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DRYERS

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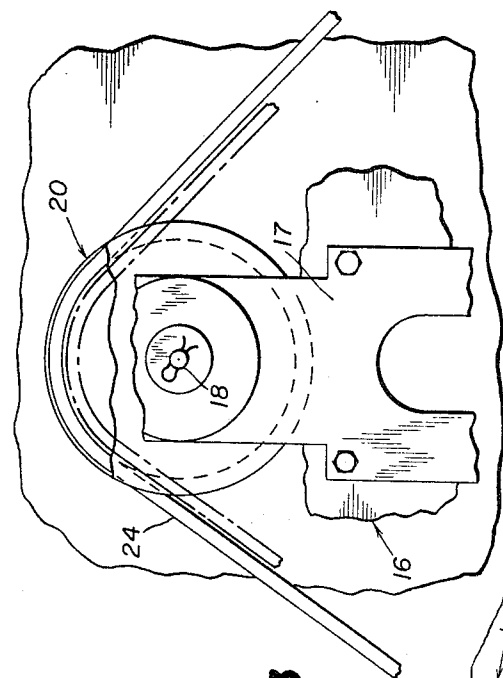


FIG. 3

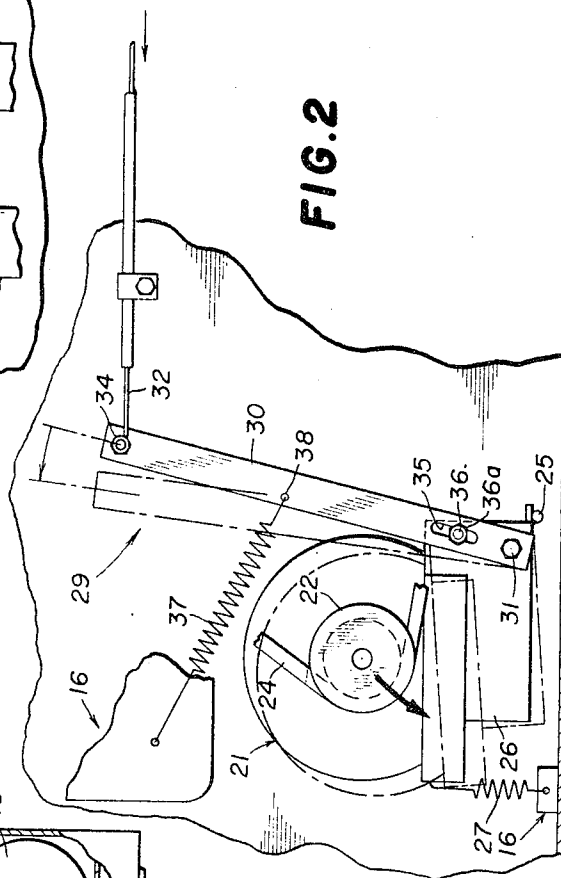


FIG. 2

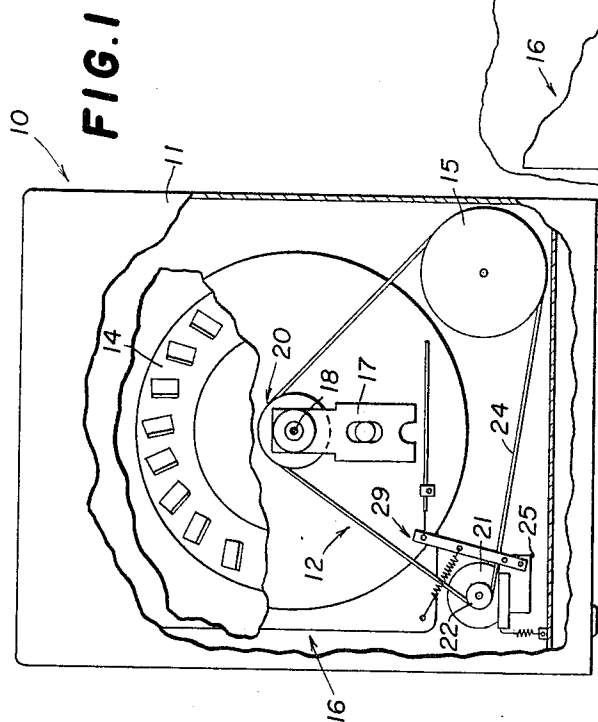


FIG. 1

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DRYERS

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The present invention relates to dryers commonly used to remove moisture from fabrics, and more particularly to the drive mechanism in such dryers.

