A driving gear is adjustable along the longitudinal axis of its supporting shaft to a plurality of positions. The gear has different numbers of teeth at the various positions so that positioning of the cam on its shaft determines the gear ratio between the driving gear and a driven gear.
ADJUSTABLE TIME TIMING GEAR FOR TIMING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an adjustable time timing gear, and more particularly to a timing gear carried on a supporting shaft and having means for releasably locking the gear at selected positions longitudinally of the supporting shaft.

2. Description of the Prior Art

It is well known in the art to provide different gear ratios between a driving gear and a driven gear by changing the number of teeth presented by one gear to the other. For example, U.S. Pat. No. 2,328,473 discloses a traffic signal controller or timer which employs a pinion for driving a selected gear of a cone gear. The desired gear ratio is obtained by pivoting the pinion to disengage from the cone gear, sliding the pinion and its prime mover longitudinally of the cone gear on a separate shaft parallel thereto and then pivoting the pinion to again engage the cone gear. U.S. Pat. No. 2,907,221 discloses the use of a cone gear as the driving gear for selective engagement with a pinion as the driven gear. Selective engagement at different gear ratios is provided by means of a cam and lever arrangement which positions the pinion longitudinally of the cone gear. Each of the foregoing types of apparatus for providing different gear ratios involves the provision and use of additional levers, shafts and/or cam mechanisms for positioning one of the gears with respect to the other, both longitudinally of the axis of one of the gears and radially with respect to the axis of the cone gear due to the stepped configuration of a cone gear.

U.S. Pat. No. 3,075,055 discloses a control member which functions as a timing gear for driving a toothed wheel at different rates. The control member has a plurality of spaced teeth about the circumference thereof, which teeth are radially displaceable for selective engagement with or by-passing of the teeth of the driven toothed wheel. The movable teeth may therefore be radially displaced in selected patterns to provide the various rates of revolution of the toothed wheel. Although this structure eliminates the aforementioned disadvantage of moving one gear radially with respect to the other, the provision of additional parts in the form of movable teeth is in itself a disadvantage.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a timing gear arrangement which is easily adjustable to provide a plurality of gear ratios between a driving gear and a driven gear.

Another object of the invention is to provide an adjustable time timing gear arrangement in which the selection of gear ratios is accomplished by movement of one gear with respect to the other only in the longitudinal direction of its axis.

Another object of the invention is to provide a longitudinally adjustable gear having different numbers of teeth at different positions along its axis which teeth have the same mean diameter.

Another object of the invention is to provide a simple means for releasably engaging the adjustable gear at different positions longitudinally of its supporting shaft.

Another object of the invention is to provide a great number of piece parts which were necessary in prior arrangements for providing different gear ratios and to provide an adjustable timing gear which is selectively and releasably engaged at positions along its supporting shaft, wherein the gear, the shaft and the means for releasably engaging the gear and the shaft are provided by only two piece parts.

A gear is provided with a plurality of gear sections at different positions along its longitudinal axis. At these positions the gear has different numbers of teeth, all of which have the same mean diameter so that longitudinal movement of the gear, parallel to the axis of rotation of the gear mated therewith, changes the gear ratio. The gear is molded from a plastic material as a single piece part. By the same token, the supporting shaft for the gear is molded of plastic material and includes a plurality of resilient locking tabs for releasably engaging the gear at the different gear ratio locations.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages of the invention, its organization, construction and operation will be best understood from the following detailed description of a preferred embodiment thereof, taken in conjunction with the accompanying drawings, on which:

FIG. 1 is a pictorial view, shown partially broken away, of a coin-operated clothes dryer as an exemplary environment for a timer employing the present invention;

FIG. 2 is an end view of a timer constructed in accordance with the principles of the present invention;

FIG. 3 is a view similar to FIG. 2 showing the timer in an operating condition;

FIG. 4 is a pictorial representation of apparatus constructed in accordance with the present invention, and FIG. 5 is a sectional view taken generally along the line V—V of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiment of the invention is illustrated in FIG. 1 in the environment of a commercial clothes drying appliance 10 which comprises an enclosure cabinet 12 having a console 14 thereon. The console 14 comprises a coin box 17 having a slide-type coin slot device 18, and houses a timing device 16 for regulating the drying operation. The enclosure cabinet 12 further comprises horizontal top and bottom panels 20 and 22, respectively, a pair of vertical side panels 24, only one of which can be seen on the drawing, and vertical front and rear panels 26 and 28, respectively. The enclosure cabinet 12 further comprises an access opening 30 in the front panel 26, as defined by an inwardly flange 31. The access opening 30 has a closure door 32 cooperating therewith for loading and unloading the dryer 10.

