

Oct. 20, 1970

C. A. EFF ET AL

3,535,010

PROPULSION SYSTEM FOR DOMESTIC APPLIANCE

Filed Sept. 23, 1969

3 Sheets-Sheet 1

FIG. 1

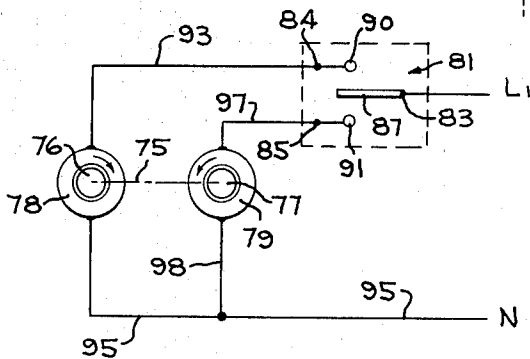
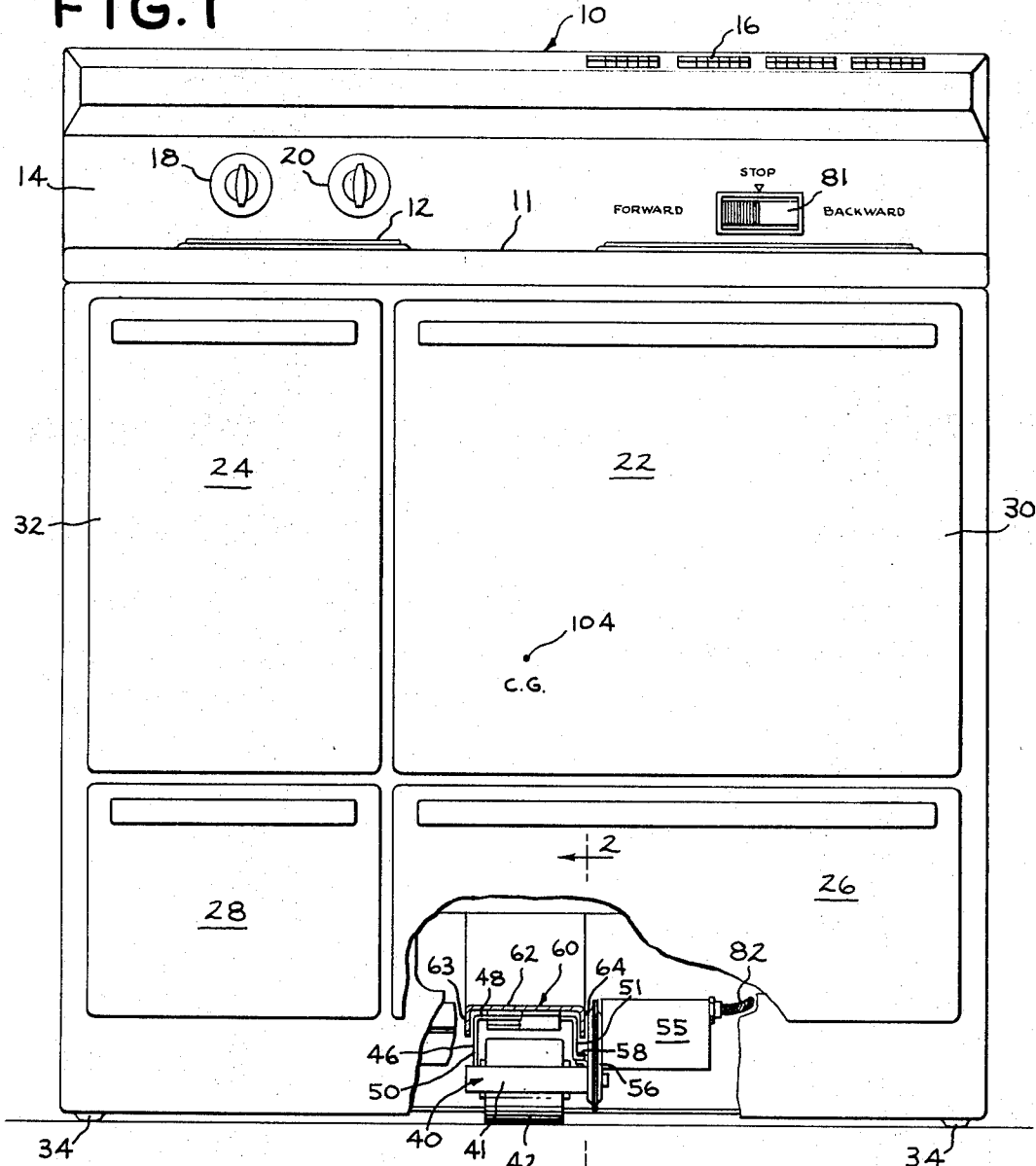


