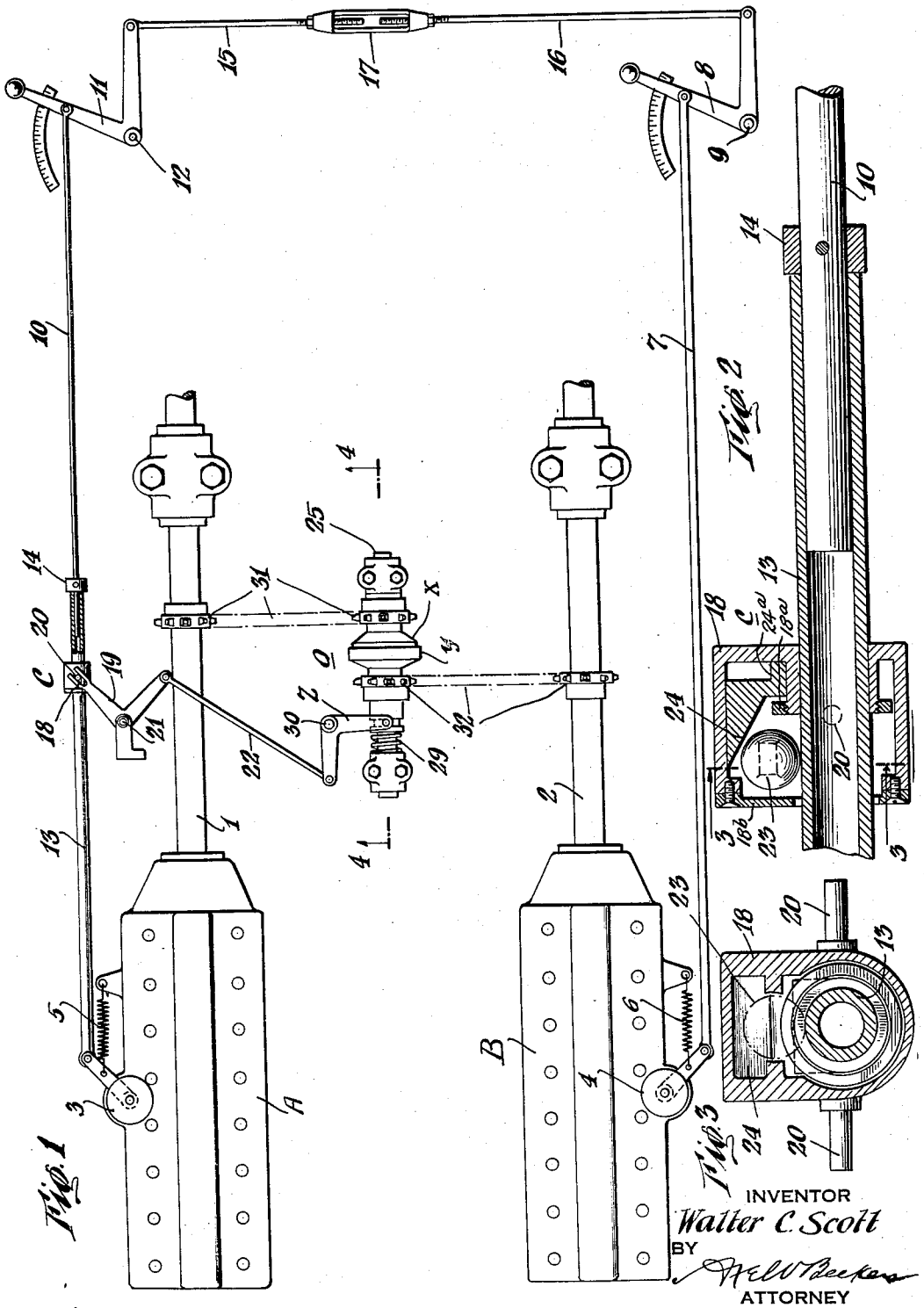
May 27, 1941. W. C. SCOTT 2,243,655

SPEED CONTROL MECHANISM

Filed Aug. 14, 1936 2 Sheets-Sheet 1



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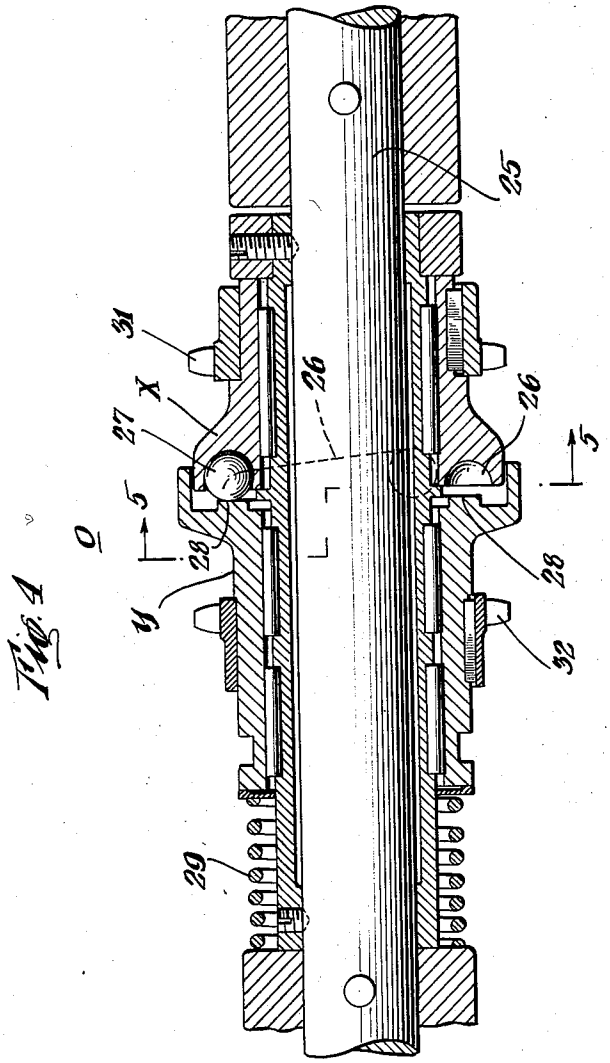

Fig. 4

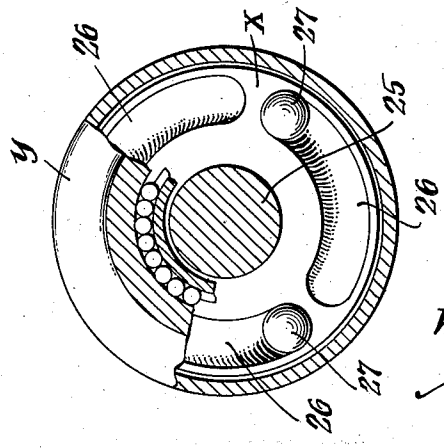

Fig. 5

INVENTOR
Walter C. Scott
BY
ATTORNEY

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SPEED CONTROL MECHANISM

Walter C. Scott, Plainfield, N. J.

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12 Claims. (Cl. 60—97)

This invention relates to speed control mechanism, and has for its main object and feature means to coordinate the speed of two motors.

In the accompanying drawings the invention is shown in one form in which:

Fig. 1 is a more or less diagrammatic view, partly in section, showing two associated motors, in the present form gas engines, and interrelated control mechanism for same;

Fig. 2 is an enlarged detail view in section of a coupling or clutch used in connection with the invention;

Fig. 3 is a transverse sectional view substantially on the plane of line 3—3 of Fig. 2;

Fig. 4 is a longitudinal sectional view through the control mechanism substantially on the plane of line 4—4 of Fig. 1; and

Fig. 5 is a transverse sectional view substantially on the plane of line 5—5 of Fig. 4.

A and B indicate two motors associated in some way and intended to run either at substantially the same speed or at some other predetermined relative speed such as two to one. In the present instance, motors A and B drive propeller shafts 1 and 2 of a ship or an aeroplane and may therefore run at equal speed or at such slightly different speed as will tend to avoid undue vibration. 3 and 4 indicate the carbureter throttles of the two motors, which throttles are movable in opposite directions to open and close them, and which are urged into closed position by springs 5 and 6. Suitable operating means for the throttles are provided, consisting, in the case of throttle 4, of member 7 and handle 8 pivoted at 9, and, in the case of throttle 3 of two slidably related members, one of which 10 is a rod connected to handle 11 pivoted at 12, and the other of which is a sleeve 13 connected to throttle 3 and adapted to abut, under the influence of spring 5, against abutment member 14 on rod 10. Handles 8 and 11 can be operated independently but it is preferred to connect them by means of rods 15 and 16 and adjustable turnbuckle 17, so that by operating either handle the two throttles can be operated in unison.