The dryer 10 further includes a drying container for tumbling clothes in the form of a revolving drum 34 housed within the cabinet 12 and extending axially from the front panel 26 to a bulkhead 36 spaced forwardly of the rear panel 28. In order to promote a tumbling action of the clothing being dried, a plurality of circumferentially spaced baffles 78 (one being illustrated on the drawing) are mounted on the inner surface of the drum 34. The drum 34 includes a radially inward extending front closure wall 41 having an access
opening 42 therein formed by means of an axially out-
turned flange 43. The flange 43 provides a forwardly
extending annular bearing which overlaps and is suit-
ably journaled on the complementary flange 31 of
the enclosure cabinet 12. It will be apparent from the fore-
going description that the opening 42 into the drum 34
and the opening 30 formed in the front panel 26 are
concentric, providing access into the rotatable drum 34
from the outside of the cabinet 12. The drum 34 is sup-
ported at the rear by a pair of support rollers 48 (one
being illustrated on the drawing) mounted on the bulk-
head 36. A raceway or circumferential groove 50 is
formed as a circumferential indentation in the periphe-
ral wall of the rear portion of the drum 34 serves as
a track for the rollers 48.

The appliance 10 also comprises a motor 52 mounted
on the bottom panel 22 in a rear corner of the cabinet
12 which rotatably drives the drum 34 by means of a
drive belt 54 extending around the periphery of and in
frictional engagement with the drum 34 and around a
motor pulley 56 mounted at one end of a motor shaft
58. The other end of the motor shaft 58 is connected
to drive a blower 60 which is arranged to circulate air
through the drum 34. The blower 60 is included in a
warm air system 62 positioned between the rear panel
28 and the bulkhead 36.

The bulkhead 36 serves to enclose an open-ended rear
portion of the drum 34 and provides a fixed rear wall
in which is located a pair of spaced openings which
are covered by respective perforate sections to provide
an air inlet 64 and an air outlet 66. The blower 60
draws moisture-laden air from the interior of the drum
34 through the air outlet 66, through a removable lint
screen 68, through an air duct 70 and exhausts the air
out of the cabinet 12 through an exhaust duct 72. Air
exhausted from the drum 34 is replaced by ambient air
entering the warm air system 62 by way of an intake
opening in rear panel 28 (not shown) and passes over
a heater means 76 as it is drawn through a fresh air duct
74 and into the drum 34 through the air inlet 64. The
warm air system 62 thus circulates a stream of warm air
through the drum 34, subjecting the clothing placed
therein to a drying environment to remove moisture
from the fabrics while the clothing is tumbled as the
drum 34 rotates.

Referring to FIGS. 2 and 3, the timing device 16 of
FIG. 1 is illustrated in greater detail. The timing device
16 has encase wall members 90 and 91 which en-
close the timing mechanism. A lever 100 is actuated
through the movement of the coin slot device 18. When
actuated the lever 100 rotates about a pin 92 and when
released rotates under the bias caused by a spring 93
back to its original or returned position. It should here
be noted that it is common practice in laundry estab-
ishments to provide a certain amount of drying time in
return for a certain denomination of coin inserted into
the coin mechanism and to provide multiples of such
drying time for each multiple of such denomination,
i.e., for each actuation of the lever 100. The lever 100
acts through a ratchet wheel or one way clutch mechan-
ism 101 to rotate a face cam 102 in the direction
shown by the arrow when the lever is released to return
to its original position. A face cam 103 is splined
through a pair of telescopically related spline collars
104, 106 to a gear 105. The gear 105 is frictionally
engaged by a detent spring member 110 so that rotat-
ion of the gear 105 is resisted. Therefore, when the
face cam 102 is rotated by the lever 100, the cam 103
does not at first rotate, but is forced away from the cam
102 by the action of the respective camming surfaces
112 and 111 against the spring bias of a pair of switches
115 and 116. The cams 102 and 103 move in opposite
directions axially of the shaft 92 in two steps, thereby
first actuating the switch 115 and then actuating the
switch 116. The switch 115 actuates the drive motor 52
and a timing motor 117 and the switch 116 actuates the
heater 76. When the cam 103 has been rotated to the
position shown in FIG. 3, the two cams 102, 103 lock
together by the action of a locking surface 113 on the
cam 102 on a locking surface 114 on the cam 103. Any
further rotation of the cam 102, as may be effected by
the insertion of additional coins and movement of the
lever 100, causes both the cam 102 and the cam 103
to rotate together by overcoming the friction of the
spring 110 on the gear 105. This further rotation of the
cams also causes a pin 107 on the gear 105 to begin to
separate from a pin 109 on a star wheel 108. FIG. 2 il-
ustrates the pins before rotation of the cam 103 while
FIG. 3 shows the pins after rotation of the cam 103.
The timer 117 acts through a shaft 121 to rotate a tim-
ing gear 120 to rotate the star wheel 108. After actua-
tion of the timer motor 117 by switch 115, the star
wheel 108 will be rotated by timing gear 120 to drive
the pin 109 until contact with the pin 107 is made. At
this point, the star wheel 108 will begin to rotate the
cam 103 with respect to the cam 102, the latter being
held stationary by the ratchet mechanism 101 when the
lever 100 is in the returned position. Rotation of the
cam 103 with respect to the cam 102 will cause a time
period to elapse and then the cam will move toward
each other in two steps as the cam surface 112 rotates
back into contact with the cam surface 111. The first
step will deactivate the heater 76 by permitting the
switch 116 to restore under the influence of its spring
bias, and the second step will deactivate the drive
motor 52 and the timer motor 117 by permitting resto-
ration of the switch 115 under the control of its bias.
This sequence provides for a cool down at the end of
each cycle, regardless of how many coins are inserted
to lengthen the drying time by arcuately separating the
pins 107 and 109.

