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[54] **GOVERNOR ASSEMBLIES**

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[58] **Field of Search** 73/494, 535, 550; 416/44

[56] **References Cited**

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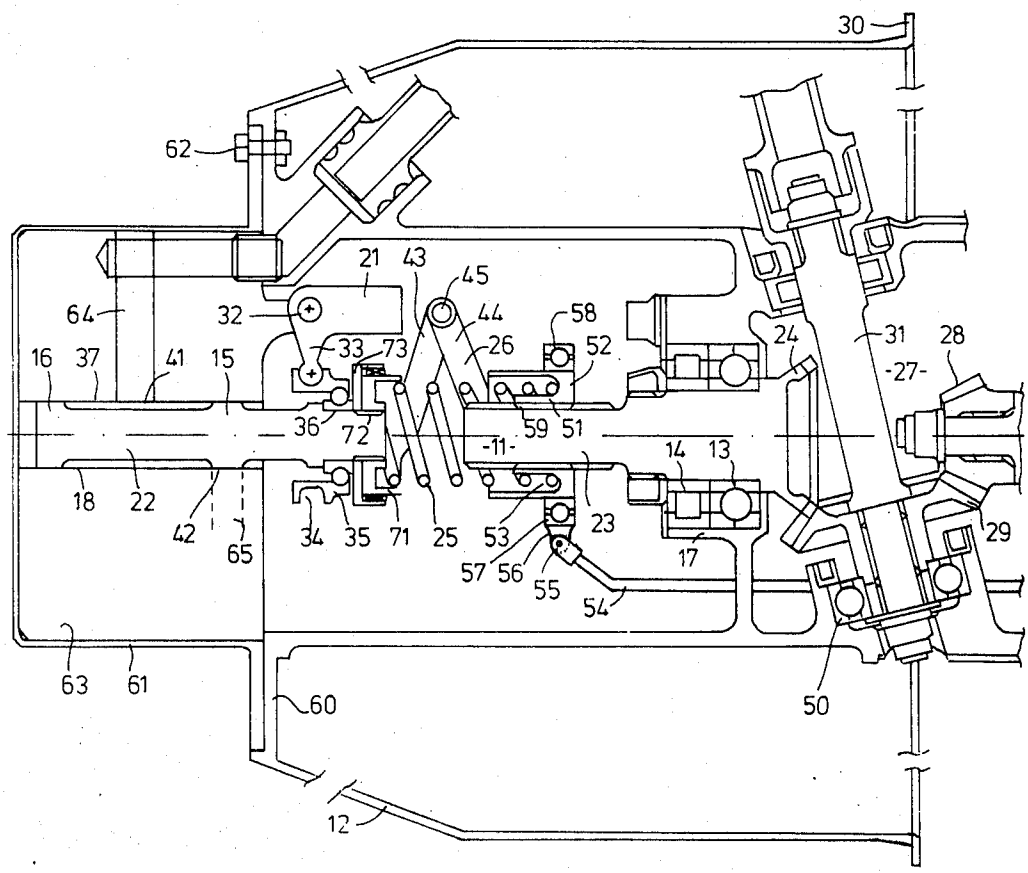
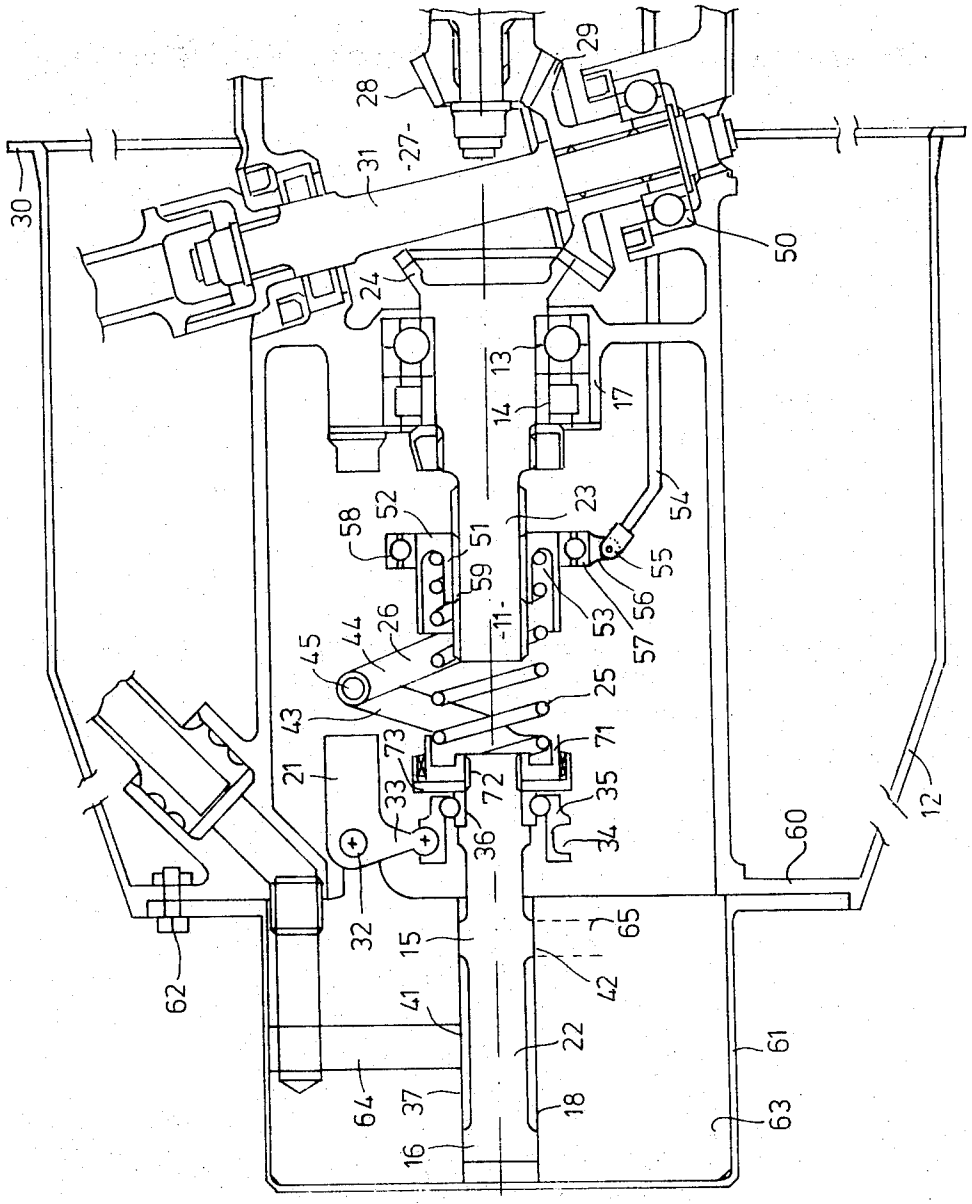
[57] **ABSTRACT**

