

July 5, 1932.

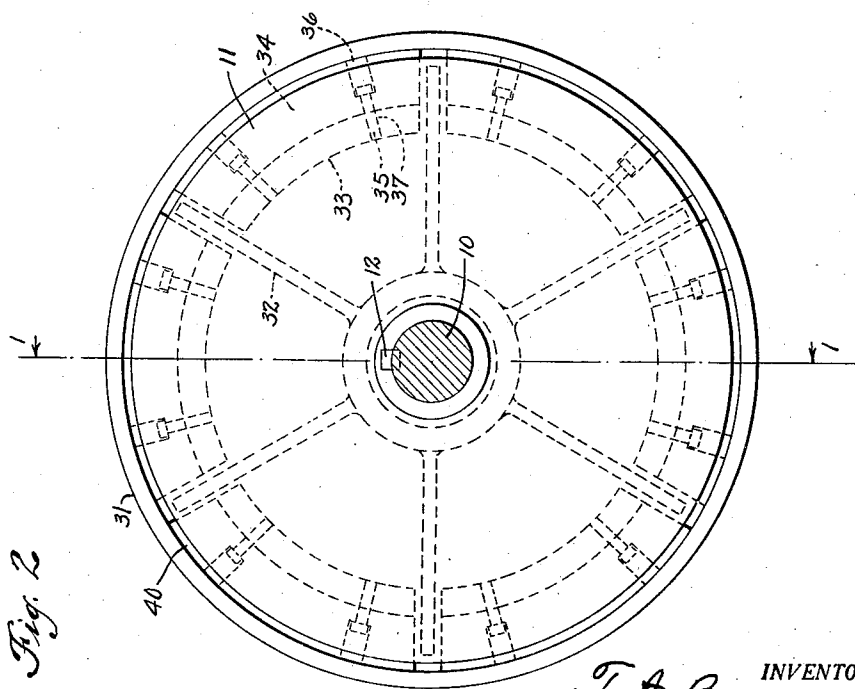
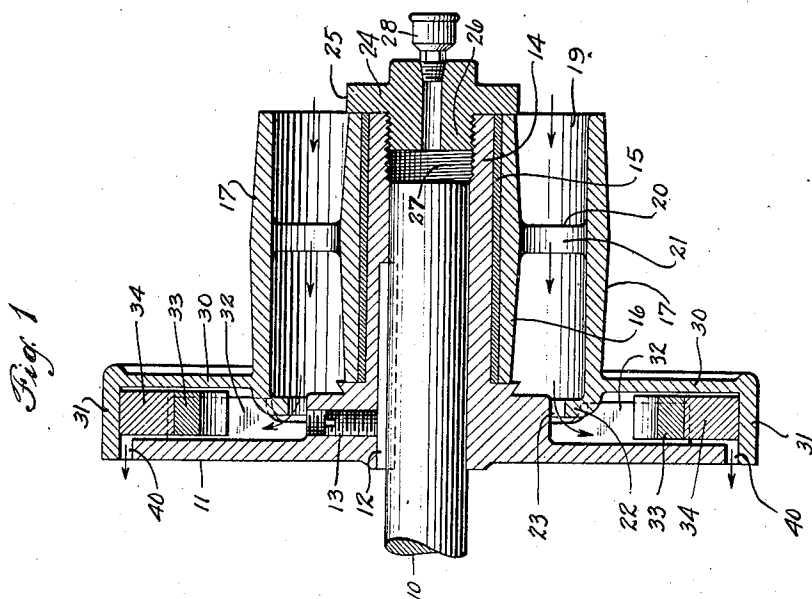
T. A. BRYSON