O indicates a speed control mechanism, to be presently described, responsive to the speed of both motors A and B and in turn controlling the position of at least one of the throttles. In the present instance this control is accomplished by means of a coupling or clutch C so constructed and arranged that a movement of control element Z of control mechanism O is transmitted to sleeve 13, but that, on the contrary, a movement of sleeve 13 is not transmitted to control element Z. The coupling consists here of a housing 18 loosely mounted on sleeve 13 and movable by bifurcated member 19 that engages pins 20 on the housing. Member 19 is here in the form of a bell-crank pivotally supported at 21 and is suitably connected to control element Z as by means of link 22. Within housing 18 is a ball 23 and a cam 24 movable with as well as independently of said housing. From the foregoing it will be understood that when the upper arm of bell-crank 19 swings to the left (in Fig. 1) its motion will be transmitted to housing 18 which will cause cam 24 to clutch ball 23 against sleeve 13 thereby imparting a movement to the latter independently of rod 10 so that the position of throttle 3 is slightly changed in that it is opened to a greater extent. When the upper arm of bell-crank 19 is moved to the right (in Fig. 1) cam 24 will no longer clutch ball 23 against sleeve 13 and spring 5 will be free to return sleeve 13 against abutment 14. It will further be observed that manipulation of say handle 11 in either direction will cause sleeve 13 to slide freely through housing 18 and the motion will not be transmitted to coupling C, control element Z or control mechanism O. Considering the action of clutch C more in detail, it will be observed that, as stated above, cam 24 is movable with as well as independently of housing 18. Prior to the time that lever 19 moves to the left (in Fig. 1), bearing member 24a of said cam will be in contact with collar 18a of housing 18 and, as the latter moves to the left (in Fig. 2), cam 24 will at first move with housing 18 and will engage ball 23 holding the latter stationary and front wall 18b will move away from the ball. At this time there is no movement of member 13. The movement of housing 18 now continues toward the left while cam 24 stands still until the rear wall of said housing 18 abuts bearing member 24a of cam 24. This causes cam 24 to clutch ball 23 so hard that it carries member 13 with it. When lever 19 is moved to the right (in Fig. 1), it carries housing 18 with it while cam 24 momentarily remains stationary until collar 18a moves it. Meanwhile movement of member 13 to the right (in Fig. 2) under the action of spring 5 keeps ball 23 against cam 24. The movement of member 13 continues until the end of said member strikes collar 14. The movement of housing 18 continues to the right (in Fig. 2) for a short additional distance but, as member 13 no longer moves, ball 23 will not follow cam 24 and will be completely released.

The construction of control mechanism O may

take many forms. In the present instance it takes the form shown in my application Ser. No. 60,423, filed January 23, 1936, now Patent No. 2,119,247 of May 31, 1938, and consists of two control members X and Y mounted to rotate independently of each other at all times on shaft 25. Member X is provided with a series of arcuate and tapering grooves 26 for the reception of balls 27, and member Y is provided with a continuous surface 28 engaging balls 27. Members X and Y rotate in the same direction which in this case is with the shallow end of grooves 26 leading and the deep end of the grooves trailing. At least one of said members, here Y, is slidably as well as rotatably mounted on shaft 25. A spring 29 urges member Y toward member X. It will now be understood that so long as member Y does not exceed the speed of member X, balls 27 will remain in the deep part of grooves 26 but that so soon as the speed of Y exceeds that of X, balls 27 will travel into the shallow end of grooves 26 whereby member Y will be moved sidewise against the tension of spring 29 thereby imparting a movement to control element Z pivotally supported at 30, which element in turn transmits its motion to coupling C in the manner previously described. When member Y slows down to the speed of X or falls below it (or when, what amounts to the same thing, the speed of X is accelerated above that of Y), balls 27 return to the deep end of grooves 26 and spring 29 moves member Y toward X, control element Z is returned to its original position and coupling C declutches. Member X is here rotated from shaft 1 by suitable transmission means consisting in this instance of sprockets and chain 31. Member Y is similarly driven from shaft 2 by means of sprockets and chain 32.

