March 17, 1953 A. W. HOLSTEIN 2,631,708

CONSTANT SPEED CENTRIFUGAL CLUTCH

Filed Aug. 13, 1949

Fig. 1.

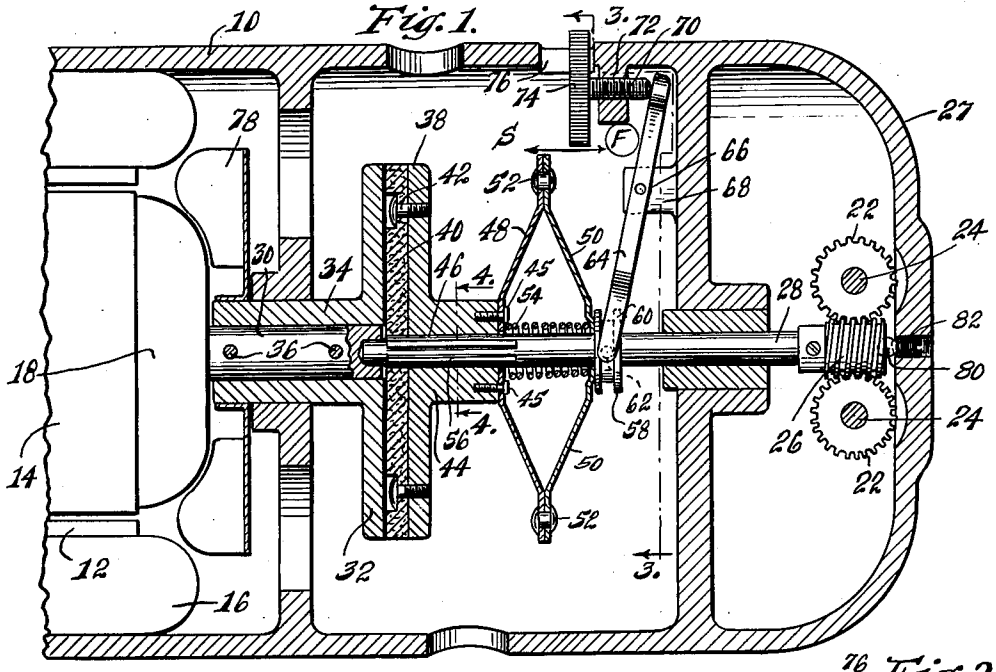


Fig. 2.

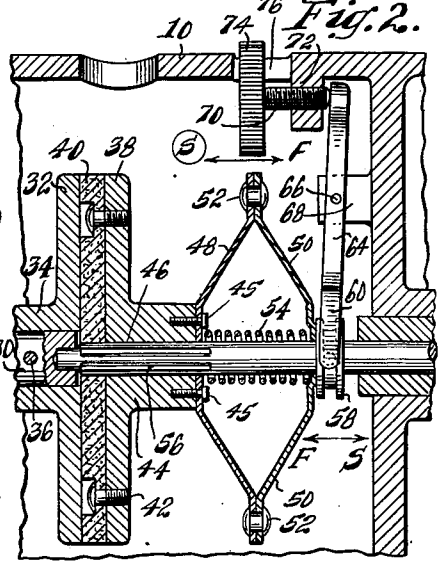


Fig. 3.

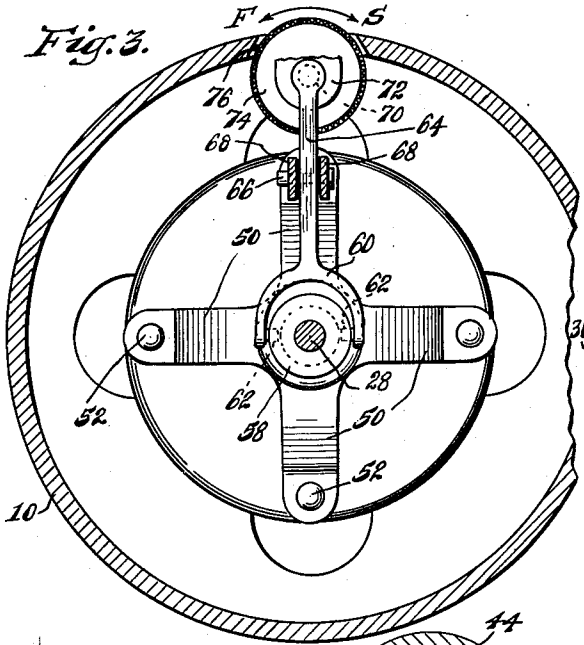
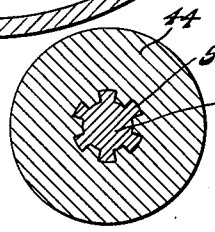


Fig. 4.