1,866,291

DRIVING MECHANISM

Filed March 16, 1929

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

Fig. 4

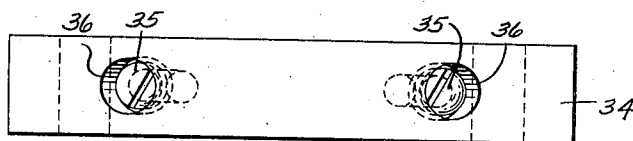


Fig. 3

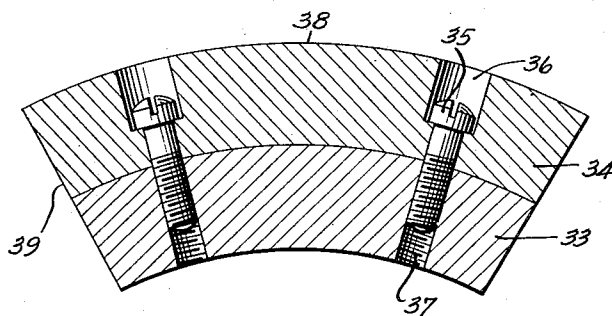


Fig. 9

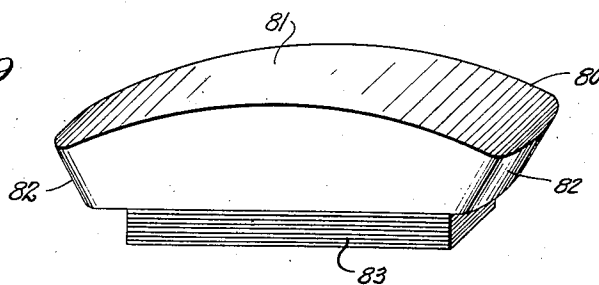
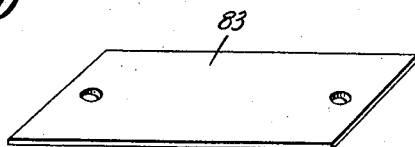


Fig. 10



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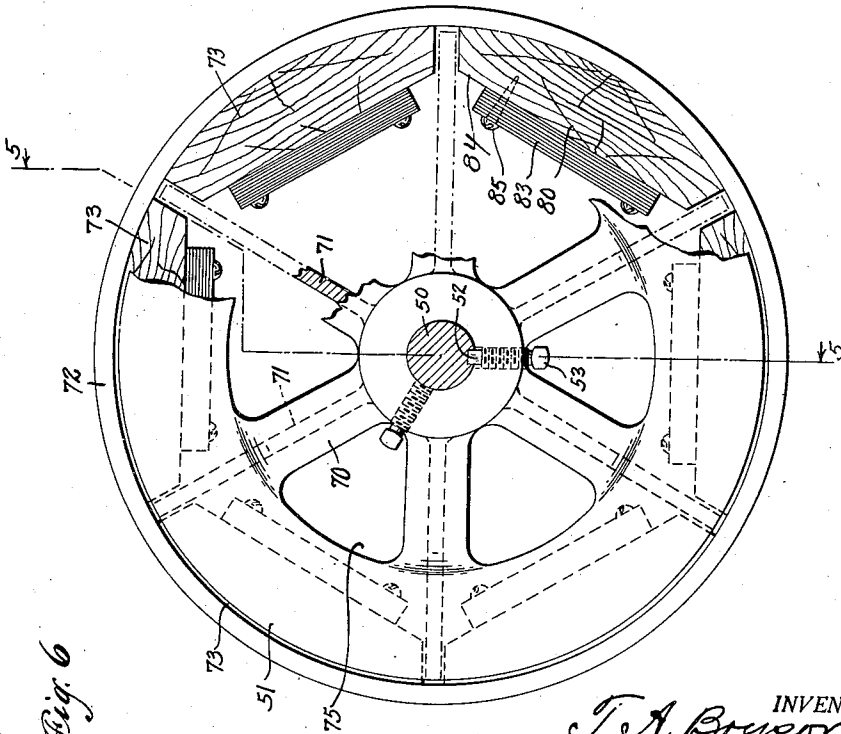
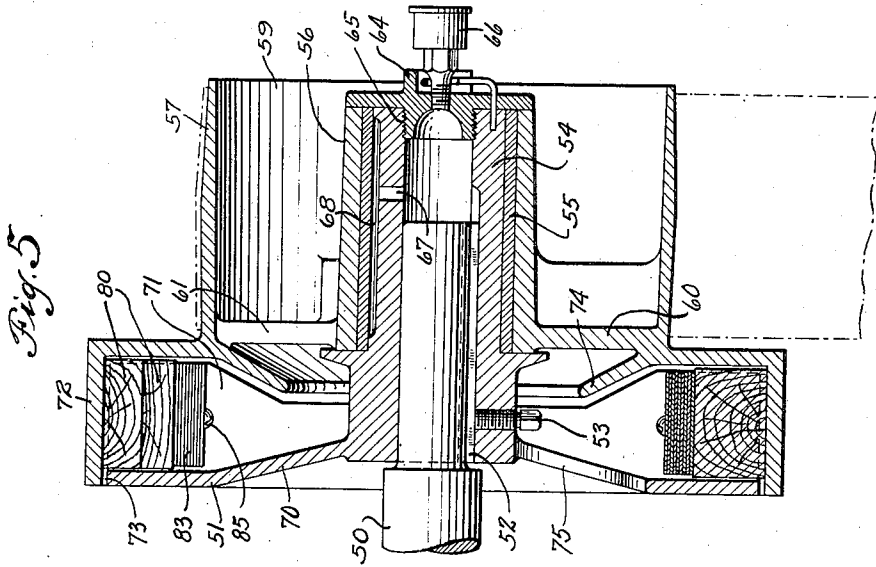
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4 Sheets-Sheet 3