FIG. 4

INVENTORS
CHRISTIAN A. EFF
& MILTON S. WILLIAMS JR.
BY *Richard L. Caslin*
THEIR ATTORNEY

Oct. 20, 1970

C. A. EFF ET AL

3,535,010

PROPULSION SYSTEM FOR DOMESTIC APPLIANCE

Filed Sept. 23, 1969

3 Sheets-Sheet 2

FIG. 2

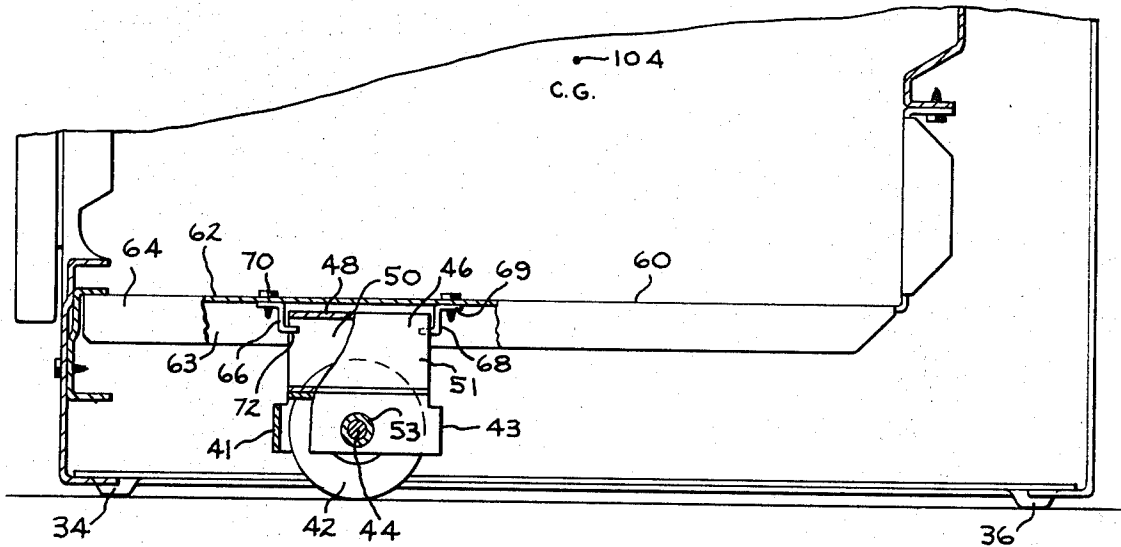
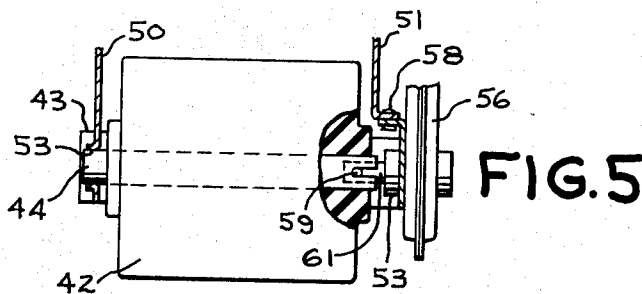
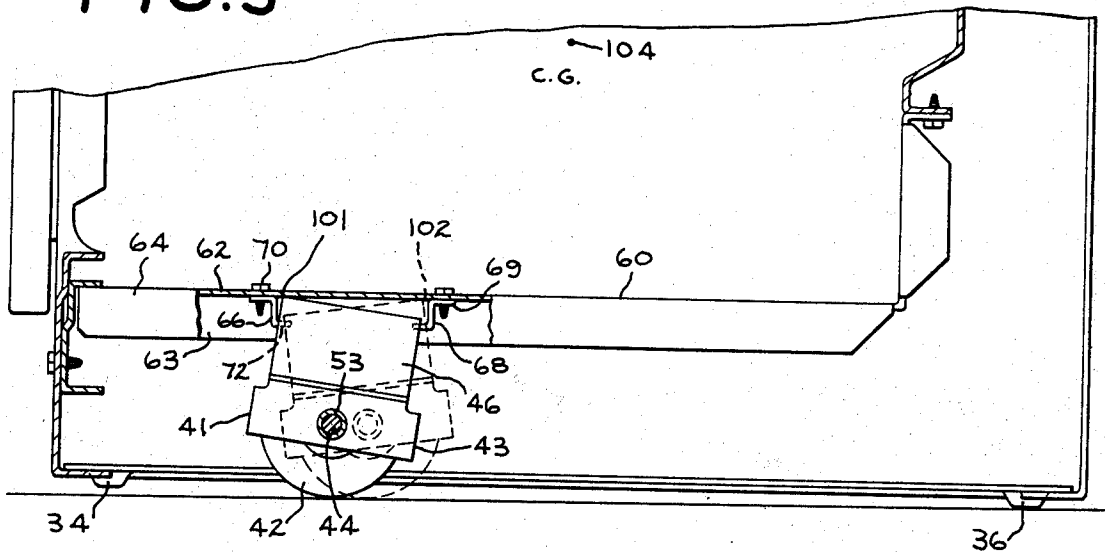