It has been found that fabric articles, for example clothes, can be dried with fluffier results and less strain on the fabric by using selected, different relative speeds at which the drying air flows with respect to the tumbled, moist articles. Because fabrics commonly used are manufactured of many different materials, for example synthetic fibers as well as cotton and wool, dryers must be versatile in handling these. One material, wool for example, is preferably dried slower than cotton. The synthetic fibers have their particular characteristics.

Accordingly, it is an object of the present invention to provide an improved drive mechanism particularly adapted for a dryer or the like which will permit selection of optimum drying speeds for particular types of fabrics.

More particularly, it is an object of the present invention to provide an adjustable speed drive for the blower of a dryer including means for selectively adjusting the speed at which hot air is blown toward articles being dried.

It is an overall object of the present invention to provide an economically manufacturable and easily maintained drive mechanism for dryers and the like which can be easily adapted to standard dryer units.

Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings in which:

FIGURE 1 is a rear elevation of a dryer embodying the present invention with a partial section removed to show the present drive mechanism;

FIGURE 2 is an enlarged elevation of a portion of the structure of FIGURE 1 showing details of the improved belt tensioning assembly;

FIGURE 3 is an enlarged elevation of a driven portion of the structure of FIGURE 1 showing the details of a blower pulley;

FIGURE 4 is an enlarged elevation of the pulley of FIGURE 3;

FIGURE 5 is a section taken along 5-5 in FIGURE 4;

FIGURE 6 is a plan view of a manual control connected to the belt tensioning assembly of FIGURE 2 showing a low speed position; and

FIGURE 7 is a plan view of the manual control of FIGURE 6 in a high speed position.

While the invention will be described in connection with the preferred embodiment, it will be understood that I do not intend to limit the invention to that embodiment. On the contrary, I intend to cover all alternatives, modifications and equivalents as may be included in the spirit and scope of the invention as defined by the appended claims.

Referring more particularly to the drawings, FIG. 1 is a rear elevation of a dryer 10 with a rear portion of a cabinet 11 removed so as to show the drive mechanism 12 for a blower 14 and a clothes tumbling drum (not shown). The latter is rotated through a drive train including a pulley 15 which is a part of the drive mechanism 12.

For supporting the drive mechanism 12 and associated structure, for example the blower 14 and the clothes receiving drum, a frame, generally designated 16, is provided. The blower 14 is rotatably carried by frame

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16 on a bearing assembly 17. To permit independent rotation of the blower and clothes drum respectively, yet use bearing assembly 17 as a common support for both rotating structures, a drum support shaft 18 is journaled in bearing assembly 17 while a blower drive shaft 19 is mounted coaxially thereon (see FIG. 5). The latter carries a pulley 20 to transmit drive to the blower. Power for the drive mechanism 12 is provided by a motor 21 having a drive pulley 22 at one end thereof.

For coupling the motor 21 and respective driven pulleys 15, 20, the drive mechanism 12 includes a belt 24 trained about all the pulleys.

In accordance with the present invention, the motor 21 is pivotally mounted for selective movement between upper and lower positions for adjusting the tension in belt 24 to select predetermined diameters for one of the pulleys 15, 20, 22 thereby permitting selection of predetermined relative speeds between fabric movement and the flow of hot drying air. As herein illustrated, the speed selection is effected by making blower drive pulley 20 expansible and pivoting the motor 21 to adjust tension in belt 24. To permit swinging movement of the motor, the latter is supported from frame 16, in the illustrative embodiment, by a pin or bolt 25 located in an opening provided in a motor frame 26 for pivotal movement of the motor. The bolt 25 is suitably anchored to the dryer frame 16 and fits loosely into the motor frame opening to permit relative movement therebetween. As preferably positioned, the pivotal support for the motor is offset from the motor center of gravity to utilize the motor weight, directed downwardly as viewed in FIGS. 1, 2, to maintain, at all times, tension on the belt 24, thereby assuring gripping engagement between the belt and the respective pulley. A spring 27 is positioned opposite the motor pivot pin 25 with an upper end 27a fastened to the motor mounting frame 26 and a lower end 27b fastened to the frame 16 to bias the motor in a counterclockwise direction. The motor weight and the spring 27 bias combine to maintain belt tension.

To control positioning of the motor, actuatable means 29 are provided. As herein illustrated, the latter includes a lever 30 pivotally supported at its lower end by motor frame 26 using suitable means, herein shown as a bolt 31 fastened to the motor frame and loosely fitted into a lever opening to permit pivoting of the lever. The upper end of the lever is connected to a control cable 32 fastened, in the exemplary embodiment, to the lever by a screw 34.