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DRIVING MECHANISM

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Fig. 7

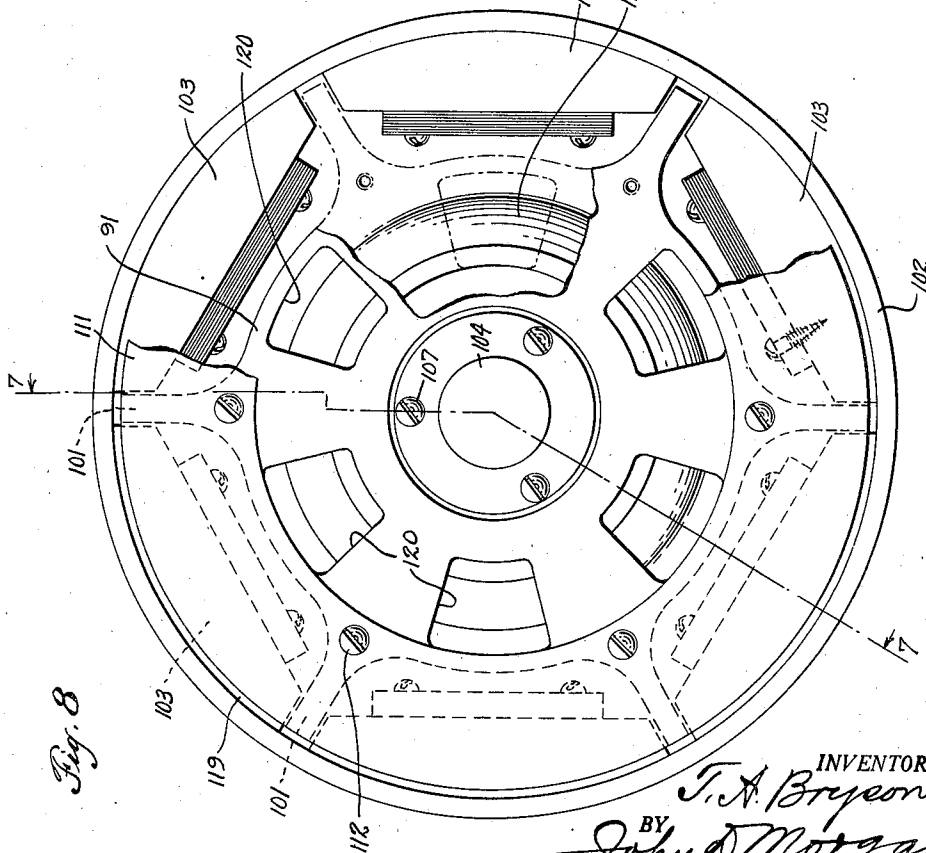
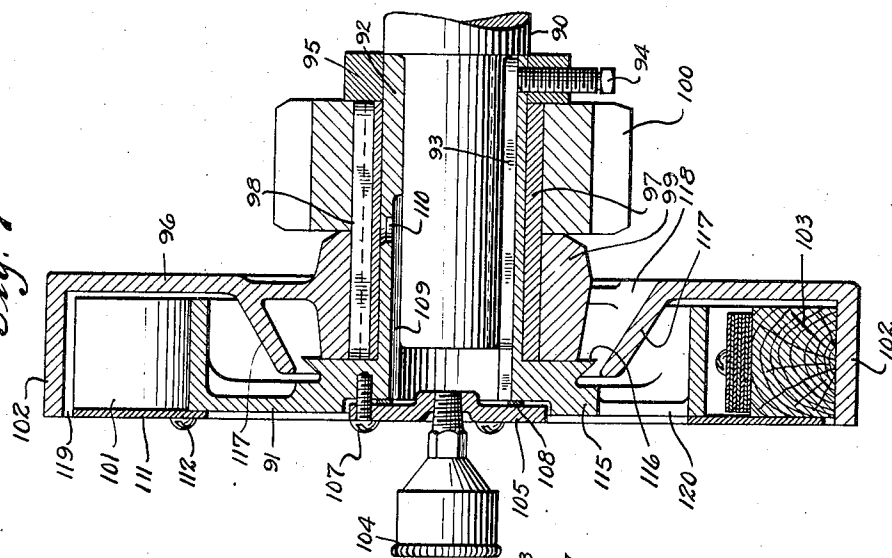


