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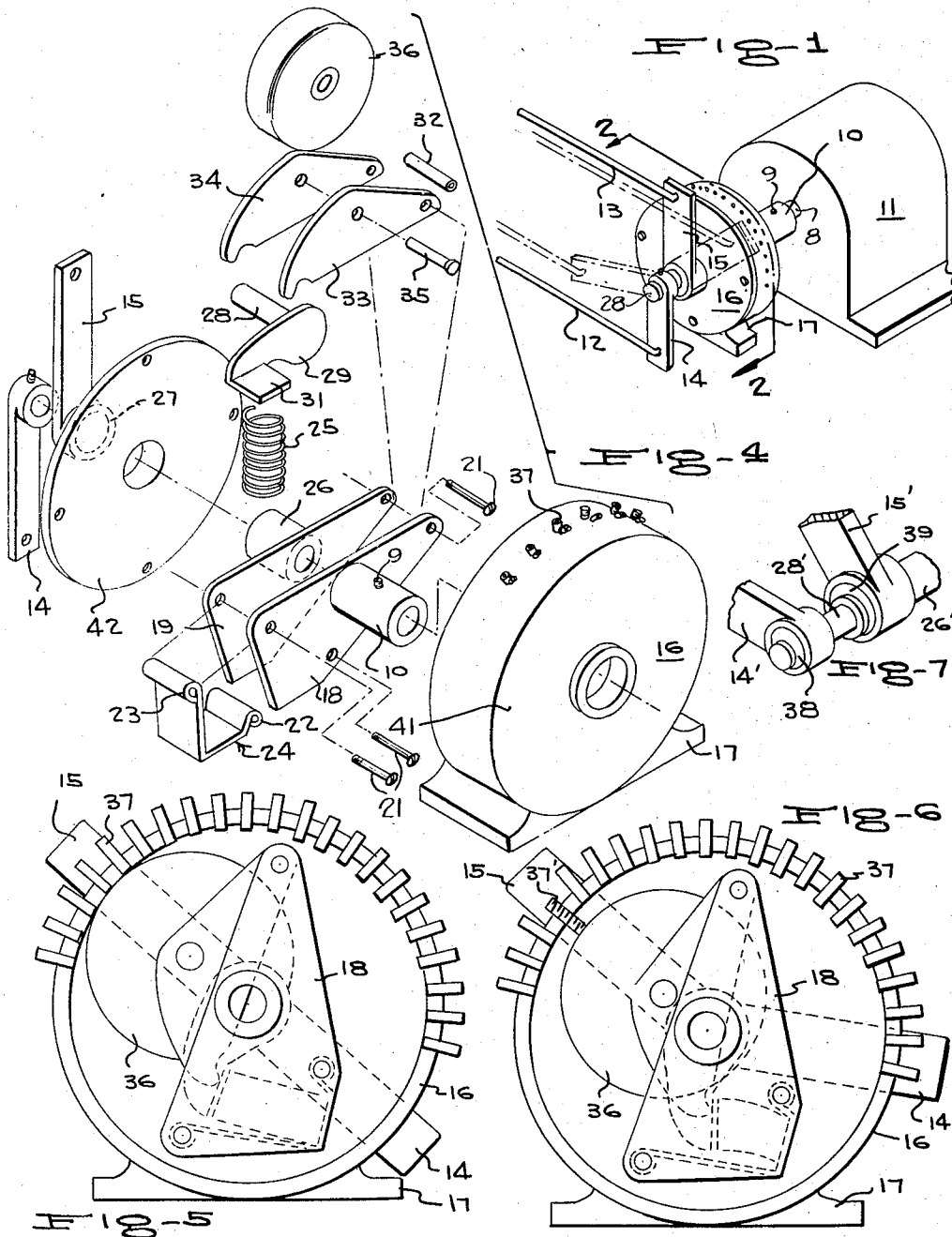
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2,899,831