FIG. 3



INVENTORS
CHRISTIAN A. EFF
& MILTON S. WILLIAMS JR.
BY
Richard L. Caslm
THEIR ATTORNEY

Oct. 20, 1970

C. A. EFF ET AL

3,535,010

PROPULSION SYSTEM FOR DOMESTIC APPLIANCE

Filed Sept. 23, 1969

3 Sheets-Sheet 3

FIG. 6

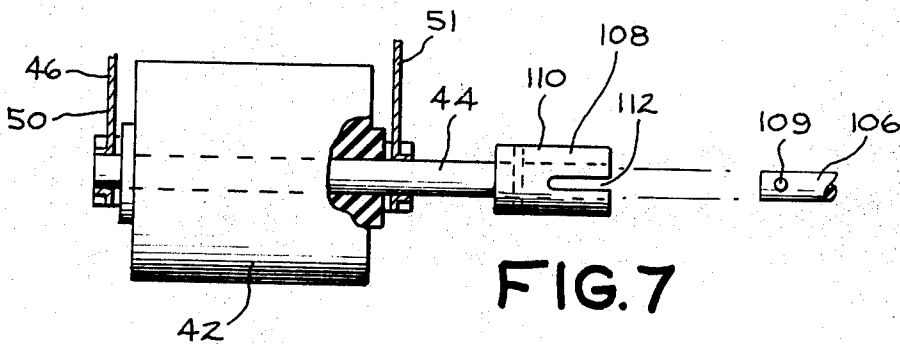
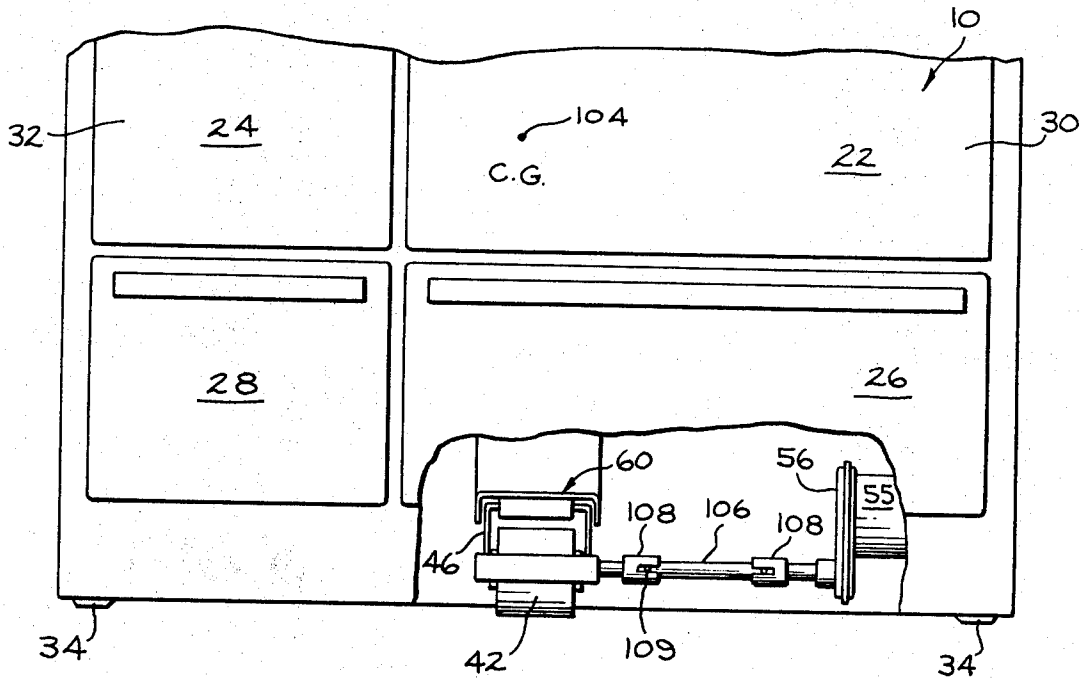