Fig. 8

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UNITED STATES PATENT OFFICE

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DRIVING MECHANISM

Application filed March 16, 1929. Serial No. 347,685.

The invention relates to mechanical driving means interposed between a motor and a machine driven thereby, and more particularly to a friction clutch and mechanical drive between an electric motor and the machine driven thereby, designed to permit the motor to get up speed before taking the load.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

The invention consists in the novel parts, construction, arrangements, combinations and improvements herein shown and described.

The present application is a continuation in part of my co-pending application Ser. No. 444,443, filed February 12, 1921.

The accompanying drawings, referred to herein and constituting a part hereof, illustrate one embodiment of the invention, and together with the description, serve to explain the principles of the invention.

Of the drawings:—

Fig. 1 is a vertical section through a friction drum and belt pulley constructed in accordance with the principles of the invention, and is taken on line 1—1 of Fig. 2;

Fig. 2 is an end elevation, looking at Fig. 1 from the left;

Fig. 3 is a detail, on an enlarged scale, of the frictional, centrifugally-operated clutching segments carried on the face plate of the clutch and engaging with the rim of the belt pulley;

Fig. 4 is a top plan corresponding to Fig. 3;

Fig. 5 is a vertical section similar to Fig. 1, of a modified and improved form of the clutch and pulley drive, taken on line 5—5 of Fig. 6;

Fig. 6 is an end elevation, looking at Fig. 5 from the left, with a part of the flat side face of the clutch disc broken away to show the centrifugally operated clutching members carried thereby;

Fig. 7 is a vertical section similar to Fig.

5, showing a modification of improved form of the clutch adapted for the drive of a gear-driven or chain and sprocket driven machine, and is taken on line 7—7 of Fig. 8;

Fig. 8 is an end elevation, looking at Fig. 7 from the left, with a part of the retaining plate of the clutch disc broken away to show the centrifugally-operated clutching members;

Fig. 9 is a detail, in perspective and on an enlarged scale, of the variably loaded, frictional clutching elements used in the modified forms of the clutch shown in Figs. 5 to 8 inclusive; and

Fig. 10 is a detail on an enlarged scale of one of the removable loading plates used with the variably loaded clutching elements.

The invention provides a clutch and drive for use between an electric motor and a centrifugal machine driven thereby, and especially for use with a squirrel cage induction motor, requiring to be started and to get up speed under a light load. The invention is applicable also to driving other machines where similar conditions and requirements obtain. In the present invention, the taking on of the load is dependent upon the motor getting up to a desired or predetermined speed, and in certain aspects of the invention this result is effected by providing a plurality of members moving freely under centrifugal action or force and deriving their clutching or driving power from the centrifugal force developed.