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CONSTANT SPEED CENTRIFUGAL CLUTCH

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1 Claim. (Cl. 192—104)

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This invention relates to speed governors and more specifically to governors used on series-wound, fractional horsepower motors, the governor being particularly adaptable for food mixers and the like although it may be employed for other motors and other appliances when desirable.

One object of the invention is to automatically and economically maintain the proper speed of the motor which is particularly desirable in connection with beater shafts of a food mixer and other power food processing attachments where the load on the motor tends to vary, for instance due to portions of the mixture being worked upon being of different viscosity.

Another object is to provide a speed control of simple, durable and rugged construction which is efficient and yet easily manufactured and assembled.

Still another object is to provide a governor which improves the forced air cooling of the motor at lower beater speeds as compared with those type of governors which govern the speed of the motor itself with the beaters directly geared thereto as distinguished from my present arrangement wherein the speed of the beaters or other power driven devices are regulated so that their rotation is different than that of the speed of the motor.

A further object is to provide mechanical means to vary the speed of the beaters or shafts for food-working attachments without regulating the motor.

Still a further object is to provide a governor which absorbs to a certain extent shocks encountered at the beaters.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my governor structure whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claim and illustrated in the accompanying drawings, wherein:

Figure 1 is a sectional view through a motor housing showing a portion of the motor and a driving means for beaters or the like together with my motor governor of the clutch type interposed between the motor and the final drive, the governor being adjusted for relatively fast operation.

Figure 2 is a similar view of a portion of Figure 1 showing the governor adjusted for slow operation.

Figure 3 is a sectional view on the line 3—3 of Figure 1 showing an end view of the governor; and

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Figure 4 is an enlarged sectional view on the line 4—4 of Figure 1 to show the connection of a driven clutch disc with the power shaft.

On the accompanying drawing I have used the reference numeral 10 to indicate a housing for a motor, the field of which is indicated at 12, the armature at 14, the field coils at 16 and the armature winding at 18. A gear housing 27 is illustrated for housing gears 22 mounted on beater shafts 24, the gears being driven by a worm 26 on a power shaft 28, the motor shaft being shown at 30.

My clutch type governor includes a driving disc 32 having a hub 34 secured to the motor shaft 30 as by pins 36, and a driven disc 38. One of the discs 32 or 38 is faced with asbestos or the like 40 held in position by any suitable means such as screws 42. The driven disc 38 has a hub 44 to which is secured, by means of screws 45, a cross-shaped governor spider 48. A similar spider 50 has its arms secured to the arms of the spider 48 by rivets 52.

A spring 54 is interposed between the two spiders and encircles the power shaft 28 which shaft is slidably and non-rotatably connected with the hub 44 of the driven disc 38 by a splined connection 56 shown particularly in Figures 1 and 4.

A grooved collar 58 is slidably and rotatably mounted on the power shaft 28 and is controlled by a yoke 60 having pins 62 (see Figure 3) entering the groove of the collar. This yoke is provided with an arm 64 pivoted at 66 to a bracket 68 and may be adjusted about the pivot 66 by an adjusting screw 70.

The screw 70 is threaded in a boss 72 of the motor housing 10 and has a manually operable knob 74 extending through a slot 76 in the housing to a position of access, the projection of the knob from the housing being best shown in Figure 3. The housing may be suitably labeled to indicate which direction to rotate the knob for faster or slower operation and this is indicated by the reference characters F and S in Figure 3. Also in Figures 1 and 2, similar reference characters are used to indicate which direction the screw 70 travels longitudinally through the boss 72 for slow and fast operation, F being encircled in Figure 1 to indicate that the fast adjustment is in effect and S being encircled in Figure 2 to indicate slow operation when the parts are in the position shown in Figure 2.

