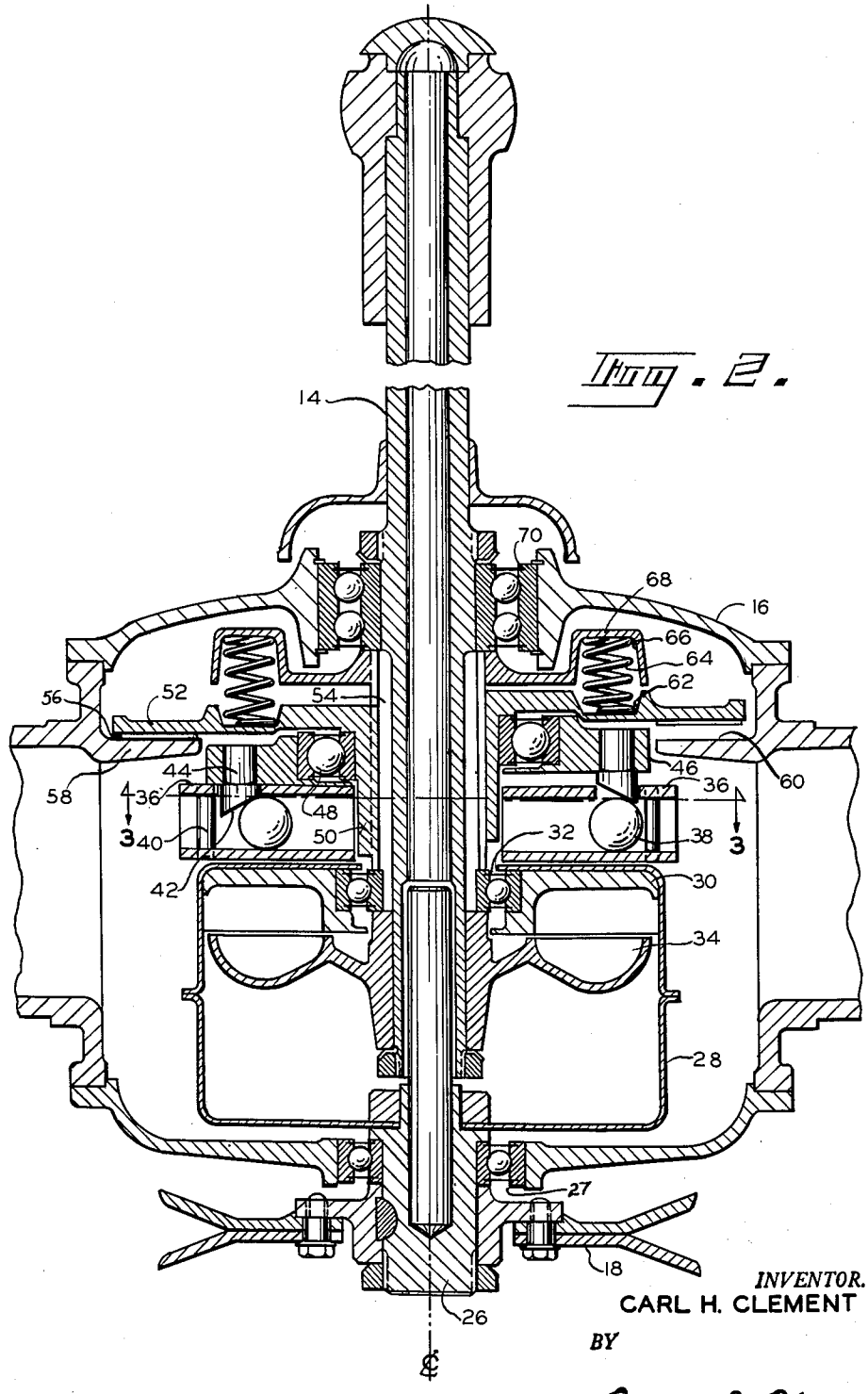
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Filed May 20, 1960 2 Sheets-Sheet 2

Fig. 2.