MACHINE MECHANISM

Filed April 12, 1957

2 Sheets-Sheet 1



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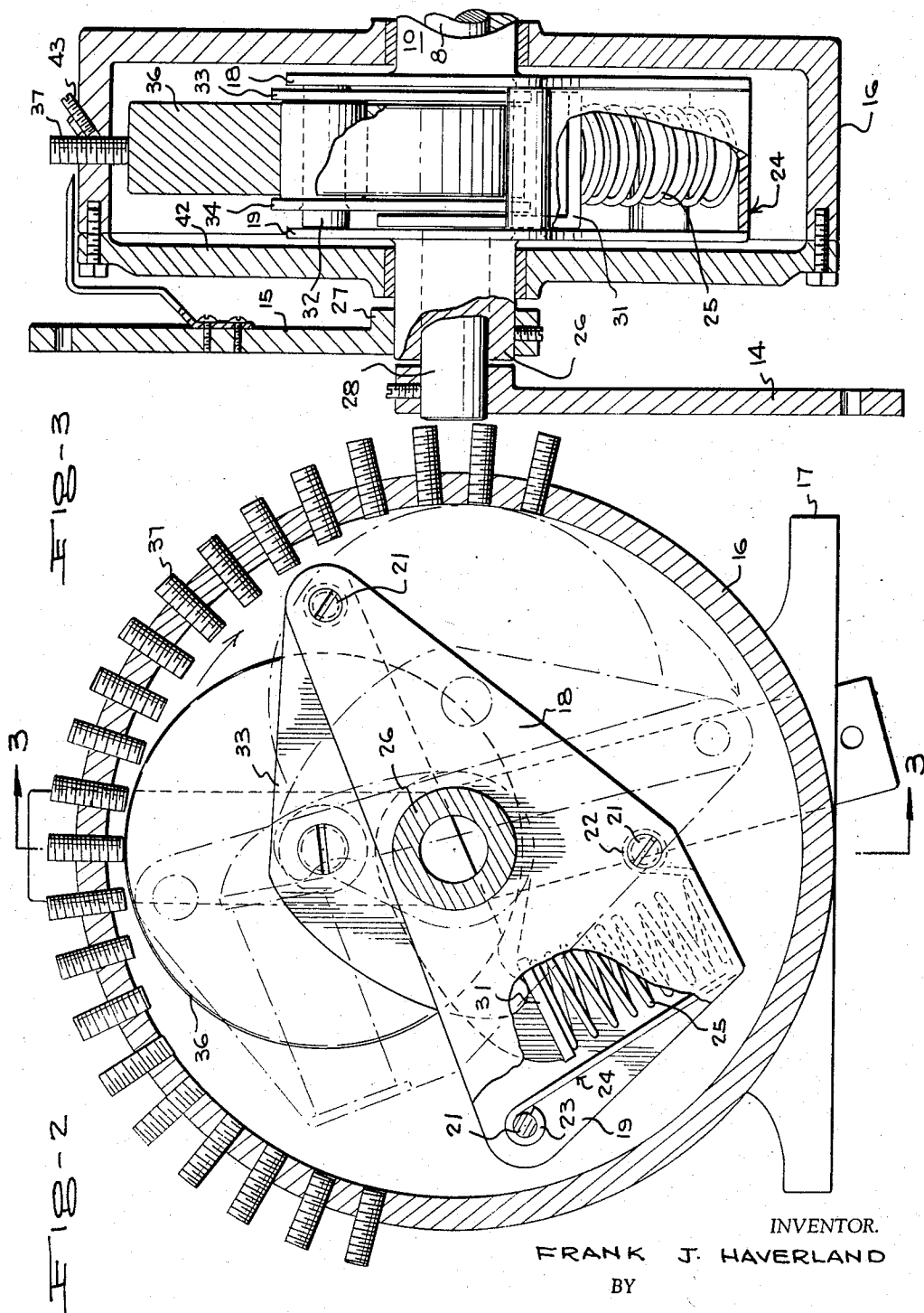
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MACHINE MECHANISM

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2 Claims. (Cl. 74—63)

The present invention relates to a machine mechanism for converting rotary motion of one element to rotary or linear motion of another element at a rate varying from the motion of the one element.

