Dec. 12, 1961 C. W. MERCHANT 3,013,132

CENTRIFUGAL SWITCH

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Fig. 1

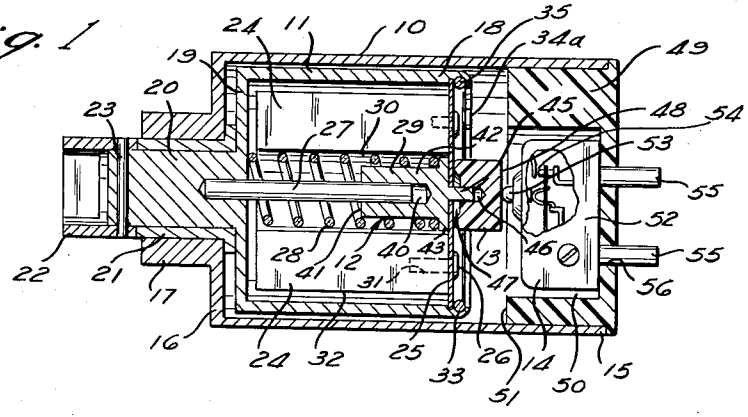


Fig. 2

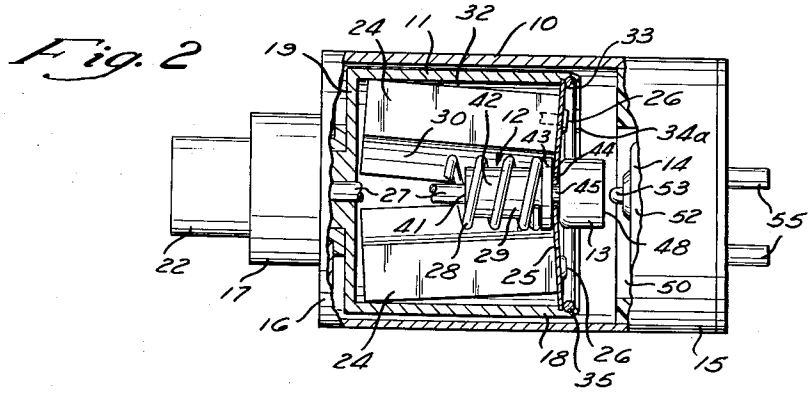


Fig. 3

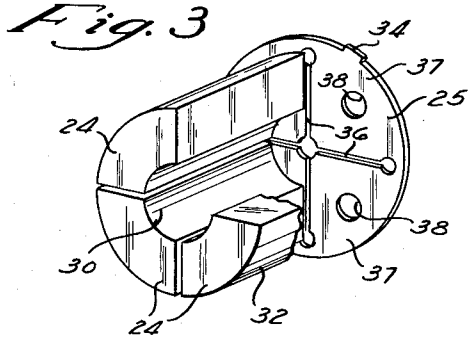
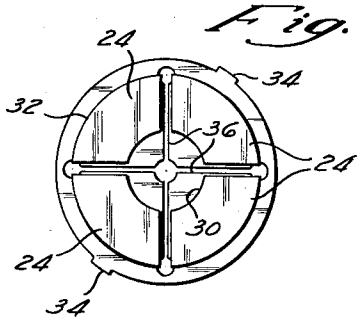


Fig. 4



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CENTRIFUGAL SWITCH

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The present invention relates to an improved centrifugal switch control device for an apparatus connected thereto in which uniform or constant speed is required for the travel of its moving parts for the proper operation of such apparatus.

A principal object of the invention is to provide an electrical centrifugal switch control device that will break the electrical circuit to such apparatus and/or the motor that drives such apparatus when there is a reduction of the required uniform speed thereof for the proper operation of such apparatus.

Another object of the invention is to provide an electrical centrifugal switch control device that will automatically protect the apparatus of which it is a part against damage to the apparatus and/or the material being processed by the use of such apparatus resulting from a reduction or drop in the speed of travel of its moving parts.

Still another object of the invention is to provide an electrical centrifugal switch control device that upon being connected to such apparatus will perform efficiently regardless of the position of its placement with respect to the axis of revolution of the governor member thereof.

Still another object of the invention is to provide an electrical centrifugal switch control device that will prevent damage to material being processed in an apparatus where a slowing down of the speed of such apparatus will result in an overexposure of such material caused by high temperature, or light, or a combination of both.

It is another object of the invention to provide an electrical centrifugal switch control device that is compact and has its member parts encased in a protective housing.

Other objects and advantages of the invention reside in a structure that is inexpensive to manufacture, has a minimum number of parts that are easy to assemble and install upon the mechanism or apparatus for which speed control is required and is efficient in operation and maintenance.