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CENTRIFUGAL BRAKING MECHANISM FOR ROTATABLE MEMBERS

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This invention relates to a braking control for rotatable members and more particularly to a centrifugal braking control for such members, which control automatically releases a brake before the member is rotated and automatically applies the brake when the speed of the member decreases a predetermined amount. The present invention also relates to an improvement in a centrifugally operated braking mechanism set forth and described in my United States Patent No. 2,899,032 entitled "Drive and Control for Rotatable Members."

While the invention is described below specifically in connection with a laundry extractor, it will be readily understood that the invention can be effectively applied to other rotatable members. In a laundry extractor, a basket carrying many pounds of wet clothes is rotated at high speed to extract the water from the clothes by centrifugal force. The rotating basket and clothes have considerable momentum which necessitates the use of a brake for rapidly bringing the basket and clothes to a stop when desired.

Previously known braking mechanism for accomplishing the above purpose includes a plurality of radially-extending inclined planes surrounding the rotatable member on which ride spherical weights which present a force longitudinally of the rotatable member when rotating to disengage a brake plate from a coacting braking surface. When the rotating member decreases in speed a predetermined amount, the weights move inwardly, allowing the braking surfaces to engage and apply a braking force to the rotatable member.

The present invention provides a centrifugally operated mechanism for accomplishing the above purpose but with improvements thereover. The new mechanism includes a plurality of radially-extending tubes carrying centrifugal weights therein, which weights contact and force longitudinally of the rotating member a plurality of pins located at the outer ends of the tubes. The pins, when moved longitudinally by the weights, force a brake plate and braking surfaces carried thereby away from cooperating braking surfaces, thus enabling the rotatable member to rotate freely. The specific construction of the centrifugal mechanism according to the invention enables closer speed control to be obtained because only a short, slanted surface provided by the pins is employed, rather than the long inclined planes previously employed. Thus, the degree of inclination can be much sharper with the new mechanism and enable engagement and disengagement of the brake to be more accurately controlled. The new mechanism also can be manufactured for less cost than the mechanism of the prior art, principally because the tubular raceways need no specific machining but can be made from standard stock. In addition, the more sharply slanted surfaces of the pins employed in the new mechanism practically eliminate the possibility that the weights

will become wedged between the slanted surfaces and the slanted pins.

It is, therefore, a principal object of the invention to provide an improved centrifugal mechanism for releasing by centrifugal action an applied brake of a rotating member and for enabling application of the brake upon deceleration of the rotational speed of the member.

Another object of the invention is to provide a centrifugally-operated brake control which is capable of applying and releasing the brake at more accurately determined speeds.

Still another object of the invention is to provide a centrifugally-operated brake control which is less expensive to manufacture.

Other objects and advantages of the invention will be apparent from the following detailed description of a preferred embodiment thereof, reference being made to the accompanying drawing, in which:

FIG. 1 is a side view in elevation of a centrifugal extractor embodying the invention, with parts broken away and with parts in cross section;

FIG. 2 is a view in vertical cross section on an enlarged scale of a drive and brake control mechanism used in the extractor shown in FIG. 1, the mechanism being shown in different positions on each side of a center line; and

FIG. 3 is a view in cross section of a portion of the brake control mechanism shown in FIG. 2.

Referring to FIG. 1, an extractor 10 embodying a brake control mechanism according to the invention includes a rotatable basket 12 in which wet clothes are placed, the basket being rotated to throw through perforate sides thereof the water carried by the clothes. The basket is rotated by a rotatable member or shaft 14 which is driven through a main housing 16 by a driven sheave 18, a belt 20, a drive sheave 22, and a motor 24. The sheave 18 is keyed to a central hub 26 (FIG. 2) in which the rotatable shaft 14 is rotatably held, the hub 26, in turn, being supported through a bearing 27 by the housing 16. An inner housing or drum 28 within the housing 16 is also supported by the hub 26, being affixed thereto for rotation therewith.

