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VARIABLE SPEED PULLEY DRIVE MECHANISM

Filed Aug. 4, 1953

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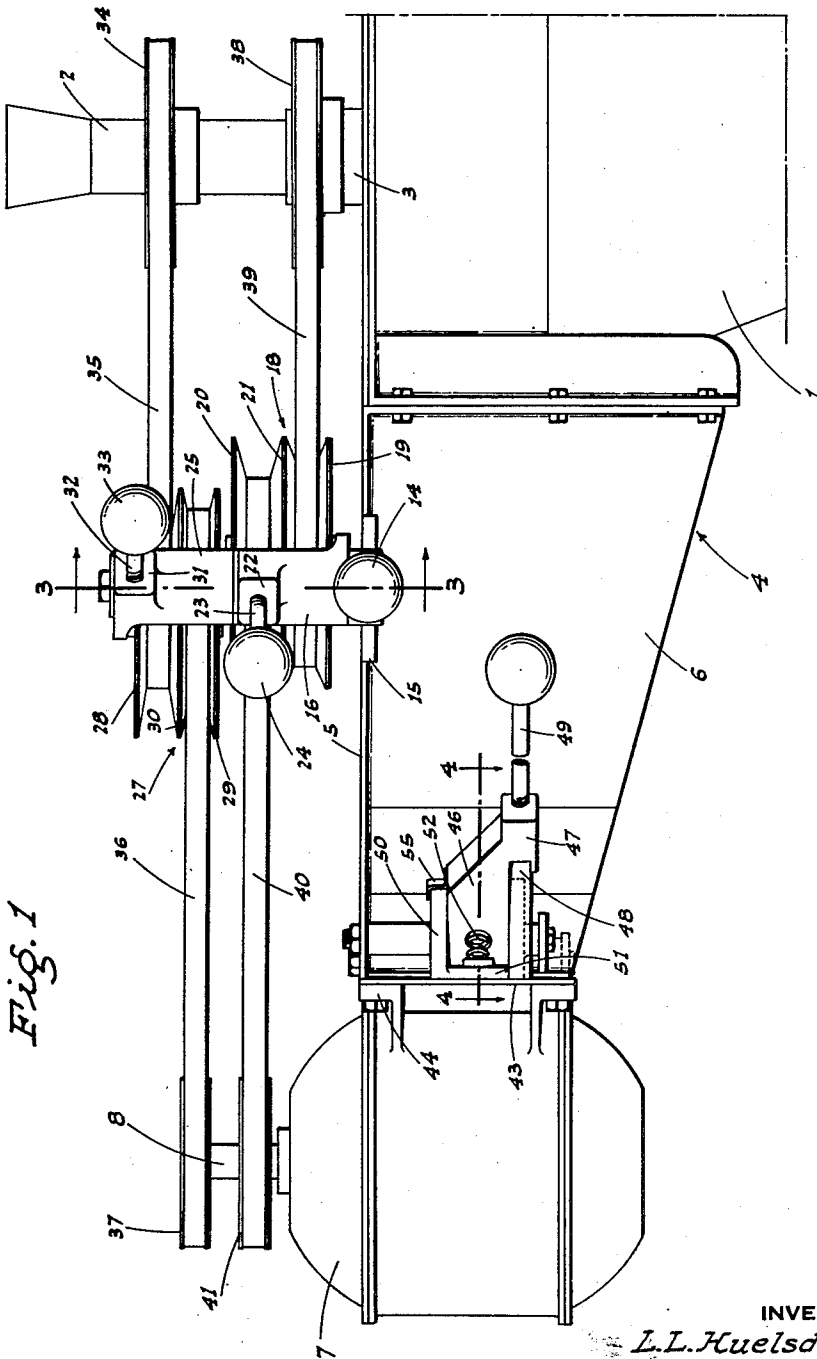