For transferring pivotal movement of the lever 29 into belt tensioning movement of the motor 21, the lower portion of lever 29 above the pivotal support 31 is provided with a slot 35 for receiving a stud 36 suitably fastened to the lever, for example by a nut 36a. In response to pivotal movement of the lever 30 to the left in FIG. 2 the stud engages the motor frame 26 and pivots the motor. Aiding the pivotal movement of lever 30 to the left is a spring 37 suitably fastened between lever 30 and frame 16, for example by respective hook-and-eye connections at opposite ends of the spring. The spring exerts a biasing force counterclockwise about pivot support 31, cooperating with the weight of the motor 21 and the spring bias 27 to increase tension in belt 24. The spring 37 is attached to lever 30 at a point 38, a predetermined distance above the slot 35 so that the pivotal force exerted by spring 37 pivots the motor, lowering the latter, to move the pulley to a position where maximum tension is applied to the belt 24. As explained subsequently, this effects high speed operation of the blower. The cable 32 is manually operated to contract the spring 37 and pivot the motor to the left or to stretch the spring 37 and pivot the motor to the right. It is clear that the pivot point 31 for the lever can be

common with the motor frame pivot point 25. The operation of the lever is the same.

In the exemplary embodiment the speed at which drying air is moved relative to the articles being dried is selected by setting the blower speed. The blower drive pulley 20 is expandable to permit changing of the drive pulley effective diameter and provide fast or slow speed operation. In the present instance the pulley 20 has a first effective diameter corresponding to ordinary tension in the belt 24 to produce slow blower operation with the motor being in a raised position, and a second smaller effective diameter corresponding to increased tension in the belt 24 to produce faster blower operation with the motor being in a lowered position. Turning to FIGS. 4 and 5 showing the expandable pulley in detail, the pulley 20 is carried by shaft 19 which is fastened to blower 14. The pulley includes a pair of respective inner and outer sheaves 39, 40, the inner sheave 39 being stationary and the outer sheave 40 being slidable outwardly relative to the inner sheave and blower drive shaft. For carrying the stationary inner sheave 39, the shaft 19 is provided with a plurality of angularly spaced, radially extending mounting ears 42, 43, 44, respectively. The inner sheave has a central opening so that it may be slid over a projecting end portion of shaft 19, and has an annular flange 45 defining the central opening and adapted to fit snugly against the respective mounting ears 42, 43, 44.

For fastening the inner sheave 39 to the respective ears, three bolts 48, 49, 50, respectively, are provided. In the preferred embodiment each of the ears are provided with openings, only one of which 52 is shown, which are adapted to line up with respective openings in the flange portion 45 of the inner sheave, only one of which 53 is shown, as well as respective openings in a central web portion 51 of the blower 14, only one of which 56 is shown. To facilitate explanation, since each of the bolts operate in the same manner, only the construction and installation of bolt 48 is described. As shown in FIG. 5 the bolt 48 extends through the respective openings 52, 53, 56 so that a boss 54 on the bolt 52 engages the flange 45 of the inner sheave 39, and when a threaded end 55 of the bolt receives a nut 58, tightening of the latter sandwiches the sheave 39, shaft ear 42 and blower web portion 51 together. Accordingly, the sheave, shaft and blower rotate as a unit.

Sheave 40 is connected to blower drive shaft 19 to cooperate with the inner sheave 39 in transmitting drive. To effect driving coupling yet to permit relative movement of the sheave 40 with respect to sheave 39 to thereby change the effective diameter of the pulley 20, a sheave mounting assembly 59 is provided. As herein illustrated, mounting assembly 59 includes a pair of respective inner and outer annular end rings 60, 61 telescoped over the blower drive shaft 19 and held in spaced-apart relationship by a plurality of bolts 62, 63, 64, respectively. Because each of the bolts are alike in structure and operation only the one bolt 62 is described in detail. It has a center portion 67 extending between respective, radially projecting retaining portions 68, 69 which engage the respective end rings 60, 61. Projecting end portions 70, 71, respectively, of the bolt 62 are threaded and fit into respective openings 72, 73 in the end rings. The bolt end 71 also extends through a body portion 74 of the outer sheave 40. For this purpose the sheave body portion is provided with a receiving opening 75. Thus, when a pair of nuts 78, 79 are threaded on the respective bolt ends 70, 71, and tightened, the respective end rings are held tightly by the bolts and in predetermined spaced apart relationship. An opening 79 is provided in the central web portion 51 of the blower to permit the bolt 62 to extend therethrough and also slide transversely relative thereto when sheave 40 is moved. The outer sheave 40 is drivingly connected to the inner sheave 39 and the blower drive shaft 19 through three

drive pins 80, 81, 82, respectively, which project as integral parts of the inner sheave mounting bolts 48, 49, 50, respectively, and are received in outer end ring 61.