Referring now to FIGS. 4 and 5, the timing gear 120
is illustrated in greater detail. The gear 120 comprises
a generally cylindrical member having rounded teeth,
the number of teeth varying along the longitudinal axis
of the gear. By positioning the gear 120 on a support-
ing shaft 121 so that a given number of teeth will engage
the star wheel 108, the amount of drying time to be
provided for the number of coins inserted can be se-
lected in that the number of revolutions of the gear 120
per revolution of the star wheel 108 can be selected.

The gear 120 is releasably locked into position on the
shaft 121 by one or more of a plurality of tabs 122, 123,
124, 125 and 126, which extend at an acute angle with
respect to the surface of the shaft 121, as illustrated in
FIGS. 4 and 5. The shaft 121 and the tabs 122–126 are
molded as a single part, as is the gear 120. The shaft
121 is driven by the timer motor 117 by way of a shaft
118. As shown on the drawing, there are five possible
positions of the gear 120 on the shaft 121, in this par-
icular exemplary embodiment. The possible positions
allow for 8, 6, 12, 4 or 9 teeth to driveingly engage the
teeth of the star wheel 108. In FIGS. 4 and 5, the gear
120 is in the position for 12 teeth to engage the star
3,861,238

5 wheel 108. This would provide, for example, 15 fifteen minute timing increment for each actuation of lever 100. To provide a 45 minute increment, the gear 120 is moved outwardly on the shaft to a position for four teeth, by depressing the locking tab 124 and moving the gear toward the locking tab 123. The tabs 122–126 are resilient so that when the gear 120 is moved in the direction of the arrow shown on the shaft 121, the tab 126 moves upwardly, as viewed in FIG. 5, so that the gear 120 is grasped between the tabs 124 and 126. To provide a 20 minute increment, the cam is moved to the position for nine teeth by pressing the locking tab 123 and moving the gear 120 out to abut the tab 122. The gear 120 will then be releasably locked between the tabs 122 and 125.

To provide a 22½ minute increment, the gear 120 is moved to the position for eight teeth by depressing the locking tab 122, removing the gear 120 from the shaft 121, reversing the ends of the gear 120 and placing the gear back on the shaft until it is locked between the tabs 122 and 125. To provide a 30 minute increment, the gear 120 is moved to the position for six teeth by depressing the locking tab 125 and pushing the timing cam in the direction opposite to that of the arrow until it is locked between the tabs 123 and 126. The gear 120 therefore provides five variable time periods, in this particular embodiment, that can be selected for a timing mechanism to vary the gear ratio between the gear 120 and the driven wheel, in this case the star wheel 108.

The simplicity in changing the gear ratio is readily apparent from the foregoing description and the associated figures of the drawing. Therefore, the owner, or maintenance personnel, of a commercial laundry establishment can easily select gear ratios for the timing mechanism and is therefore provided with an additional degree of flexibility in relating coins and drying times.

Although I have described my invention by reference to a particular illustrative embodiment thereof, many changes and modifications of the invention may become apparent to those skilled in the art without departing from the spirit and scope of the invention. I therefore intend to include within the patent warranted hereon all such changes and modifications as may reasonably and properly be included within the scope of my contribution to the art.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a timer apparatus of the type wherein a control mechanism is coupled to be driven by a motor via a gear train including first and second meshed gears, the improvement therein of means for varying the gear ratio of said first and second gears to vary the rate at which said motor drives said control mechanism, wherein:

said first gear including at least two sections at positions along its axis of rotation, each section including a different number of teeth and the teeth of each section providing the same mean diameter for said first gear as the teeth in each other section; and

locking means for selectively and releasably locking one of said gears at positions along its axis of rotation to selectively mesh the teeth of said first gear

with the teeth of said second gear at different gear ratios.