The invention is directed to providing a clutch adapted and capacitated as a drive between alternating current or other motors and machines presenting heavy and difficult load requirements of various kinds such as wide variations in speed and inertia, in heavy loading, in taking on heavy loads of relatively great inertia at relatively high motor speed or with loads susceptible of disturbance or damage from too sudden acceleration.

In the textile, chemical and laundry industries the driving of large centrifugal extractors with electric motors particularly through belt connection, great difficulty is experienced in providing a motor with suffi-

cient torque to overcome the high inertia and to accelerate the machine within a reasonable time. Motors which are capable of producing high starting torques are inefficient at the light loads which the centrifugal draws at full speed. Furthermore, there is a definite limit to the amount of torque which may be transmitted through the belt to the machine without slipping and burning the belt. This is particularly troublesome due to the torque impact developed when an electric motor of this type is started. Motors which have the characteristic of a gradually rising torque-speed curve draw excessive and sustained currents on starting and this is particularly serious when accelerating a high inertia load requiring considerable time to attain full speed.

The principal functions of my clutch are, first, to slip in a predetermined and essential manner during the starting or accelerating period and to take on the inertia of the load gradually without impact, shock, or disturbance to the driven machine or to the material operated upon and second, to form a positive non-slipping drive when full speed is attained.

Other features of the invention than those already briefly outlined will be set forth in connection with the detailed description of the mechanism, and it will be understood that the same, as well as the foregoing is exemplary and explanatory of the invention and not restrictive thereof.

Referring now to Fig. 1 and the following figures, the motor shaft 10 of the motor is shown with a clutch disc 11 mounted thereon and fixed thereto to rotate therewith, by means of a key 12 held by set screw 13. The circular disc 11 has fixed thereto or integral therewith a sleeve 14, surrounding the shaft 10, and rotating with the shaft by reason of the key 12. Loosely sleeved on the sleeve 14 is a friction sleeve 15, which is pressed into the hub 16 of a driving pulley 17, which in the present exemplification drives the belt of the centrifugal machine. The pulley 17 is hollow, that is, of tubular form, and is ventilated and cooled by a current of air passing therethrough as hereinafter described. With this in view, the end of the pulley comprises an annular aperture 19, and the center web 20 is likewise provided with ventilating apertures 21, and the inner wall 22 of the pulley is provided with ventilating apertures 23.

The pulley is maintained in position upon the sleeve 15 by suitable means, such as a screw cap 24 having a flange 25 abutting on the pulley hub at its exterior end. The interior portion 26 of the screw cap is screw-threaded, screwing into the internally screw-threaded end 27 of the sleeve 14, which is part of the clutch disc 11. A suitable oil or grease cup 28 may be mounted in the retain-

ing cap 24 to lubricate the interior of the device.

Referring now to the details of the clutch mechanism, the pulley 17 has fixed thereto or integral therewith, at what may be termed its inner end, the left hand end in Figs. 1 and 8, a circular disc or plate 30, terminating in an annular crown flange or drum 31, which is adapted to cooperate with clutching devices carried by the disc 11, which disc as already described, is fixed on shaft 10 of the motor.

Referring now to the details of construction of the disc 11, it has formed on its interior face a plurality of radially disposed ribs or vanes 32, projecting perpendicularly from the flat face of the disc, and serving as a part of the clutching mechanism and serving also to create a current of cooling and ventilating air through the device.

The clutching mechanism in the present case, as already described, is centrifugally operated, and comprises a plurality of loose sectors or segments resting between the radially disposed ribs or vanes 32, and adapted to move out under the impulsion of centrifugal force and to engage with the interior surface of the flange or drum 31 of the pulley drum to drive the pulley from the motor and thereby to drive the centrifugal machine or other load. The device operates to connect the load to the motor at a substantially predetermined speed, for which the parts are proportioned and weighted.

The centrifugally operating clutching elements comprise pieces or sectors 33, preferably of metal, with like pieces 34, preferably of wood or fiber, or other suitable friction material, fitted to the exterior face of the corresponding piece 33. The two parts or sections 33 and 34 are connected together in a suitable manner, as by screws 35 counter-sunk in holes 36 in the part 34 and screw-threaded into openings 37 in the part 33. The pieces are arcuate or circular on their outer faces 38 so as to fit and press against the inner face of the flange 31 to drive the pulley, and at their exterior ends 39 they are beveled to fit substantially between the radial ribs 32, so as to fit loosely and to be free from the pulley flange 31 when the mechanism is at rest and to move outwardly into clutching engagement with the flange 31, due to centrifugal force created by the rotation of the disc 11 fixed to the motor shaft 10, when the proper speed of rotation has been attained.