Fig. 1

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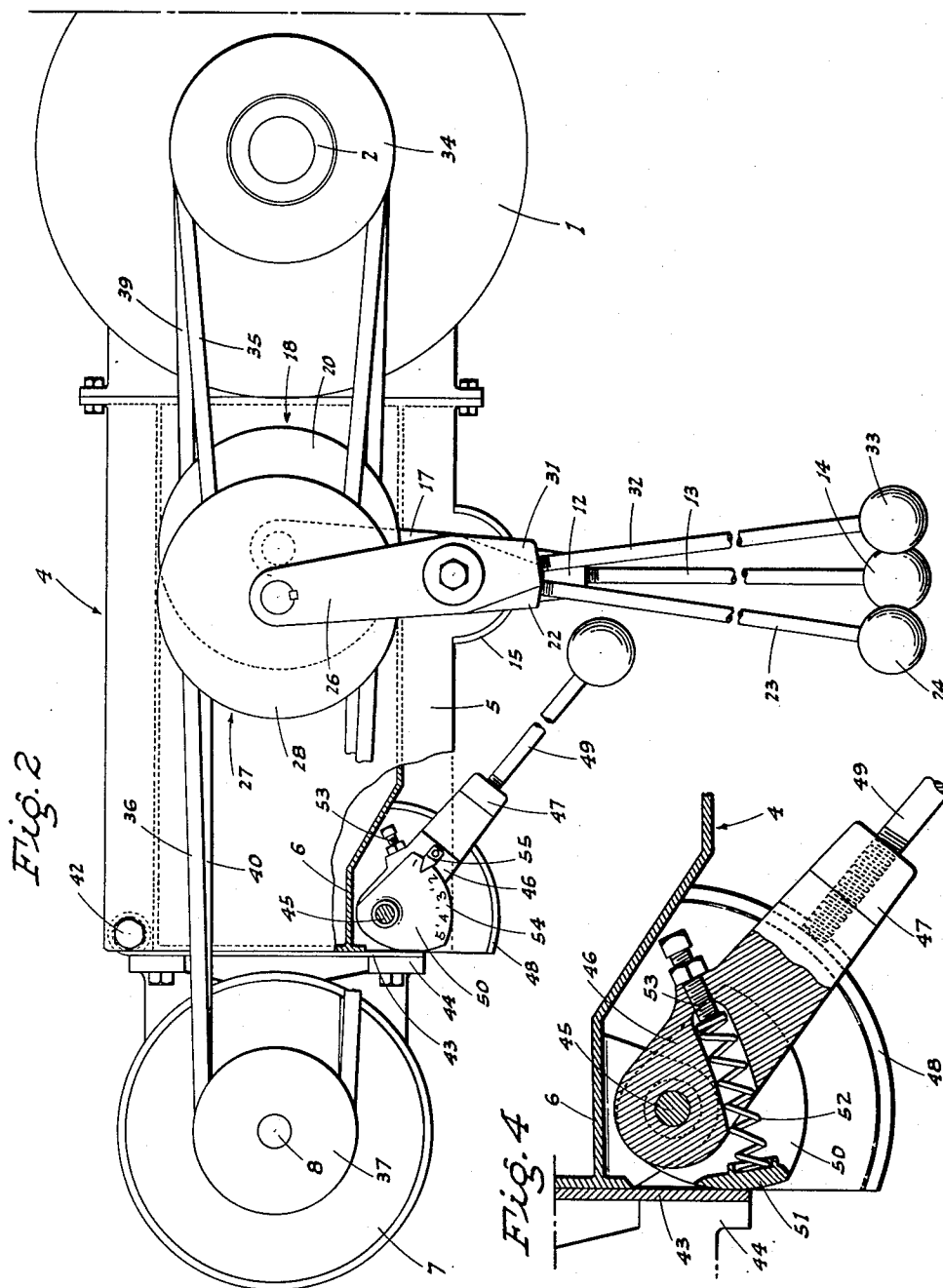
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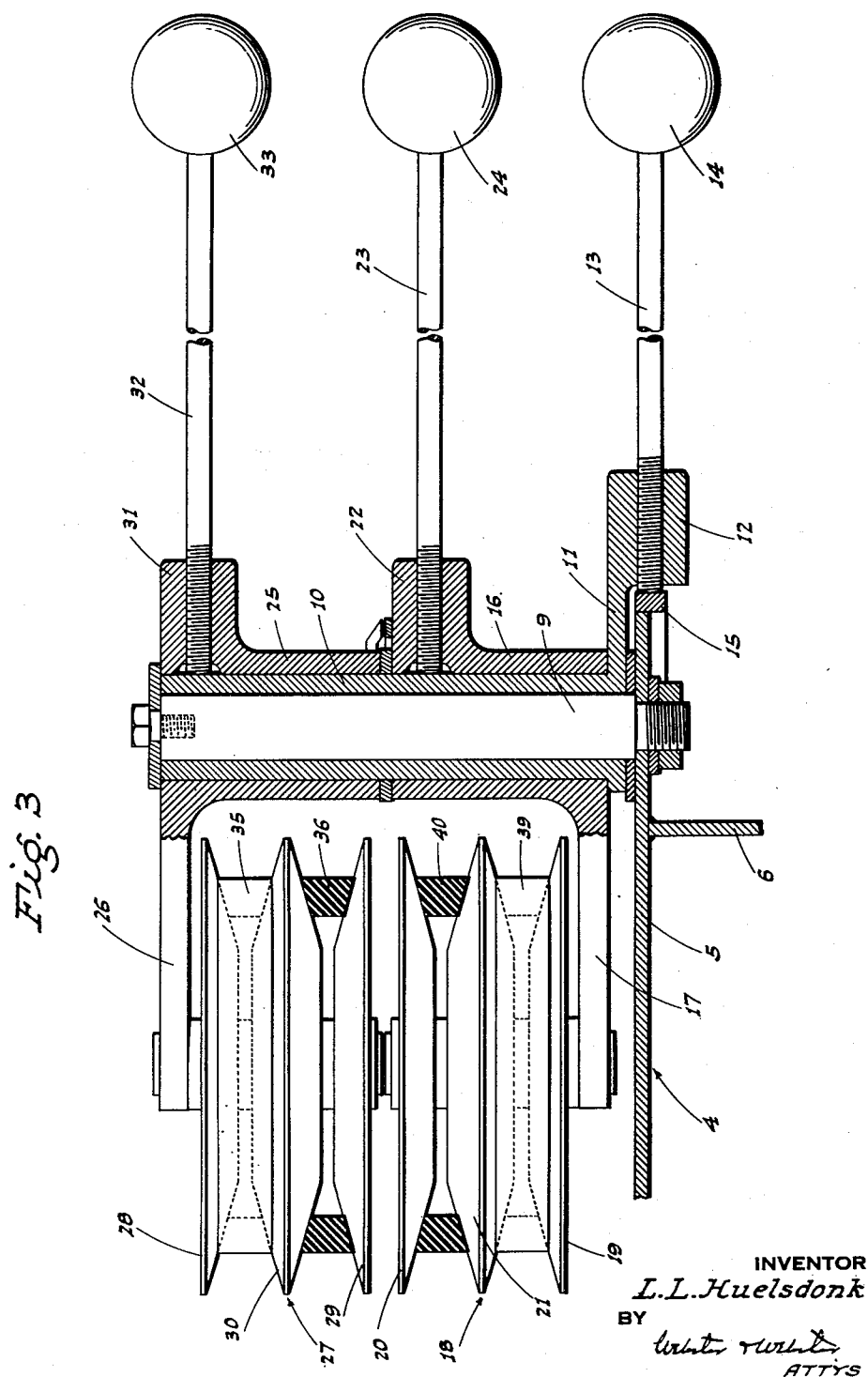
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VARIABLE SPEED PULLEY DRIVE MECHANISM