Other objects and advantages more or less ancillary to the foregoing, and the manner in which all the various objects are realized will appear in the following description, which considered in connection with the accompanying drawings sets forth the preferred embodiment of the invention.

Referring to the drawings:

FIG. 1 is a side elevational view of the centrifugal switch control device shown largely in section and in which a portion of the casing of the micro switch is cut away to show the micro switch contacts;

FIG. 2 is a side elevational view of the said device in which a portion of the housing is cut away to show the governor weights in an extended position;

FIG. 3 is a perspective fragmentary view of a part of the governor assembly showing the weights and support disc attached thereto;

FIG. 4 is an end view of a part of the governor assembly showing the relative position of the weights and support disc in the governor assembly.

Referring particularly to the drawings, the improved centrifugal switch control device may preferably be made of suitable metal except for the non-conductor parts of the micro switch assembly and parts associated therewith which may preferably be made of hard rubber, phenolic or other insulating material.

It consists of five principal parts, i.e. the outer protective housing **10**, the inner rotating housing **11**, the rotating governor assembly **12** contained within said inner housing **11**, the actuator cup **13** and the micro switch assembly **14**.

Referring to FIGS. 1 and 2 it will be seen that the outer protective housing **10** is cylindrical in form with one end **15** thereof open to receive the said inner housing **11** in axial alignment therewith and the micro switch assembly **14**. The other end **16** is closed except for an integral axially aligned bearing support tube **17**.

The said inner rotating housing **11** is cylindrical in form and also has one end **18** open to receive the governor assembly **12**. The other end **19** thereof is closed with an axially aligned journal **20** integral therewith and which is seated in the bearing **21** mounted in the said bearing support tube **17**.

The adjacent walls of said housings **10** and **11** are spaced apart approximately the thickness of said bearing **21** to provide the free rotation of the said inner housing **11** within the said outer housing **10**.

The remote end of said journal **20** has a power connection with the source of power (not shown) which comprises a keyed thrust collar **22** and a thrust collar inner housing pin **23** adjacent its said remote end and extending through said thrust collar **22** and journal **20**.

The said rotating governor assembly **12** is contained within said inner housing **11** and consists of weights **24**, a beryllium copper resilient support disc **25**, rivets **26**, a guide pin **27**, a compression coil spring **28** and a spring and actuator bearing **29**.

The said weights **24** are preferably formed from a metallic cylinder which has a diameter slightly smaller than the corresponding diameter of the inner housing **11** and which has a bore **30** therethrough concentric with its cylindrical surface. The said metallic cylinder is cut longitudinally into preferably four radial sections of substantially equal weight and shape. On one end of each weight there is a blind hole **31** centered upon a radius that bisects the radial sides of each weight at the mid point between the surface of the said bore **30** and the cylindrical outer surface **32** thereof to receive rivets **26**.

The said inner housing **11** has a groove **33** on its inner surface adjacent its open end **18** to receive said support disc **25**.

The said support disc **25** has ears **34** projecting from its periphery that are seated in recesses **34***a* of the cylindrical wall of said inner housing **11** to maintain uniform rotation of the said disc with attached weights and the inner housing **11**. The said support disc is held in place by a retaining ring **35** seated in the groove **33**.

Said support disc **25** has apertures in the form of radial slots **36** forming inwardly directed radial spring leaves **37** of equal size whose radial edges are in the same plane as the radial surfaces of the said weight adjacent thereto. Each of said slots extends an equal distance from the center of said support disc **25** and is approximately the length of the radius of the cylinder from which are formed the weights. Each said spring leaf **37** is apertured at **38** on a radial bisector thereof and in alignment with said blind hole **31** to receive said rivets **26**. The said weights **24** are attached to said support disc **25** by said rivets **26** with their cylindrical surfaces parallel to the inner wall of said inner housing **11** and are spaced apart at equal distances, one from the other, and from the inner wall and closed end of said inner housing **11**.

The closed end **19** of the inner housing **11** has a blind hole **39** concentric with and extending into the journal **20** and in co-axial alignment therewith to fixedly receive said guide pin **27**. The said guide pin **27** extends through said bore **30** and into a concentric blind hole **40** in the end **41** of the cylindrical body portion **42** of said spring and actuator bearing **29** and in co-axial alignment with said

guide pin 27 and in slidable engagement therewith. The said compression coil spring 28 is mounted on said guide pin 27 and extends from the closed end 19 of the inner housing 11 through the bore 30 to a shoulder 43 adjacent the remote end 44 of the cylindrical body portion 42 of said spring and actuator bearing 29. The said spring and actuator bearing 29 is contained within the bore 30 with its said remote end 44 engaging the adjacent surface of the said spring leaves 37.