2. The improvement in timer apparatus, as set forth in claim 1, wherein said first gear is mounted for rotation on a supporting shaft and said locking means includes a plurality of resilient tabs spaced along and extending from said supporting shaft for engaging a face of said first gear when such face is positioned adjacent thereto.

3. The improvement in timer apparatus, as set forth in claim 2, wherein said shaft and said tabs are formed as a unitary structure.

4. The improvement in timer apparatus, as set forth in claim 2, wherein said tabs extend at an acute angle with respect to the surface of said supporting shaft.

5. The improvement in timer apparatus, as set forth in claim 4, wherein a first group of said tabs are directed toward one end of said supporting shaft and a second group of said tabs are directed toward the other end of said supporting shaft so that said first gear may be locked between a tab of said first group and a tab of said second group.

6. Timer apparatus comprising:

a motor;
a first shaft connected to and rotated by said motor;
a first gear carried on said first shaft for rotation therewith, said first gear including sections axially thereof having different numbers of teeth, said first gear having the same mean tooth diameter at all said sections;
a second shaft mounted for rotation;
a control mechanism connected to said second shaft and operated by the rotation thereof to perform at least one control operation;
a second gear having teeth engaged with teeth of said first gear and carried on said second shaft for rotating said second shaft, one of said gears fixed to its respective shaft and the other of said gears being axially movable along its respective shaft; and
locking means for locking said axially movable gear at a selected position on its respective shaft for selecting the gear ratio between said first and second gears and the rate of operation of said control mechanism.

7. The apparatus according to claim 6, wherein said locking means includes spaced, resilient tabs extending from the shaft which carries the axially movable gear.

8. The apparatus according to claim 7, wherein said tabs and said shaft which carries the axially movable gear are constructed as a single unitary structure.

9. The apparatus according to claim 7, wherein said tabs extend at an acute angle with respect to the surface of the shaft which carries the axially movable gear.

10. The apparatus according to claim 7, wherein a first group of said tabs extend at an acute angle from the surface of and are directed toward one end of the shaft which carries the axially movable gear, a second group of said tabs extend at an acute angle from the surface of and are directed toward the other end of the shaft which supports the axially movable gear, and the axially movable gear may be positioned and releasably locked between a tab of said first group and a tab of said second group.

11. For use in a coin-operated laundry appliance of the type having a rotatable clothes receptacle, means for treating clothes within the receptacle and a coin-
operated timing device, said timing device comprising:
a rotatable shaft;
means operable upon the insertion of coins of a pre-
determined denomination to rotate said shaft in a
first direction;
a motor operable to rotate said shaft in the opposite
direction;
means coupled to said shaft for controlling the opera-
tion of said means for treating clothes;
a gear train driven by said motor and connected to
said shaft and including
a first gear having a plurality of gear sections dis-
pensed along its longitudinal axis, each of said sec-
tions including different numbers of teeth and all
sections having the same mean tooth diameter,
a second gear having teeth engageable with the teeth
of said first gear, and
means for providing relative longitudinal movement
between said two gears and releasably and select-
tively locking said two gears with respect to said
longitudinal movement to provide a selected gear
ratio therebetween.
12. In a dryer having a coin-operated control mech-
anism, said mechanism having a motor and means in-
cluding a driven gear driven by said motor for control-
ing timing operations of said dryer, an adjustable gear
driven by said motor for varying the rate at which said
motor drives said means for controlling the timing op-
erations of said dryer, said adjustable gear comprising:
an essentially cylindrical member, a first plurality of
teeth circumferentially protruding from said mem-
ber, a second plurality of teeth circumferentially
protruding from said member, said second plurality
of teeth being longitudinally spaced at a distance
from said first plurality of teeth, locking means for
locking said member in a position for engagement
of one of said first and second pluralities of teeth
with said driven gear, whereby the positioning of
said gear for engagement with said driven gear de-
termines the rate at which said motor drives said
means for controlling timing operations of said
dryer.
13. In a dryer according to claim 12, comprising a
first shaft carrying said cylindrical member, a second
shaft extending parallel to said first shaft and carrying
said driven gear; and wherein said locking means com-
prises a plurality of resilient locking tabs carried by one
of said shafts.
14. In a dryer according to claim 12, comprising a
shaft carrying said cylindrical member, said locking
means including a plurality of resilient tabs extending
from said shaft.
15. In a dryer according to claim 14, wherein said
plurality of resilient tabs are divided into two groups,
the tabs of a first of said groups extending at an acute
angle from the surface of and directed toward one end
of said shaft and the tabs of the second group extending
at an acute angle from the surface of and directed to-
ward the other end of said shaft, said cylindrical mem-
ber being axially movable and releasably locked be-
tween a tab of the first group and a tab of the second
group.