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Application August 4, 1953, Serial No. 372,321

9 Claims. (Cl. 74—230.17)

This invention relates to drive mechanism between a power unit, such as an electric motor, and a pair of rotary members driven from the one motor at different and variable speeds relative to each other; the mechanism of this invention having been particularly designed to operate the rotating members in the centrifuge shown in my patent, No. 2,612,314, dated September 30, 1952.

In the patent, the drive mechanism employed to rotate the parts at the desired variable speed ratios included a relatively complex gearing arrangement and two separately controlled motors, and the major object of the present invention is to provide a driving mechanism for the purpose which has all the range of adjustability of the original mechanism, but which requires only a single motor, and a simple belt and pulley arrangement, which eliminates the need of the gearing and the extra motor previously used.

Still another object of the invention is to provide a drive mechanism which is practical, reliable, and durable, and one which is exceedingly effective for the purpose for which it is designed.

These objects are accomplished by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

Fig. 1 is a side elevation of the drive mechanism as mounted on a centrifuge.

Fig. 2 is a top plan view of the mechanism, partly broken out and in section.

Fig. 3 is an enlarged fragmentary cross section on line 3—3 of Fig. 1, but showing the pulley units in a common or non-adjusted speed position.

Fig. 4 is an enlarged fragmentary sectional plan on line 4—4 of Fig. 1.

Referring now more particularly to the characters of reference on the drawings, the centrifuge to which the mechanism is applied includes a fixed upstanding housing 1, a turnable feed tube 2 projecting upwardly from the housing some distance, a rotary cone (not shown) within the housing, and a central sleeve or hub 3 on the cone projecting upwardly from the housing a short distance and turnable on tube 2 in concentric relation thereto.

In order to rotate the feed tube 2 and cone in the same direction, but at adjustably varying speeds relative to each other, as is desirable for the proper functioning of the centrifuge as set forth in the aforementioned patent, the drive mechanism now to be described is provided.