The gearing or transmission is so proportioned that when motors A and B run at the desired relative speed, control members X and Y will run at equal speed. The parts can be so adjusted that, when either handle 8 or 11 is actuated, throttle 3 will be opened to a slightly less extent than that desired. This will cause control member Y to run slightly faster than X and therefore member Y will move sidewise thereby actuating control element Z and will cause coupling C to move sleeve 13 to open throttle 3 to a slightly greater extent. If member X is accelerated to equal the speed of member Y, coupling C will be declutched whereby spring 5 will return sleeve 13 against abutment member 14 and member X will be decelerated. This acceleration and deceleration will repeat itself whenever conditions warrant it, and consequently the two motors will operate substantially at the desired relative speed.

I claim:

1. The combination with a carbureter throttle movable in opposite directions, of a spring to urge said throttle toward its closed position, means controlled by the operator to move said throttle into its open position, and a speed control mechanism and connections to move said throttle toward its open position.

2. The combination with a carburetor throttle movable in opposite directions, of means controlled by the operator to move said throttle in either direction, a speed control mechanism, and connections including a coupling to transmit a movement of the speed control mechanism in one direction only to the means controlled by the operator but incapable of transmitting a movement of the means controlled by the operator to the speed control mechanism.

3. The combination with a carburetor throttle movable in opposite directions, of a spring to urge said throttle toward its closed position, means controlled by the operator to move said throttle into its open position, a speed control mechanism, and connections including a coupling to transmit a movement of the speed control mechanism in one direction only to the means controlled by the operator but incapable of transmitting a movement of the means controlled by the operator to the speed control mechanism.

4. A control means for a motor including: two slidably related members movable in unison and one of which is capable of independent movement, and means to move said independently movable member including a coupling that is incapable of transmitting a movement of the member it moves.

5. A control means for a motor including: two slidably related members, an abutment element carried by one of said members against which the other member abuts, a spring to urge the members into abutting relation, and means to move one of said members independently of the other including a coupling that is incapable of transmitting a movement of the member it moves.

6. A control means for a motor including: an operating member movable in opposite directions to control the motor, a control mechanism and connections to move the operating member in one direction but not in the other, said control mechanism being unresponsive to movements of the operating member in either direction.

7. A control means for a motor including: an operating member movable in opposite directions to control the motor, a control member, coupling means between said members responsive to transmit a movement of the control member to the operating member in one direction but not in the other and incapable of transmitting a movement of said operating member to the control member.

8. In a system of speed control, the combination with the carbureter throttles of two motors, of a speed control mechanism controlled by the relative speed of the motors, means controlled by said speed control mechanism to vary the position of at least one of said throttles, and means to vary in unison the position of said throttles independently of the speed control mechanism.

9. The combination with a carbureter throttle movable in opposite directions, of speed controlled means to move said throttle in one direction but not in the other, and means controlled by the operator to move said throttle in either direction without transmitting the movement to the speed controlled means.

10. In a system of speed control, the combination with the carbureter throttles of two motors, of a speed control mechanism controlled by the relative speed of the motors, means controlled by the operator to move said throttles in either direction, and connections including a coupling to transmit a movement of the speed control mechanism to the means controlled by the operator to vary the position of at least one of said throttles but incapable of transmitting a movement of the means controlled by the operator to the speed control mechanism.

11. In a system of speed control, the combination with the carbureter throttles of two motors, of means controlled by the operator to move said throttles in opposite directions, speed control

mechanism controlled by the relative speed of the two motors, and connections from said speed control mechanism to the means controlled by the operator to move the throttle of at least one motor but in one direction only.

12. In a system of speed control, the combination with the carbureter throttles of two motors, an operating member movable in opposite directions to control the throttle of one of said motors, a speed control mechanism controlled by the relative speed of the two motors, and connections from said speed control mechanism to move the operating member in one direction but not in the other, said control mechanism being unresponsive to movements of the operating member in either direction.

WALTER C. SCOTT.