An object of the present invention is to provide a machine mechanism which lends itself to the application of a variable motion drive force in a control system such as the control system of a burner.

Another object of the present invention is to provide a machine mechanism which lends itself to installation in any mechanical system in which it is desired to have one element rotating at a predetermined speed and a second element moving at speeds faster and slower than that of said one element with the total average speed for both elements being the same for any cycle.

A further object of the present invention is to provide a machine mechanism having positive action, one sturdy in construction and of relatively few parts, one economically feasible to manufacture and assemble, and one which is highly effective in action.

These and other objects and advantages of the present invention will be fully apparent from the following description when taken in connection with the annexed drawings, in which:

Figure 1 is an isometric view of the machine mechanism of the present invention attached to a control drive mechanism as an example of the use of the machine mechanism according to the present invention;

Figure 2 is a sectional view, on an enlarged scale, taken on line 2—2 of Figure 1;

Figure 3 is a sectional view taken on the line 3—3 of Figure 2;

Figure 4 is an isometric exploded view of the components of the present invention;

Figure 5 is a schematic view showing the machine mechanism in one position;

Figure 6 is a view similar to Figure 5, showing the machine mechanism in a second position; and

Figure 7 is an isometric fragmentary view of a modified form of the attachment of the arms to the driven shaft.

Referring in greater detail to the drawings in which like numerals indicate like parts throughout the several views, the machine mechanism according to the present invention is attachable to the motor shaft of a furnace control motor and the control rods of a burner control system. Specifically, the machine mechanism includes a rotatable drive shaft 10 which is connected to a motor shaft 8 of a slow moving reversible type control motor 11 by means of a set screw 9, and further includes a pair of arms 14 and 15 which are drivingly connected to the drive shaft 10 and which are adapted to be connected to the control rods 12 and 13 respectively, of a burner control system. As shown in Figure 1, the control rods 12 and 13 are disposed substantially parallel to each other and are reciprocal between on and off positions. The control rods 12 and 13 are simultaneously shiftable in opposite directions with respect to each other upon rotation of the drive shaft 10 through 180 degrees.

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This is a single example of one of the uses of the machine mechanism of the present invention although other uses are contemplated.

When so used, the control rods 12 and 13 are connected by their one ends to the outer ends of the arms 14 and 15, respectively, and have their other ends connected to components of the burner system such as an air inlet control and a fuel feed control. In such a system, it is desired to control the volume of air admitted into the system in such a way as to vary the volume with respect to the volume of coal or other fuel admitted to the system. The control rods 12 and 13 reciprocate simultaneously in opposite directions as the arms 14 and 15 move through 180 degrees of rotary motion, first in one direction and then in the other direction in response to suitable system controls not shown.

The arm 15 is connected to the drive shaft 10 for positive rotation therewith at the same rate of speed as the rate of rotation of the drive shaft 10. The arm 14, constituting a driven element, is connected to the drive shaft 10 so that for each complete or partial revolution of the drive shaft 10, it will travel for a fractional part of the revolution of the drive shaft 10, first at a slower rate and then at a faster rate than the rate of the drive shaft 10 and for the remainder part of the complete or partial revolution of the drive shaft 10, the arm 14 will travel at the same rate as the rate of the drive shaft 10.

The drive shaft 10 projects into one closed end of a hollow fixed casing 16 having a base 17 or other means by which it is fixed to a supporting surface. The portion of the drive shaft 10 adjacent one end extends through the end of the casing 16 and is fixedly mounted upon a first plate member 18 intermediate the ends of the latter. A second plate member 19 is arranged in parallel spaced relation with respect to the first plate member 18 and is fixedly secured thereto by means of bolts 21, three in number, as shown in Figure 2.