By virtue of the multi-part clutching elements described, it is possible to very nicely and accurately regulate the clutching effect. The loading elements 33 may be easily removed from the backs of the friction elements 34 and replaced by similar loading elements of different weight and radial thickness and in this manner the clutching effect can be very accurately controlled and varied between

wide limits. Furthermore, the loading effect is entirely uniform throughout the clutching element and this uniformity is in no wise disturbed by changes in weight of the loading member.

The clutching elements are located a relatively great radial distance from the axis of the driving shaft and as a result the tangential driving force of the blades 32 is applied relatively near the friction or engaging surfaces of the clutching elements. This structure is very advantageous in that it prevents torsional effects in the blocks, avoiding tilting thereof and uneven or localized wear.

Referring to the ventilating feature of the device, there is sufficient clearance about the centrifugally movable clutching members to provide air passages, and between the periphery of the clutch disc 11 and the inner face of the flange 31 is an annular space 40, providing an exit passage for the air. As the device or mechanism rotates, the ribs or vanes 32 create an outwardly moving air current, along their length, which draws the air in through the openings 19 along the interior of the pulley and beneath the belt carrying parts 17, inwardly longitudinally of the pulley and thence radially outwardly between the pulley disc 30 and the clutch disc 11 and out through the aperture 40.

In Figs. 5 and 6 is shown a modified form of clutching mechanism also adapted for a belt drive and embodying various different and improved features with regard to both the circulation of the cooling air currents and the variable weighting of the clutching elements or blocks. The motor shaft 50 is shown with a clutch disc 51 mounted thereon and fixed thereto to rotate therewith by means of a key 52 held by set screw 53. The circular disc 51 has fixed thereto or integral therewith a sleeve or hub 54, surrounding the shaft 50 and rotating with the shaft by reason of the key 52. Loosely sleeved on the hub 54 is a friction sleeve 55 which is pressed into the hub 56 of a driving pulley 57, which in the present embodiment drives the belt of a centrifugal or other machine. The pulley 57 is hollow or tubular and is ventilated and cooled by a current of air passing there-through as hereinafter described. With this in view, the end of the pulley comprises an annular aperture 59 and the inner wall 60 is likewise provided with ventilating apertures 61.

The pulley is maintained in position upon the sleeve 55 by means similar to those described in connection with Fig. 1, the flanged screw cap 64 abutting on the pulley hub at its exterior end and having a similar screw-threaded engagement with the internally screw-threaded end 65 of the sleeve 54, which is part of the clutch disc 51. A suitable oil or grease cup 66 may be mounted in the retaining cap 64 to lubricate the interior of the

device. An aperture 67 in the hollow end of the sleeve 54 communicates with a grease groove 68 in the outer surface of the sleeve 54 and thus provides for lubrication of the bearing parts.

Referring to the details of construction of the disc 51, the inner or central portion thereof is inwardly recessed at 70. A plurality of radially disposed ribs or vanes 71 is provided, projecting perpendicularly from the face of the disc, and serving as a part of the clutching mechanism and serving also to create a current of cooling and ventilating air through the device.

The clutching mechanism in the present modification, is generally similar to that described in connection with the embodiment of Figs. 1 and 2 and comprises a plurality of loose segments or blocks 73 resting between the radially disposed driving vanes 71 and adapted to move out under the impulsion of centrifugal force and to engage with the interior surface of the flange 72 of the pulley drum in the manner hereinbefore described.

Referring to the improved ventilating features of the present modification, there is provided a similar annular space 73 between the periphery of the disc 51 and the inner face of flange 72 for the exit of air, while a sufficient clearance for passage of air exists around the radially movable clutching segments 73. The pulley hub is provided at 74 with an inwardly and rearwardly extending annular flange which provides clearance for air drawn through the pulley hub and aperture 61. The recessed portion 70 of the disc 51 is also provided with a plurality of ventilating apertures 75, which are staggered with respect to the aperture 61 in the hub. The vanes 71 are relatively narrow near their inner or central portions and follow the lines of the inclined flanges 70 and 74 whereby their outer portions are flared or widened and the fanning action thus intensified.