FIG. 7

INVENTORS
CHRISTIAN A. EFF
& MILTON S. WILLIAMS JR.
BY *Richard L. Caslin*
THEIR ATTORNEY

1

2

3,535,010
**PROPULSION SYSTEM FOR DOMESTIC
APPLIANCE**

Christian A. Eff and Milton S. Williams, Jr., Louisville,
Ky., assignors to General Electric Company, a corpora-
tion of New York

Continuation-in-part of application Ser. No. 706,407,
Feb. 19, 1968. This application Sept. 23, 1969, Ser.
No. 864,942

Int. Cl. A47f 9/06; A47b 95/18

U.S. Cl. 312—253

10 Claims

ABSTRACT OF THE DISCLOSURE

A propulsion system is shown on a free-standing domestic range of the type used by the housewife in the kitchen for cooking food for the family, although it will be understood by those skilled in this art that the invention has general utility in moving other bulky objects and domestic appliances such as refrigerators and automatic ironers, office equipment and bulky storage cabinets. The propulsion system is shown built into the base of the range and it includes a slow motion drive roller having a roller housing cooperating with a combined reversible electric motor and speed reduction unit. The roller housing is confined from moving in a horizontal plane about a vertical axis, but it is capable of tilting up at an angle in a front-to-back direction or plane; whereby when the motor is energized, the roller housing rises up to reduce the weight of the appliance on its supporting feet and especially at the leading edge of the moving appliance so as to drag the appliance along on its supporting feet at the trailing edge of the appliance.

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part application of our copending application Ser. No. 706,407 which was filed on Feb. 19, 1968 now abandoned, and this application is assigned to the same assignee as is the copending application.

BACKGROUND OF THE INVENTION

In the present day kitchen, many housewives are concerned about the difficulty of cleaning beneath and around the refrigerator and the free-standing range, or perhaps retrieving lost articles that fall behind or under these appliances. Very few people are capable of wrestling with the refrigerator or range and single-handedly moving it away from the wall for gaining access to the back of the appliance. Several decades ago, the electric range or gas stove was supported off the floor on long slender legs so that this access problem didn't exist, but with the cabinet type structures used on ranges and stoves today these appliances are built low to the floor and they must be moved in order to clean beneath and behind them. One difficulty in mounting the appliance on rollers to facilitate moving is to insure that the appliance does not move out of position inadvertently.

The principal object of the present invention is to provide an article of manufacture such as a cabinet or rigid frame structure with a slow motion propulsion system built into the base thereof for both back and forth movement, where a roller power means is raised to reduce the weight of the article on its supporting feet and then the power means carries the article in the direction in which it was moving.

A further object of the present invention is to provide a propulsion system of the class described with a reversible motor means utilizing a speed reduction unit and a lost motion lifting arrangement between the propul-

sion system and the cabinet so as to be able to utilize a small motor with a low starting torque and a high running torque.

A further object of the present invention is to provide a domestic appliance with a propulsion system for front or rear movement at a very slow rate of speed, where the appliance may be steered at will by exerting a small holding force at one top corner of the appliance thereby causing the appliance to turn slightly in that direction in a large sweeping arc.

A further object of the present invention is to provide a propulsion system of the class described where the motor is unloaded when it is de-energized and there is a short time delay before the full load is applied to the motor after it is energized thereby affording sufficient time for the motor to reach its running speed before the load is applied to the motor.

A still further object of the present invention is to provide a propulsion system of the class and described which may be installed in the base of a cabinet without requiring substantial alterations in the cabinet to accommodate the propulsion system.

SUMMARY OF THE INVENTION

The present invention, in accordance with one form thereof, relates to an article of manufacture having a body with a base provided with a plurality of supporting feet. The base includes a propulsion system for moving the body in both front and rear directions. The system includes a drive roller with a roller housing that cooperates with a reversible electric motor and speed reduction unit. The roller housing is mounted to the base so that the housing is incapable of moving in a horizontal plane about a vertical axis, but is capable of rising in a plane along the direction of movement of the body so that when the motor is energized the roller housing will rise slowly to reduce the weight of the appliance on its supporting feet and then will carry the article in the direction in which it was moving.

BRIEF DESCRIPTION OF THE DRAWINGS

Our invention will be better understood from the following description taken in conjunction with the accompanying drawings and its scope will be pointed out in the appended claims.