Two of the bolts 21 extend through eye-formations 22 and 23 on the ends of the legs of an L-shaped saddle member 24, one leg of which forms a seat for a coil spring 25. The plate members 18 and 19 form an open frame and a hollow shaft 26 has one end fixedly secured to the outer face of the member 19 and is disposed concentrically with respect to the drive shaft 10. The portion adjacent the free end of the shaft 26 extends exteriorly of the casing 16 through the end of the latter remote from the housing 11 and carries thereon a collar to which is affixed the arm 15, the collar being shown in dotted lines in Figure 4 and designated by the reference numeral 27.

The arm 14 is carried by the free end portion of a driven shaft 28 which has a portion adjacent the end remote from the free end extending through the same end of the casing 16 as the shaft 26, the driven shaft 28 extending through the collar 27 and the hollow shaft 26.

The end of the driven shaft 28 remote from its free end is fixedly secured to one face of a perpendicularly projecting arm 29 which carries on its free end a shelf 31.

The coil spring 25 has one end bearing against the one leg of the saddle member 24 and its other end bearing against the underside of the shelf 31.

The eye-formations 22 and 23 on the ends of the legs of the saddle member 24 form spacing elements for the plates 18 and 19 and a sleeve 32 forms another spacing element for the ends of the plates 18 and 19 remote from the saddle member 24. The sleeve 32 also serves as a spacing element for a pair of levers 33 and 34 at one end of the latter, the associated bolt 21 extending through holes provided in the plates 18 and 19, through holes provided in the adjacent end portions of the levers 33 and 34 and through the sleeve 32 to connect the levers 33 and

34 to the plates 18 and 19 for rocking movement about the sleeve 32 and associated bolt 21 as an axis. A stub shaft 35 extends through the levers 33 and 34 and through a hole provided in a cam roller 36 for the support of the cam roller 36 between the levers 33 and 34. The free ends of levers 33 and 34 remote from the sleeve 32 bear against the upper face of the shelf 31 and the spring 25 biases the cam roller 36 in a direction away from the axis of the driven shaft 10 and hollow shaft 26.

The inner wall of the casing 16 is cylindrical in shape and for a portion of its periphery, the casing is provided with a plurality of spaced stud bolts 37 extending through the casing wall and having their inner ends in the path of rolling movement of the cam roller 36. The stud bolts 37 are individually shiftable into and out of the casing 16 so as to form when extended into the casing 16 a cam track over which the cam roller moves with a camming movement.

Referring to Figures 5 and 6, in Figure 5 the cam roller 36 is shown in the position engaging only stud bolts 37 which are not extended into the casing any appreciable distance so that in effect the cam roller 36 is in camming movement upon the inner wall of the casing 16. In Figure 6, a single stud bolt 37' has been moved inwardly of the casing 16 so as to form a cam over which the cam roller 36 is moved to effect the movement of the cam roller 36 towards the axis of the drive shaft 10. This movement effects the shifting of the arm 29 on the driven shaft 28 and results in the partial rotation of the driven shaft 28 with respect to the hollow shaft 26 and therefore with respect to the drive shaft 10. It will be seen that for a partial or complete revolution of the drive shaft 10, the driven shaft 28 will at first move slower than the drive shaft 10 and then will move faster than the drive shaft 10 and for the remaining part of the partial or complete revolution of the drive shaft 10, the driven shaft 28 will travel at the same rate of speed as the drive shaft 10, this movement occurring during the period of rolling movement of the cam roller 36 upon the portion of the inner wall of the casing 16 which has no stud bolts 37 projecting therethrough. The machine mechanism illustrated in Figure 1 permits the movement of the arms 14 and 15 through substantially 180 degrees of rotation so that the control rods 12 and 13, constituting means connecting the arms 14 and 15, respectively, to members to be driven move in alternately reciprocatory movements with the control rod 12 first moving at a rate slower than the rod 13 and then at a rate faster than the rod 13 and for the remaining part or fractional part of the revolution of the arms 14 and 15 at the same rate of speed as the rod 13.