The said spring and actuator bearing 29 has an integral concentric pin 45 projecting through the support disc 25 at the inter-section of the radial slots 36 and into a concentric blind hole 46 of the cupped end 47 surface of the said cylindrical actuator cup 13 resting on the outer surface of said support disc 25. The said actuator cup 13 is preferably made of nylon.

The said micro switch assembly 14 is contained within the outer housing 10 adjacent the remote end 48 of the said actuator cup 13 and consists of a cylindrical switch mounting cap 49 and having a recess 50 in its inner end 51 to receive a micro switch 52. Preferably said mounting cap is made of an insulating material with its cylindrical diameter equal to the inner diameter of the housing 10 and is fixedly mounted in the said open end 15 thereof.

The said micro switch 52 is mounted in said recess 50 with the push button 53 thereof in coaxial alignment with the guide pin 27 and actuator bearing pin 45. The said push button 53 engaging and bearing upon the remote end 48 of the actuator cup 13 with sufficient pressure to open the switch contact points 54 while the weights 24 are at rest. The terminals 55 of said switch 52 project through apertures 56 in the base of the recess 50 of the actuator cup 13. The said terminals 55 provide a connection to the electrical control circuit (not shown) of the apparatus connected to said thrust collar 22.

The centrifugal switch control device may be mounted upon the apparatus connected thereto by the use of the well known attaching devices (not shown) such as a strap, clamp, flange or foot mounting.

An electrical circuit (not shown) including relay means is provided for starting the motor of such apparatus and bringing its moving parts up to the required speed prior to the closing of the micro switch 52.

It will be seen that the centrifugal switch control device may be connected to such apparatus requiring control in any suitable position without disturbing the efficiency of its operation due to gravity or movement of the said apparatus. The force exerted by the compression coil spring 28 together with the spring leaves 37 will resist the force of gravity upon the said weights 24 or any centrifugal force thereon, and retain the said weights 24 in parallel alignment with the axis of revolution until the critical control speed is reached. At this point the combined forces of the compression spring 28 and the spring leaves 37 are overcome, permitting the weights 24 to fly away from the axis of revolution to the extent permitted by the cylindrical wall of the said inner housing 11.

When the said weights 24 are in a said fly away position the said spring leaves 37 adjacent said actuator cup 13 and the said spring and actuator bearing 29 are depressed thereby disengaging the actuator cup 13 from the push button 53 of the micro switch 52. The release of the said push button 53 permits the contact points 54 of said micro switch 52 to close thereby closing the control circuit between said motor and the centrifugal control switch structure.

When the required speed of the moving parts has been attained and the said control circuit has been actuated, the said starting circuit to the motor is simultaneously broken and may not again be closed during such period of operation. Thus a reduction of the speed of the moving parts of the apparatus, for any cause, will also reduce the speed of revolution of the governor weights 24,

and should the said critical point be reached the forces exerted by the said compression spring 28 and the said spring disc will overcome the centrifugal force exerted by the said governor weights 24 and cause the said weights to retract to said parallel alignment and restore the said spring leaves 37 to a pressure position on the said actuator cup 13 and through it to a pressure position on the said push button 53 of the micro switch 52. The said pressure on the said push button 53 opens the contact points 54 and breaks the control circuit to the motor of the apparatus and brings the moving parts of such apparatus to a stop.

For example, where it has been determined that the apparatus for which control is desired operates at its peak efficiency while the inner housing 11 is rotating approximately 500–525 r.p.m. then a compression coil spring 28 is provided that will deflect under the load created by the revolving weights 24 when the inner housing 11 reaches an ascending speed of 470–500 r.p.m. The said deflection allows the said weights 24 to fly away from the axis of revolution, thus removing the pressure on the push button 53 of the micro switch 52. When the said pressure is removed the switch contact points 54 close bringing the said control circuit into operation.

Although the foregoing description is necessarily of a detailed character, in order that the invention may be completely set forth, it is understood that the specific terminology is not intended to be restrictive or confining, and that various rearrangements of parts and modifications of detail may be resorted to without departing from the scope or spirit of the invention as herein claimed.

What is claimed is:

1. A centrifugal switch control device for an apparatus as described comprising a stationary cylindrical housing having one open end and an axially aligned journal bearing support tube extending through the closed end thereof, an inner cylindrical housing rotatably mounted therein in axial alignment therewith and spaced apart therefrom, and having one end open and an integral axially aligned journal on a closed end thereof mounted in said journal bearing, the said journal having apparatus connecting means adjacent the outer end thereof, governor control means mounted in said inner housing and secured thereto, said governor control means including a slotted support disc having inwardly directed radial spring leaves fixedly secured to the open end of said inner housing, governor weights mounted on said radial spring leaves, compression spring means abutting the closed end of said inner housing and engaging said support disc, an actuator cup mounted on said governor control means in axial alignment therewith and resting on said radial spring leaves, a switch mounting cap disposed in said open end of said stationary housing, an electrical micro switch fixedly mounted thereon, said micro switch having a switch push button slideably engaging said actuator cup and in axial alignment therewith and terminals for electrical control circuit connection therewith.