As the mechanism rotates, the vanes 71 create an outwardly moving air current along their length which draws the air in through the openings of the hollow pulley along the interior thereof and beneath the belt carrying parts inwardly along the flange 74 and thence radially outwardly between the pulley disc 72 and clutch disc 51 and out through apertures 73. At the same time, air is drawn from the rear or left-hand side of the mechanism through the apertures 75 in the clutch disc 51 and radially outwardly past the clutching blocks and through apertures 73 as described. Thus a large volume of cooling air is drawn longitudinally in both directions of the device and then outwardly radially through the clutching or friction surfaces.

Referring now to the structure of the clutching elements, the segments 73 comprises segmental pieces 80, preferably of wood or fibre or other suitable friction material, hav-

ing an outer curved face 81 adapted to engage with the inner curved periphery of the flange 72 to drive the pulley. The end portions 82 are bevelled to fit substantially between the ends of the radial vanes 71 so as to fit loosely and be free from the pulley flange 72 when the mechanism is at rest and to move outwardly into clutching engagement with the flange due to the centrifugal force created by the rotation of vanes 71 and disc 51, fixed to the motor shaft 50 when the proper speed of rotation has been attained. The members 80 are shaped and positioned to engage with the vanes 71 at the outer ends thereof, whereby the tangential driving force imparted to the clutching members from the vanes 71 is as close as possible to the clutching surfaces.

The segmental pieces 80 are provided with a plurality of loading or weighting plates 83, which are removably secured to the flat back faces 84 of the pieces 80 by a suitable means, as, for example, the wood screws 85. The plates 83 are thus adapted to form a composite loading device for the friction pieces 80, which can be very readily removed and varied in weight between wide limits so as to vary the clutching force of the clutching members. It will be clear that the plates 83 may be made as thin as desired, so that the loading increments may be very minutely regulated and the clutch thus adapted to vary minute variations in driving requirements. Furthermore, the addition or taking away of one or more loading plates 83 from the back of a clutching member 80 in no wise affects the uniform distribution of the loading. Each plate is of the same size and all plates extend substantially over the entire rear face of the member 80.

In Figs. 7 and 8 is shown a modified form of the invention, wherein the clutch is adapted for gear driving. The clutch disc 91 is provided with an integral hub or sleeve 92 which is made fast to the motor shaft 90 by key 93 and set screw 94 through the collar 95. The driven drum 96 is secured to bushing 97 by the key 98 which engages hub 99 of the drum 96, the bushing 97 being loosely fitted for turning movement on the exterior surface of the hub 92. A gear or sprocket 100 is likewise keyed to the bushing 97 by key 98 and bears against the collar 95 on one side and the hub 99 on the other.

The construction described permits the use of a relatively small clutch pinion, which is of importance in a drive of the nature indicated where a high speed motor is used to drive a low speed machine. By mounting the gear directly on the same bushing to which the drum hub 99 is secured instead of extending the hub 99 and mounting the gear on the hub, a considerable diameter is saved and consequently the gear ratio can be made less for a given sized gear. A considerable saving in size and cost of the cooperating chains or gears results.

Referring to other mechanical details of the present modification, the clutch disc 91 comprises a flat circular plate extending radially from the outer or left hand end of the hub 92 approximately half way to the outer periphery of the clutch. The driving vanes 101 are formed as radial extensions of the plate 91, projecting radially and perpendicularly to form suitable driving and air current-creating blades of the type hereinbefore described. The driven clutch drum is formed by a circular web 96 extending radially outwardly from the hub 99 and having a peripheral flange 102, the inner surface of which cooperates with radially movable clutch blocks 103 to receive the driving force in the manner hereinbefore described. Means are provided for readily removing and replacing the clutch blocks in the mechanism. As embodied, an annular plate 111 is attached to the outer surface of disc 91 by screws 112.