A rotatable governor assembly which includes an epicyclic gear to impart to the governor spring a rotation opposite in direction and equal in speed to that of the bobweights so that the governor spring remains stationary relative to earth.

10 Claims, 1 Drawing Figure

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GOVERNOR ASSEMBLIES

The present invention relates to a rotatable governor assembly.

According to the present invention there is provided a rotatable governor assembly comprising a body having centrifugally moveable bobweights connected thereto, a governor spring connected for spring urging the bobweights, and means for imparting to the spring a rotation opposite in direction and substantially equal in speed to that of the bobweights when the assembly is rotated.

In a preferred form of the invention said means is a differential gear which is connected to the spring.

An envisaged application of a rotatable governor assembly according to the invention is as part of a control system for a variable pitch fan or propeller. The control system which is completely self-contained and in the form of a module contained within a casing can be connected to the fan or propeller rotor to rotate therewith as a single unit. Within the casing are provided an oil tank, an oil pump, a pitch-change mechanism and governor for controlling the fan.

One problem of the self-contained control system is that as it rotates with the fan or propeller there is no stationary structure on which to attach the governor body and it has been found that the spring of a centrifugal governor varies in rate if made to rotate and no longer provides accurate governing. The present invention overcomes this problem.

An embodiment of a rotatable governor assembly according to the invention will now be described, by way of example only, with reference to the accompanying drawing which shows an axial section of:

A rotatable governor assembly **11** rotatably mounted in, and coaxial with the axis of rotation of, a rotatable housing **12** from ball and roller bearings **13** and **14** respectively and lands **15** and **16**. The bearings **13** and **14** are located in a bearing housing **17** which is integral with the housing **12**. The lands **15** and **16** are part of a spool **22** and bear against the walls of a cylindrical bore **18** in the housing **12**.

The housing **12** comprises cylindrical portions **60** and **61** bolted together by means of nut and bolt assemblies **62**, and a cylindrical shaped block **63** in nesting relationship with the portion **61**. The block **63** includes passages **64** and **65** therein for the supply of oil therethrough to and from the cylindrical bore **18** via ports **41** and **42** respectively.

The governor assembly **11** comprises bobweights **21** pivotally mounted from the housing, a spool **22** which is in axial alignment with and held from a stub shaft **23** of a bevel gear **24** by a straight coiled spring **25**. The spool **22** and stub shaft **23** are rotatably connected by a linkage system **26** to allow relative axial movement therebetween.

The bevel gear **24** forms part of an epicyclic bevel gear train **27** which also comprises a first bevel gear **28** and a second bevel gear **29**. The gear **28** is mounted from and rotated by a first external drive (not shown) and meshes with the second gear **29** which is rotatably mounted from the housing **12** on bearing **50** and connected to an accessory drive shaft **31**. The gear **29** meshes with the bevel gear **24**.