2. A centrifugal switch control device for an apparatus as described comprising a stationary cylindrical housing having one open end and an axially aligned journal bearing support tube extending through the closed end thereof, an inner cylindrical housing rotatably mounted therein in axial alignment therewith and spaced apart therefrom, and having one end open and an integral axially aligned journal on a closed end thereof mounted in said journal bearing, the said journal having apparatus connecting means adjacent the outer end thereof, governor control means mounted in said inner housing and secured thereto, said governor control means including a slotted support disc having inwardly directed radial spring leaves fixedly secured to the open end of said inner housing, governor weights mounted on said radial spring leaves, a compression coil spring mounted on an axial aligned guide pin in the closed end of said inner housing, the said compression coil spring abutting the closed end of

said inner housing and engaging an actuator and spring bearing adjacent said support disc, an actuator cup mounted on said actuator and spring bearing in axial alignment therewith, and resting on said radial spring leaves, a switch mounting cap disposed in the said open end of said stationary housing, an electrical micro switch fixedly mounted thereon, said micro switch having a switch push button slideably engaging said actuator cup and in axial alignment therewith and terminals for electrical control circuit connection therewith.

3. A centrifugal switch control device for an apparatus as described comprising a stationary cylindrical housing having one open end and an axially aligned journal bearing support tube extending through the closed end thereof, an inner cylindrical housing rotatably mounted therein in axial alignment therewith and spaced apart therefrom, and having one open end and an integral axially aligned journal on a closed end thereof mounted in said journal bearing, the said journal having apparatus connecting means adjacent the outer end thereof, governor control means mounted in said inner housing and secured thereto, said governor control means including a support disc having internal radial slots with the peripheral edge thereof fixedly secured to the open end of said inner housing, governor weights mounted on said support disc, and compression spring means abutting the closed end of said inner housing and engaging said support disc, an actuator cup mounted on said governor control means and in axial alignment therewith, a switch mounting cap disposed in said stationary housing, an electrical micro switch fixedly mounted thereon, said micro switch having a switch push button slideably engaging said actuator cup and in axial alignment therewith and terminals for electrical control circuit connection therewith.

4. A centrifugal switch control device for an apparatus as described comprising a stationary cylindrical housing having one open end and an axially aligned journal bearing support tube extending through the closed end thereof, an inner cylindrical housing rotatably mounted therein in axial alignment therewith and spaced apart therefrom, and having one open end and an integral axially aligned journal on a closed end thereof mounted in said journal bearing, the said journal having apparatus connecting means adjacent the outer end thereof, governor control means mounted in said inner housing and secured thereto, said governor control means including a support disc with internal slots forming radial spring leaves, the peripheral edge of said support disc fixedly secured to the open end of said inner housing, governor weights

having the bases thereof mounted on said radial spring leaves and compression spring means abutting the closed end of said inner housing and engaging said radial spring leaves, and actuator cup mounted on said governor control means and resting on said spring leaves and in axial alignment therewith, a switch mounting cap disposed in said stationary housing, an electrical micro switch fixedly mounted thereon, said micro switch having a switch push button slideably engaging said actuator cup and in axial alignment therewith and terminals for electrical control circuit connection therewith.

5. A centrifugal switch control device for an apparatus as described comprising a stationary cylindrical housing having one open end and an axially aligned journal bearing support tube extending through the closed end thereof, an inner cylindrical housing rotatably mounted therein in axial alignment therewith and spaced apart therefrom, and having one end open and an integral axially aligned journal on a closed end thereof mounted in said journal bearing, the said journal having apparatus connecting means adjacent the outer end thereof, governor control means mounted in said inner housing and secured thereto, said governor control means including a slotted support disc having inwardly directed radial spring leaves, the peripheral edge of said support disc fixedly secured to the open end of said inner housing, governor weights forming cylindrical sectors having the bases thereof mounted on said radial spring leaves, a compression coil spring mounted on an axial aligned guide pin in the closed end of said inner housing, the said compression coil spring abutting the closed end of said inner housing and engaging an actuator and spring bearing adjacent said radial spring leaves, a pin on the remote end of said actuator and spring bearing extending through said support disc in axial alignment therewith, an actuator cup mounted on said remote end pin and resting on the outer surface of said radial spring leaves, a switch mounting cap disposed in the said open end of said stationary housing, an electrical micro switch fixedly mounted thereon, said micro switch having a switch push button slideably engaging said actuator cup and in axial alignment therewith and terminals for electrical control circuit connection therewith.

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