A grease cup 104 is attached to the outer face of disc 91 by circular plate 105 which is set in an annular recess in disc 91 and held by screws 107. A suitable sealing gasket 108 prevents leakage of the lubricant around plate 105. A grease groove 109 in sleeve 92 transmits lubricant through aperture 110 to the bearing surfaces.

The invention provides means for preventing grease or other lubricant from working or flying into the interior of the clutching mechanism and getting to the friction surfaces. As embodied, the hub 92 of disc 91 is provided with an intermediate enlarged head portion 115 against which the outer ends of hub 99 and bushing 97 bear. The head 115 projects radially beyond the hub 99 and forms a lip 116 which prevents grease from working around and into the clutch. Cooperating with lip 116 the web 96 of the clutch drum is provided with an inwardly inclined annular flange member 117 adapted to deflect away from the clutch and shaft any grease which may be thrown against it by centrifugal force from the lip 116.

Means are provided for effecting an air-cooling and ventilating action with the present modification. As embodied, the web 96 is provided with a plurality of spaced apertures 118 through which air is drawn by the fan action of the vanes 101, the air passing longitudinally through the space between lip 116 and flange 117, radially out around the clutch blocks and through annular opening 119. Provision is also made for drawing air from the other face of the clutch through openings 120 in disc 91.

From all the foregoing it will be understood that a driving mechanism has been provided having the functions, capacities and advantages set forth. It will be understood also that changes may be made from the particular structure shown, within the scope of the accompanying claims without departing

from the principles of the invention and without sacrificing its chief advantages.

What I claim is:—

1. A driving mechanism including in combination a motor shaft, a flat disc fixed thereon, radially disposed guides on the flat face thereof, arcuate centrifugally operated clutching members freely moving along the guides, a drum encircling the periphery of the disc against which the arcuate clutching members are pressed by centrifugal action, a flat disc supporting the drum and a belt pulley supporting said disc, the guides on the first mentioned disc also acting as ventilating vanes, the pulley having a hollow hub.

2. A driving mechanism including in combination a motor shaft, a flat disc fixed thereon, radially disposed guides on the flat face thereof, arcuate centrifugally operated clutching members freely moving along the guides, a drum encircling the periphery of the disc against which the arcuate clutching members are pressed by centrifugal action and a belt pulley driven by the drum, the guides on the first mentioned disc also acting as ventilating vanes.

3. In a centrifugal clutch, the combination with a pair of radially extending driving vanes, of a freely movable clutch element located between the driving vanes comprising a pair of radially beveled arcuate elements, and means for detachably connecting said arcuate elements.

4. In a centrifugal clutch, the combination of a driving shaft, a driven pulley journaled thereon, annular means carried by said pulley at one side thereof, centrifugally operated clutch elements driven by said shaft for driving said annular means, and means associated with said driving and driven elements for causing a positive circulation of air through the pulley and clutch.

5. In a centrifugal clutch, the combination of a driving shaft, a driving disk mounted thereon, radially disposed driving blades carried by said disk, freely movable, centrifugally operated clutch elements arranged between said blades, and a driven element adapted to be driven by said clutch elements, the said driving blades acting also as fan blades for causing a positive flow of cooling air through the clutch.

6. In a centrifugal clutch, the combination of a driving shaft, a driving disk mounted thereon, radially disposed driving blades carried by said disk, a pulley journaled on said driving shaft, an annular flange carried by the pulley, and a plurality of freely movable, centrifugally operated clutch elements arranged between the driving blades for driving said annular flange and pulley, the driving blades serving also as fan blades for causing a positive circulation of cooling air through the pulley and clutch.

7. In a centrifugal clutch, the combination

of a driving shaft having a driving disk thereon, driving blades fixed on the side of said disk and extending radially from near the hub to near the periphery thereof, a driven disk rotatably mounted substantially parallel to the driving disk, a circumferential flange carried by the outer part of the driven disk, a pulley carried by the inner part of the driven disk, and freely movable, centrifugally operated clutch elements arranged between the two disks, and between said driving blades, the blades engaging against the ends of the clutch elements, for driving said circumferential flange and driven disk.

In testimony whereof I have signed my name to this specification.

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