Affixed to the lower side of a top wall of the drum 28 is a driving member 30 of a fluid coupling, the member 30 being rotatably mounted on the shaft 14 by a bearing 32. Subjacent the driving member 30 is a driven member 34 of the fluid coupling which is affixed to the shaft 14 and rotates therewith. The drum 28 contains suitable hydraulic coupling fluid, such as oil, which establishes a driving connection between the members 30 and 34 when the drum is rotated and the oil is thrown upwardly on the sides of the drum 28 and into the space between the members.

Mounted above the drum 28 are a plurality, eight in this instance, of radially extending tubes or tubular raceways 36 which are suitably affixed to the top wall of the drum 28 and rotate therewith. Centrifugal weights 38, shown as spheres, are located in the tubes 36 and can move radially inwardly and outwardly in response to the speed of rotation of the tubes. The tubes 36 also contain stops or pins 40 which positively limit outward movement of the weights 38.

When the drum 28 is rotated and the weights 38 are thrown outwardly, they contact inclined surfaces 42 of camming pins 44 suitably mounted for non-rotatable

movement in a lifting plate 46, there being one of the pins 44 for each of the tubes 36. The plate 46 is rotatably mounted by a bearing 48 on a hub 50 of a brake plate 52 so that the lifter plate 46 can rotate relative to the brake plate 52 but cannot move axially with respect to it. This enables the lifter plate 46 to rotate with the camming pins 44 and the tubes 36 yet raise and lower the brake plate 52 when the lifter plate is raised and lowered. The brake plate 52 is mounted on the shaft 14 by keys and keyways 54 to enable the brake plate 52 and the shaft 14 to rotate together yet to enable the brake plate 52 to move in a longitudinal direction with respect to the shaft 14.

When the weights 38 do not apply force to the pins 44, the lifter plate 46 remains superjacent the tubes 36, as shown on the left side of FIG. 2, and the brake plate 52 is in a lower position with a brake pad 56 in contact with a stationary brake flange 58 extending inwardly from the housing 16 to form an annular braking surface 60. However, when the drum 28 and the tubes 36 have reached a predetermined rotational speed, the weights 38 are moved outwardly by centrifugal force to exert force on the slanted surfaces 42 of the pins 44 to move the lifter plate 46 upwardly. This causes the brake plate 52 to move upwardly which raises the brake pad 56 out of contact with the annular surface 60 of the flange 58, thereby enabling free rotation of the shaft 14 with which the brake plate 52 is engaged.

The brake plate 52 has a plurality of lower recesses 62 which receive the lower ends of springs 64 located between the recesses 62 and upper recesses 66 of a backing plate 68. The springs 66 urge the brake plate 52 downwardly into engagement with the annular flange 58, the backing plate 68 being unable to move longitudinally of the shaft 14 because it abuts an upper bearing 70 located between an intermediate portion of the shaft 14 and the top of the housing 16.

To review the operation of the extractor 10 in more detail, when it is desired to begin rotation of the basket 12, the motor 24 is started to drive the hub 26 and the drum 28. Rotation of the drum 28 rotates the upper member 30 of the coupling and forces the oil up the sides of the drum 28 and between the fluid coupling members 30 and 34 to provide driving engagement therebetween. However, as this driving engagement is being established, the tubes 36 are already rotating with the drum 28 causing the weights 38 to move radially outwardly and contact the slanted surfaces 42 of the pins 44. When the forces exerted on the pins 44 by the weights 38 exceed the downward forces exerted by the springs 64, the lifter plate 46 is raised and moves the brake plate 52 upwardly to free it from the brake flange 58. This occurs before a complete fluid engagement is established between the fluid coupling members 30 and 34 so that the shaft 14 is free to rotate by the time it begins to pick up speed, with the driven fluid coupling member 34 approaching the speed of the driving member 30. The weights 38 remain outwardly under the pins 44 during operation of the extractor 10, as shown on the right hand side of FIG. 2.