In Figure 7, a modified form of the attachment of the arms 14' and 15' to the driven shaft 28' and the hollow shaft 26' is shown in which eccentrics 38 and 39 are used to connect the arms 14' and 15', respectively, to the shafts 28' and 26'. This permits the complete rotation of the shafts 26' and 28' in one or more complete revolutions and effects the same alternately reciprocatory movement of the arms 14' and 15' as means for driving members to be driven.

Preferably, the casing 16 is provided with a closed end 41 and open end covered by a closure member 42 for purposes of assembly. Each of the stud bolts 37 has an associated locking set screw 43 for securing it in its adjusted position within the casing 16 in which the series of stud bolts 37 form, one extended, a cam track for the roller 36.

As shown in Figure 2, the cam roller 36, moving from its full line position to the dotted line position in the direction of the arrow rolls along the inner ends of the bolts 37 as a cam track to effect the shifting movement of the cam roller 36 and compress the spring 25 to slow the rotational movement of the driven shaft 28 relative to the

drive shaft 10 and then to speed up the rotation of the driven shaft 28 and to finally, with the cam roller 36 in the dotted line position, effect the rotation of the driven shaft 28 at the same rate of speed as the drive shaft 10. It is intended that the arms 14 and 14' and 15 and 15' may be omitted and suitable gears, eccentrics, levers, and the like may be substituted for the arms to effect the variable motion of one element with respect to the other element, as above described.

What is claimed is:

1. A machine mechanism comprising a hollow fixed casing having closed ends, a rotatable drive shaft having a portion adjacent one end thereof extending through one end of said casing, a rotatable driven shaft having a portion adjacent one end thereof extending through the other end of said casing, means connecting said portion of said drive shaft to said portion of said driven shaft so that for each partial or complete revolution of said drive shaft said driven shaft will travel a fractional part of said partial or complete revolution first at a slower rate and then at a faster rate than said drive shaft and for the remainder part of said partial or complete revolution will travel at the same rate as said drive shaft, said means comprising a cam track positioned within said casing eccentrically with respect to said driven shaft, an arm arranged perpendicularly with respect to said one end of said driven shaft, an eccentric connecting said arm to said one end of said driven shaft, a cam member in engagement with said cam track and connected to said drive shaft end portion for orbital camming movement along said cam track responsive to rotary movement of said drive shaft, and means connecting said cam member to said arm and operable to shift said arm relative to said drive shaft responsive to camming movement of said cam member.

2. A machine mechanism comprising a hollow fixed casing having closed ends, a rotatable drive shaft having a portion adjacent one end thereof extending through one end of said casing, a rotatable driven shaft having a portion adjacent one end thereof extending through the other end of said casing, and means connecting said portion of said drive shaft to said portion of said driven shaft so that for each partial or complete revolution of said drive shaft said driven shaft will travel a fractional part of said partial or complete revolution first at a slower rate and then at a faster rate than said drive shaft and for the remainder part of said partial or complete revolution will travel at the same rate as said drive shaft, said means comprising a cam track positioned within said casing eccentrically with respect to said driven shaft, an arm arranged perpendicularly with respect to said one end of said driven shaft, an eccentric connecting said arm to said one end of said driven shaft, a cam member in engagement with said cam track and connected to said drive shaft end portion for orbital camming movement along said cam track responsive to rotary movement of said drive shaft, means connecting said cam member to said arm and operable to shift said arm relative to said drive shaft responsive to camming movement of said cam member, and spring means operatively connected to said cam member for urging the latter into engagement with said cam track.

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