The housing **12** is provided with a radially extending flange **30** and is rotatably connected at the flange to a second external drive (not shown). The respective rotations imparted by the first and second external drives are in the same direction and in constant speed ratio. The gear teeth ratios of the gears **24, 29** and **28** are so designed that when the gear **28** is rotated by the first external drive and the housing **12** is rotated by the second external drive the rotation imparted to the gear **24**, and hence the spring **25** and the spool **22**, is opposite in direction and substantially equal in speed to that of the housing **12**, hence the rotation of the governor assembly is substantially zero relative to earth.

Each bobweight **21** pivots about a pin **32** and is provided with a bell-crank arm **33** the outer end of which engages in a circumferential groove **34** in a collar **35** which is rotatably mounted around the spool **22** from a bearing **36**.

Between the lands **15** and **16** and the spool and the walls of the cylindrical bore **18** is formed an annular channel **37** open to the oil supply port **41**. The land **15** seals the port **42** in the wall of the cylindrical bore **18**.

In operation as the housing **12** is rotated and each bobweight **21** pivots under centrifugal force the bell-crank arm moves the collar and the spool in an axial direction to compress the spring **25** and at a given speed to give flow connection between the channel **37** and the port **42** through which oil flows to the pitch change mechanism (not shown). Since the rotation of the governor assembly remains substantially zero relative to earth the spring is not subjected to centrifugal force. When the speed of rotation of the housing falls below the given speed the spool **22** returns under the spring load to the position where the land **15** seals the port **42**. The rotation of the spool **22** relative to the housing **12** facilitates an easier axial sliding movement of the spool in the cylindrical bore **18**.

The spring **25** is mounted from each end in cup-shaped collars **52** and **71** respectively.

The collar **71** is mounted on the spool valve **22** and is in splined engagement therewith by means of splines **72** and is locked in one position on the spool valve by means of a lock washer **73**.

The collar **52** is mounted on the stub shaft **23** and is in splined engagement therewith by means of splines **59**. A thrust bearing **58** is mounted on the collar **52** and includes a lug **56** projecting from its outer race **57**. The lug **56** is pivotally connected by means of a pin **55** to a control rod **54**. The control rod **54** is actuated from an external source (not shown) to slide the collar **52** in an axial direction relative to the stub shaft **23** to a position where a desired spring load is obtained and then to hold the collar **52** in said desired position. The spring load of the spring **25** will determine the speed of rotation at which the bobweights cause the spool valve **22** to move towards the stub shaft against the spring load and to give open connection between the annular channel **37** and the port **42**.

The linkage system **26** comprises a pair of plates **43,44** pivotally connected one to the other by a pin **45** and respectively pivotally connected to the collars **71** and **52**.

I claim:

1. A governor assembly and a first drive means for rotating the governor assembly about the longitudinal axis of the assembly, said governor assembly comprising a casing having mounted therein centrifugally movable bobweights pivotally connected from the casing, and a governor spring which is disposed in the casing for spring urging the bobweights, wherein the improve-

ment comprises a second drive means for imparting to the governor spring a rotation which is opposite in direction and substantially equal in speed relative to that imparted to the governor spring by the first means so that the resultant rotation of the governor spring is substantially zero relative to earth.

2. A governor assembly as claimed in claim 1 in which said second drive means for imparting a rotation to the governor spring comprises a differential gear which is drivingly connected to the governor spring.

3. A governor assembly as claimed in claim 2 in which the governor assembly comprises also a spool valve and a stub shaft of the differential gear rotatably connected together by a linkage system, said stub shaft being rigidly connected to a gear wheel of the differential gear.

4. A governor assembly as claimed in claim 3 in which said governor spring is disposed between and connected to the spool valve and the stub shaft.

5. A governor assembly as claimed in claim 4 in which the spool valve, the governor spring and the stub shaft are in a coaxial relationship.

6. A governor assembly as claimed in claim 5 in which the spool valve, the governor spring and the stub shaft are rotatable by said second drive means.

7. A governor assembly as claimed in claim 6 in which each bobweight comprises a bell-crank arm connected to the spool valve to produce, during rotation of the governor assembly about its longitudinal axis, a movement of the spool valve against the action of the governor spring.

8. A governor assembly as claimed in claim 7 in which the bell-crank arm of each bobweight is connected to the spool valve by engaging with a first collar which is rotatably mounted around the spool valve from a bearing which is in turn mounted on the spool valve.

9. A governor assembly as claimed in claim 8 in which adjustable means are provided to set the governor spring to a predetermined length such that, in operation of the governor assembly, said predetermined length of the governor spring will determine the speed of rotation of the governor assembly at which the bobweights will begin to move the spool valve against the action of the governor spring.

10. A rotatable governor assembly as claimed in claim 9 in which the adjustable means comprises a second collar mounted on the stub shaft and in sliding engagement therewith, said second collar abutting an end coil of the governor spring and capable of being moved along the stub shaft to a desired position and held thereat by means of an externally controlled rod which is pivotally connected to the outer race of a bearing which is mounted on the second collar.

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