When it is desired to stop the basket 12 of the extractor 10, the motor 24 is shut off, thereupon acting to some extent as a brake, decreasing the rotation of the basket 12. After the speed of the basket 12 decreases to a predetermined amount, the centrifugal force acting upon the weights 38 has decreased to an extent such that the vertical component thereof acting upon the pins 44 is less than the force of the springs 64 whereby the springs move the plate 52 downwardly against the brake flange 58, thereby quickly stopping rotation of the shaft 14. Thus, the basket 12 is relatively rapidly brought to a stop in a fraction of the time which would be required if no brake were used.

The tubes 36 are relatively simple to fabricate, being made of standard stock, and require a minimum of machining operations, holes only being required for the pins 44

and the stops 40. Further, by using the relatively short slanted surfaces of the pins 44 rather than inclining the entire raceways in which the weights 38 move, the surfaces 42 can be at a steeper angle which enables greater control over the speed at which the pins 44 will be lifted to be obtained. The angle also prevents the weights from being wedged in the raceways as can occur with surfaces of lesser inclination. While the weights 38 are preferably of a spherical shape, it is to be understood that other weights which are free to slide in the tubes 36 can be used.

Modifications of the above described improvement in the braking mechanism for rotatable members will be apparent to those skilled in the art and it is to be understood that such modifications can be made without departing from the scope of the invention, if within the spirit of the accompanying claims.

I claim:

1. In a power transmission, a rotatable drive member, a driven shaft, a clutch connection between said drive member and said shaft, and a normally engaged brake for said driven shaft having a stationary member and a member movable parallel to the longitudinal extent of said driven shaft to move into and out of braking engagement with said stationary member, the improvement comprising a plurality of generally radially extending raceways rotatable with said drive member, a weight movable in each of said raceways, a body having a slanted surface located near the end of each of said raceways and in the path of each weight, and means positioning said bodies for lateral movement with respect to the paths of said weights to enable said bodies to be pushed outwardly by said weights to disengage said brake when the speed of rotation of said raceways exceeds a predetermined amount.

2. In a power transmission, a rotatable drive member, a driven shaft, a clutch connection between said drive member and said shaft, and a normally engaged brake for said driven shaft having a stationary member and a member movable parallel to the longitudinal extent of said driven shaft to move into and out of braking engagement with said stationary member, the improvement comprising a plurality of radially extending tubes located in a generally horizontal plane and rotatable with said drive member, a weight movable in each of said tubes, and a body extending laterally into each of said tubes and having a slanted surface located near the end of each of said tubes and in the path of each weight for being pushed in a direction laterally of said path by said weight to disengage said brake when the speed of rotation of said tubes exceeds a predetermined amount.

3. In a power transmission, a drive means, a driven shaft, a clutch connecting said drive means and said shaft, said clutch being operable at a predetermined speed of the drive means, a stationary brake member, a movable brake member rotatable with said shaft, and means for urging said rotatable brake member into engagement with said stationary brake member, the improvement comprising a plurality of generally radially extending raceways around said shaft and rotatable with said drive means, a weight slidably movable longitudinally of each of said raceways, a body extending laterally into each of said tubes and having a slanted surface adjacent the end of each of said raceways and in the path of each of said weights, said weights contacting and forcing in a direction laterally of said raceways each of said bodies when the rotation of said raceways exceeds a predetermined amount, and means for connecting said bodies and said brake plate for moving said brake plate out of engagement with said stationary brake member when said bodies are moved by said weights.

4. In a power transmission, a drive means, a driven shaft, a clutch connecting said drive means and said shaft, said clutch being operable at a predetermined speed of the drive means, a stationary brake member, a movable brake member rotatable with said shaft, and means for

urging said rotatable brake member into engagement with said stationary brake member, the improvement comprising a plurality of generally radially-extending tubes around said shaft and rotatable with said drive means, the axes of said tubes being located in a common horizontal plane, weights movable longitudinally in said tubes, and slanted bodies extending into each of said tubes and into the ends of the paths of said weights and movable laterally of said tubes and the paths by said weights when the rotation of said tubes exceeds a predetermined amount, said bodies moving said movable brake member out of engagement with said stationary brake member.

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