For biasing the outer sheave 40 into engagement with the inner sheave 39 to provide a first effective diameter for the pulley 20, a spring 83 is telescoped over blower drive shaft 19 and installed between the inner end plate 60 and respective mounting ears 42, 43, 44 projecting radially from the drive shaft. The drive shaft is provided with respective raised portions, one of which, 84, is exemplarily shown at the base of ear 42, for centering the blower central web portion on the shaft 19. One end of the spring 83 is adapted to fit juxtaposed the respective base portions of the ears 42, 43, 44, while the other engages the inner end ring 60.

To prevent overtravel of the sheave 40 a retaining ring 85 is coaxially carried by the blower drive shaft 19 to engage inner end ring 60 as the latter slides on the blower drive shaft in response to increased tension in the belt 24. As has been explained, the respective mounting bolts 62, 63, 64 for holding the outer sheave 40 are slidable relative to the blower central web portion 51. The respective drive pins 80, 81, 82 besides receiving drive from the outer sheave 40 also serve to guide the sliding movement of the outer sheave 40 by guiding the sliding movement of outer end ring 61.

In operation, the V-belt 24 is trained over the pulley 20 and between opposed adjustable sheave portions 39, 40. Tension in the belt besides effecting intimate contact between the belt and the sheaves 39, 40 necessary to transmit drive, also exerts a force tending to press sheave 40 outwardly. Because the sheave is coupled to inner end ring 60 which is held in biased position by spring 83, the tension in belt 24 must exert a force sufficient overcome the spring biasing force whereupon the sheave 40 is permitted to move outward. Shown in phantom in FIG. 5 is the position of sheave 40 when it moves outward. As is clear, when the sheave 40 moves to its outer position a V-belt 24 will ride closer to the center of pulley 20 (see FIG. 3). The result is that with belt 24 being powered by motor 21 at the same speed, measured in feet per second, the reduced circumferential dimension of the pulley 24 results in more revolutions per minute of the pulley 20. In other words, with the sheave 40 moved to an outer position the blower speed is faster than when the sheave 40 is held in juxtaposed relation with respect to the inner sheave 39.

To facilitate movement of the outer sheave mounting assembly, the respective end rings 60, 61 may be constructed of the material which is strong and can be fitted snugly on shaft 19, yet permits easy sliding movement. In practice, such a material has been found to be a Delrin plastic. (Trademark of E. I. du Pont de Nemours Co. Inc.)

The tension in belt 24 is adjusted by using actuatable means 29 to swing motor 21 between respective first and second positions, as herein illustrated, motor raised and motor lowered positions, respectively. The spring 37 pivots the motor about to the motor lowered position and maximum tension is applied to the belt to slide sheave 40 outward to decrease the effective diameter of pulley 20. The control cable 32 is manually operated to oppose the spring biasing force and swing motor 21 upward to decrease tension in belt 24 and permit sheaves 39, 40 to engage thereby increasing the effective diameter of the pulley 20 to maximum possible size. In response to decrease of tension in belt 24, spring 83 biases sheave 40 toward sheave 39 and the belt automatically rides up and into position on the larger effective diameter pulley.

For operation control cable 32, a manual control assembly 86 is provided. As shown in FIGS. 6, 7, the assembly 86 includes a bell crank shaped control lever 88 pivotally supported by a screw 89 on a frame support 90. To transfer pivotal movement of control lever 88 into lateral movement of control cable 32, a pivotable link

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91 is swung about its one end 92. The link is coupled to the manual operable bell crank by a screw 94 extending from the link and riding in an arcuate slot 95 of the bell crank. An end 96 of the link is fastened to an end 97 of the control cable 32 by suitable means, in the present instance by a screw 98, so that pivotal movement of the link about its pivoted end 92 in response to arcuate movement of the slot 95 is transmitted into lateral movement of the control cable 32.