The adjustment just referred to causes the grooved collar 58 to more or less compress the spring 54 so that when adjusted as in Figure 1

greater speed is had than when adjusted as in Figure 2. The arms of the governor spiders 48 and 50 constitute centrifugal weights which are aided by the rivets 52 tending to straighten the spider arms out upon rotation as illustrated in Figure 1 when compared with Figure 2. This straightening out of the arms loosens the facing 40 of the driven disc 38 in relation to the face of the driving disc 32 as illustrated in this figure which permits slipping when the desired output speed is had. The motor, however, can continue to rotate at high speed and in fact will speed up slightly because the load is somewhat released between the facing 40 and the disc 32.

As the load increases on the beater shafts 24, they will slow down the disc 38 and consequently the centrifugally-operated governor spiders 48 and 50 will permit the spring 54 to expand slightly for engaging the facing 40 more tightly against the driving disc 32 thus decreasing the slippage, or eliminating it so that the power shaft 28 is directly driven from the motor. As the load varies, the relative speeds of the motor shaft 30 and the power shaft 28 will vary in relation to each other in an obvious manner, the resulting speed of the power shaft remaining substantially constant within the limits of the power of the motor with respect to the load imposed on the shafts 24.

Lower speed is had with the adjustment shown in Figure 2 due to the spring tension 54 being lessened so that it takes less centrifugal force to compress it and thereby slip the clutch. With such an arrangement it is possible to have a wider variation of output speeds with the input speed constant or slightly variable and this is particularly desirable in connection with an electric motor which should be cooled as by a fan 78.

It is desirable that end play of the power shaft 28 be substantially nil and this is accomplished by an adjustable thrust bearing 80 backed by a set screw 82.

With my arrangement of clutch, which permits slipping action between the motor shaft and the power shaft, I do not sacrifice power at slow speeds and still secure satisfactory operation of the output shaft. This also eliminates overdesigning a cooling system for the motor since the motor speed will not be decreased to reduce the beater speed and such an arrangement I find superior to a contact breaker operated by centrifugal means to de-energize or partially de-energize the motor when the speed exceeds a predetermined value.

Since the torque required to mix liquid mounts in relation to the viscosity of the liquid, due to the increase in work as the beaters shear and compress the mixture, a directly-connected motor would draw more current and increase the losses causing the motor to heat up. Torque demands are usually greatest at lower beater speeds thus creating a higher motor temperature due to increased current. At this time the fan should provide the greatest ventilation and

with my arrangement it does so because at that time the greatest slippage occurs and there is therefore a relatively greater motor speed. This permits reduction in cost of the motor also as the diameter of the wire windings can be reduced and a less expensive grade of electrical sheet steel for rotor and field laminations can be used. My friction drive absorbs to a certain extent shocks encountered at the beaters as compared with a positive gear transmission train. If a knife or spoon becomes entangled with the beaters slippage can occur instead of the rotating armature, that is its inertia, being expended suddenly as when a direct drive is provided. My arrangement thereof has a number of advantages, the main ones of which have been enumerated.

Some changes may be made in the construction and arrangement of the parts of my motor governor of the clutch type without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claim any modified forms of structure or use of mechanical equivalents which may be reasonably included within its scope.

I claim as my invention:

In a motor governor of the clutch type, a driving disc and a driven disc, a power shaft with which said driven disc is non-rotatably and slidably connected, a friction facing on one of said discs, a collar slidable on said power shaft, a pair of sheet metal spiders having central portions arranged in planes normal to the axis of rotation of said power shaft and secured against opposed end faces of said driven disc and said collar, means for connecting the outer ends of said spiders together, said means constituting centrifugal force responsive weights for urging said central portions of said spider toward each other in proportion to the magnitude of the centrifugal force acting thereon, a spring interposed between said central portions to oppose such urge, and means for varying the axial position of said collar relative to said power shaft to adjust the speed of operation of said driven disc.

ALVIN W. HOLSTEIN.

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