This mechanism is mounted on a bracket 4 projecting from one side of housing 1 and secured thereto; said bracket including a horizontal top plate 5, preferably at the level of the top of the housing, and a vertical web 6 depending from plate 5. A drive motor 7 is supported from the outer end of the bracket and has an upstanding drive shaft 8 parallel to feed tube 2.

Secured to and upstanding from plate 5, adjacent its outer edge, in laterally offset relation to a straight line drawn through the axes of the motor 7 and feed tube 2, is a fixed spindle 9, turnable on which is a full-length sleeve 10. At one end the sleeve is formed with an outwardly projecting radial flange 11 having a depending boss 12 at its outer end in which the stem 13 of a handle knob 14 is adjustably threaded.

The stem 13 is radial with spindle 9, and at its inner end, beyond boss 12, is adapted to clampingly engage

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an arcuate band or quadrant 15 fixed with bracket plate 5 concentric with the spindle 9.

Turnable on the lower portion of sleeve 10 is a hub 16 having a laterally projecting radial arm 17 at its lower end which supports an upstanding vertical-axis variable speed V-pulley unit 18 of a standard type. This unit includes a lower pulley 19 and an upper pulley 20; pulleys 19 and 20 including a common axially movable flange member 21 whose movement in one direction or the other increases the width of the belt receiving groove of one pulley while decreasing the width of the groove of the other pulley.

A radial boss 22 is formed with the hub 16, at its upper end, through which boss the stem 23 of a handle knob 24 is adjustably threaded so as to enable said stem to be releasably clamped against sleeve 10 when desired.

Turnable on sleeve 10, above and separate from hub 16, is a hub 25 having a laterally projecting radial arm 26 at its upper end, which supports a depending variable speed V-pulley unit 27. This pulley unit is of the same type as unit 18, and includes upper and lower pulleys 28 and 29, respectively, and which include a common axially movable flange member 30. Formed with hub 25, at its upper end and opposite arm 26, is a boss 31 adjustably threaded through which is the stem 32 of a handle knob 33; the stem being adapted to releasably clamp against sleeve 10.

For convenience of operation, the handle stems 13, 23, and 32 all project laterally out from the bracket in opposite relation to the pulley units, as shown in Fig. 2, and in vertically spaced relation to each other, as shown in Fig. 3.

Fixed on feed tube 2, in horizontal alinement with pulley 28, is a fixed-size V-pulley 34, from which a V-belt 35 extends about said pulley 28.

A similar belt 36 extends from pulley 29 to a fixed-size pulley 37 on the motor shaft 8 in horizontal alinement with said pulley 29.

Fixed on sleeve 3, in horizontal alinement with pulley 19, is a fixed-size pulley 38, from which a V-belt 39 extends about said pulley 19.

A similar belt 40 extends from pulley 20 to a fixed-size pulley 41 on motor shaft 8 in horizontal alinement with said pulley 20.

The length of the various belts is such that the corresponding pulleys of units 18 and 27 may be vertically alined, with the individual pulleys self-adjusted to a common size, as shown in Fig. 3. When the pulleys of the units are so disposed, and assuming that motor pulleys 37 and 41 are of equal size and that the centrifuge pulleys 34 and 38 are likewise of equal size, it will be evident that tube 2 and sleeve 3 will be rotated at the same speed.

If, however, handle stem 32 is swung in one direction or the other from a central or what may be termed a neutral position, the sizes of pulleys 28 and 29 will be altered relative to each other, and the speed of tube 2 will be altered relative to the speed of cone sleeve 3.

Similarly, swinging of handle stem 23 from the central or neutral position will alter the relative speed of sleeve 3. Holding the pulley units in their adjusted position is, of course, effected by rotating the handle stems so that they clamp against sleeve 9 and prevent turning of the hubs 16 and 25 thereon.

The relatively large knobs on the turnable stems enables a good clamping pressure to be easily obtained.

If the sleeve 10 is rotated, by swinging the stem 13, when the hubs of the pulley units are clamped thereto, the speed of tube 2 and cone sleeve 3 will be increased or decreased without altering the relative speed ratio thereof which has already been obtained by individual manipulation of handle stems 23 and 32, as previously described.

It may be noted that the motor pulleys 37 and 41 may be different sizes relative to each other, and this is true of pulleys 34 and 38 also, if a great variation in the relative spreads of the centrifuge parts is desired.