Turning to FIG. 2 and the operation of the present invention, the position of the actuatable means lever 30 is drawn in solid lines for the control cable position corresponding to control lever 88 in the low speed position (FIG. 6). Shown in phantom is the position of lever 30 for the control cable position corresponding to control lever 88 in high speed position (FIG. 7). To hold the actuatable means in the low speed position and counteract the biasing force of spring 37, the control lever arcuate slot 95 has a detent recess 99 at one end to engage link stud 94. An opposite slot end 100 engages the stud 94 as spring 37 biases the lever 30 and cable 32 in a counterclockwise direction to a high speed position. The motor pivots to a position in which maximum tension is applied to belt 24.

It is clear from the foregoing that the present invention provides a simple operable control for the drive mechanism of a dryer permitting adjustment of the speed at which drying air flows past clothes being dried. The housewife can select either high speed or low speed operation by moving the lever 88. Though in the present instance, the speed of the blower is adjusted to select the speed at which drying air is blown into the drum, it is within the teachings of the present invention to adjust the speed at which clothes are tumbled thereby adjusting the relative speeds between the clothes and the drying air.

What is claimed is:

1. In a dryer including means for controlling the speed of a rotating element, the combination comprising a supporting frame, a shaft rotatably supported on said frame and connected to said rotating element, a driven pulley carried on said shaft for transmitting rotation to the latter, a motor pivotally supported on said frame to one side of the center-of-gravity thereof, a pulley driven by said motor, means adjustably supporting said motor for movement between a first and a second position, respectively, a belt trained about said respective pulleys, one of said pulleys being expansible in response to increase in the tension of said belt, actuatable means carried by said frame and coupled to said motor for swinging the latter between said first and second positions respectively and utilizing the weight of said motor to apply a downward force on said drive pulley and facilitate swinging movement of said motor to adjust belt tension, said motor drive pulley in said first position maintaining a first tension on said belt so that said expansible pulley is in a non-expanded condition having a first effective diameter for driving said rotating element at a first speed and said motor drive pulley in said second position maintaining a second increased tension on said belt so as to expand said expansible pulley to a second effective diameter smaller than said first effective diameter for driving said rotating element at a second speed.

2. The combination of claim 1 wherein the actuatable means includes a lever coupled to said motor and said frame and pivotal to move said motor between said respective first and second positions and a spring biasing said lever to normally maintain said motor in said second position.

3. In a dryer including means for controlling the speed of a rotating element, for example a blower, the combination comprising a supporting frame, a shaft rotatably supported by said frame and connected to said rotating element, an expansible driven pulley carried on said shaft for

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transmitting rotation to the latter, a motor pivotally supported on said frame to one side of its center-of-gravity, a drive pulley carried by said motor movable between respective first and second positions with pivotal movement of said motor, a belt trained about both said expansible driven pulley and said motor drive pulley, said expansible driven pulley having predetermined different effective diameters selectable by adjusting tension in said belt thereby permitting operation of said rotating element at different speeds, actuatable means carried by said frame and coupled to said motor to control swinging movement of said motor between said respective first and second positions to utilize the weight of said motor to apply downward force on said motor drive pulley and facilitate swinging movement of said motor to adjust belt tension, said motor drive pulley in said first position maintaining a first tension on said belt so that said expansible pulley is in a non-expanded condition having a first effective diameter for driving said rotating element at a first speed and said motor drive pulley in said second position maintaining a second increased tension on said belt so as to expand said expansible pulley to a second effective diameter smaller than said first effective diameter for driving said rotating element at a second speed faster than said first speed.

4. In a dryer including means for controlling the speed of a rotating element, for example a blower, the combination comprising a frame, a shaft rotatably supported by said frame and connected to said rotating element, an expansible driven pulley carried on said shaft for transmitting rotation to the latter, a motor pivotally supported on said frame to one side of its center-of-gravity, a drive pulley carried by said motor movable between respective first and second positions with pivotal movement of said motor, a belt trained about both said expansible driven pulley and said motor drive pulley, said expansible driven pulley having predetermined different effective diameters selectable by adjusting tension in said belt thereby permitting operation of said rotating element at different speeds, actuatable means carried by said frame and coupled to said motor to control swinging movement of said motor, said actuatable means including biasing means for maintaining said motor in one of said positions, and manually operable means coupled to said actuatable means and being selectively operable to swing said motor and pulley between said respective first and second positions, said manually operable means having a detent for maintaining said motor in said one position opposite to said spring biased position, said motor drive pulley in said first position maintaining a first tension on said belt so that said expansible pulley is in a non-expanded condition having a first effective diameter for driving said rotating element at a first speed and said motor drive pulley in said second position maintaining a second increased tension on said belt so as to expand said expansible pulley to a second effective diameter smaller than said first effective diameter for driving said rotating element at a second speed faster than said first speed.

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