In order to maintain an adjustable tension on the belts, and which will affect the centrifuge belts as well as the motor belts, the following arrangement is provided:

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Vertically hinged, as at 42, on the outer end of the bracket 4, at the side thereof opposite the web 6, is a vertical transverse plate 43 on which the motor base 44 is secured. Mounted in the bracket 4 in front of web 6, adjacent plate 43, is a vertical pin 45 on which a radial arm 46 is mounted; this arm projecting laterally out and having a depending boss 47 at its outer end which aligns with an arcuate band 48 concentric with pin 45 and rigid with the bracket. A handle stem 49, radial with pin 45, is threaded through the boss 47 to releasably and clampingly engage the band 48 when desired.

The arm 47 projects between the upper and lower faces of a cam unit 50 turnable on the pin 45 and having a vertical cam portion 51 eccentric to the pin and connecting said faces and engaging the plate 43. A compression spring 52 extends between the arm 46 and portion 51; the initial loading of the spring being controlled by an adjustable screw 53 mounted in the arm beyond and engaging one end of the spring, as shown in Fig. 4.

Upon swinging of the arm 46 in a clockwise direction, it will be seen that the spring is increasingly loaded, and exerts a pressure against plate 43 to swing the same on its hinge away from the bracket to place the belts under tension. The upper face of the cam may be curved concentric with the pin 45 and graduated, as at 54, to read against a pointer 55 on the arm 45 so that the amount of spring pressure being exerted against the belts may be determined.

While the above described mechanism has been particularly designed for use with the centrifuge shown in Patent No. 2,612,314, it will be evident that the mechanism is not limited in its use for such centrifuge, but may be of service in connection with any apparatus in which similar speed-control conditions of operation are desired.

From the foregoing description it will be readily seen that there has been produced such a device as substantially fulfills the objects of the invention, as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such details may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described the invention, the following is claimed as new and useful, and upon which Letters Patent are desired:

1. A drive mechanism for a pair of adjacent and parallel rotary members to be driven, said mechanism comprising, with a power unit spaced from the members and including a drive shaft parallel to said members, a supporting structure on which the members and unit are mounted, pulleys on the shaft in axially spaced relation, pulleys on the members spaced apart in planes at right angles to the axes of said members, a pair of variable-speed pulley units disposed between the drive shaft and members with the axes of the pulley units parallel to the shaft; each unit including a pair of pulleys of varying size relative to each other, belts between the shaft pulleys and one of each of the pulleys of the pulley units, belts between the other pulleys of said units and the pulleys on said members, and means mounting the pulley units on the structure for independent movement in a general direction toward or from the drive shaft.

2. A mechanism as in claim 1, in which one member is

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a sleeve turnable on and concentric with the other member.

3. A mechanism as in claim 2, in which the axes of the drive shaft, pulley units, and members are substantially in alignment.

4. A mechanism as in claim 1, with means coupling the mounting means of the pulley units together for movement in unison in said general direction.

5. A mechanism as in claim 1, in which the pulley-unit mounting means comprises a normally stationary sleeve whose axis is parallel to the axes of the pulleys of the units and common to both units, said sleeve being disposed in laterally offset relation to a line drawn between the shaft and the axes of the pulley units, hubs separately turnably mounted on the sleeve, an arm projecting from one hub and supporting one pulley unit, an arm projecting from the other hub and supporting the other pulley unit, handle members projecting from the hubs for separately rotating the same, and means to releasably clamp the hubs to the sleeve.

6. A mechanism as in claim 5, with means to rotate the sleeve, and means to releasably retain the sleeve in any rotated position.

7. A mechanism as in claim 5, with a boss on each hub, each handle member including a turnable stem extending radially of the hub and adjustably threaded through the boss for releasable clamping engagement with the sleeve.

8. A mechanism as in claim 6, with a fixed spindle mounted on the supporting structure on which the sleeve is turnable; the sleeve rotating means including a radially projecting handle stem, a boss on the sleeve at one end thereof through which the stem is adjustably threaded; the retaining means including, with the stem, a fixed arcuate band concentric with the spindle adapted to be releasably and clampingly engaged by the stem upon rotation thereof.

9. In a drive mechanism between a drive shaft and a driven rotary member parallel thereto and which includes pulleys on the shaft and member, an endless belt extending about and between the pulleys and a supporting structure for the shaft and member; a plate parallel to the shaft on which the latter is mounted, means pivoting the plate on the supporting structure on an axis parallel to the shaft in laterally offset relation to a line drawn between the shaft and member, a pin parallel to the shaft mounted on the structure back of the plate, a cam turnable on the pin and having a cam surface eccentric to the pin and engaging the plate, an arm separately turnable on the pin, a handle projecting from the arm, a compression spring between the arm and cam acting in a direction to force the cam surface against the plate, and means to clamp the arm against rotation in any position of adjustment relative to the cam.

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