FIG. 1 is a front elevational view of a free-standing electric range with parts broken away at the base to show the propulsion system of the present invention in the at-rest mode where the weight of the range is not carried by the drive roller and hence the motor will be unloaded at the moment when it is first energized.

FIG. 2 is a fragmentary cross-sectional, side elevational view of the base of the range taken on the lines 2—2 of FIG. 1, and showing the drive roller and the surrounding roller housing and the tiltable connection or lost motion lifting arrangement between the roller housing and the base of the range.

FIG. 3 is a view similar to that of FIG. 2 showing the propulsion system in its moving or working mode after the motor has been energized and the roller is turning and the roller housing rises to reduce the weight of the range on its supporting feet and, as shown, carry the front of the range off the floor and drag the range on the feet at the trailing edge of the range.

FIG. 4 is a schematic wiring diagram for the reversible motor of the propulsion system of the present invention.

FIG. 5 is an enlarged detail view of the roller, and the method of connecting its supporting axle to the speed reduction unit, and the bearings of the roller housing with respect to the roller.

FIG. 6 is a fragmentary front elevational view, similar

to that of FIG. 1 of a second modification of this invention showing the drive motor and speed reducing unit mounted stationary with respect to the range remote from the drive roller and joined therewith by an extended drive shaft with a pair of universal joints to overcome the alignment problem.

FIG. 7 is a fragmentary view on an enlarged scale showing the drive roller and the type of simple universal joint employed in the drive shaft.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to a consideration of the drawings, and in particular to FIG. 1, there is shown a standard double oven, free-standing electric range 10 as one example of an article of manufacture with which the propulsion system of the present invention may be incorporated. The range has a top cooking surface 11 supporting a plurality of surface heating elements 12, a backsplash 14 positioned above the cooktop and along the back edge thereof for incorporating the various range control components such as multiple pushbutton switches 16 each for controlling one of the surface heating elements 12, and an oven selector switch 18 for choosing one of several heating circuits having different rates of heating, and an oven thermostat 20 for controlling the temperature within the oven. The particular range 10 that is illustrated is a 40 inch wide range having a master oven 22 and a smaller companion oven 24 arranged at the side thereof. As an alternative on the lower cost range models, this companion oven 24 could be merely a storage drawer. Positioned beneath ovens 22 and 24 are storage drawers 26 and 28 respectively for the storage of pots and pans and other cooking utensils. As a general rule the two ovens 22 and 24 would have front-opening drop-doors 30 and 32 respectively, while the storage drawers 26 and 28 are pullout drawers that function in the manner of a desk drawer. Notice in the front view of FIG. 1 and the side view of FIG. 2 that the range is supplied with supporting feet or embossed cups 34 and 36 at the four corners of the base of the range. The two front feet are marked 34, and the two rear feet are marked 36 for purposes of this description. Many appliances such as ranges have adjustable leveling screws (not shown) as the supporting feet at the front thereof, because the floor is not always flat or level and it is of importance to have the cooktop 11 level and the range stable. Many kitchen floor coverings have soft surfaces, and the ordinary supporting feet tend to sink into the surface. Hence, a possible modification would be to substitute simple rollers for two or more of the supporting feet.

Looking at the front view of FIG. 1, the propulsion system 40 of the present invention includes a wide track drive roller 42 which carries a roller housing 46 that overhangs the roller. The roller housing 46 is of generally inverted U-shape formation when viewed from the front or the back, and it has a top wall 48 and a pair of parallel side walls 50 and 51. Each side wall 50 and 51 has a journal bearing 53 in which the axle 44 of the roller rotates, as in seen in FIG. 5. For the sake of strength and rigidity, front and rear straps 41 and 43, respectively, join the side walls 50 and 51. The roller housing 46 supports a combined reversible motor 55 and speed reduction unit 56 for connection to and the driving of the roller axle 44. Notice in FIG. 5, the side wall 51 of the roller housing 46 has a fastener 58 joining the roller housing to the cover of the speed reduction unit 56. There is a slip joint at 59 between the end of the roller axle 44 and the shaft of one of the driving gears (not shown) of the speed reduction unit 56. Thus the bearing 53 of the side wall 51 is shown supporting a stub shaft 61 of the axle 44; but, in actuality, the axle 44 and its stub shaft 61 may be considered in total as the roller axle.

It is desirable that the weight of the range 10 be not

carried on the drive roller 42 when the range is in a fixed or parked position. This avoids an unstable condition where otherwise the range might be able to see-saw on the roller when extra weight is applied. Also, this avoids the possibility of the roller 42 sinking into a soft kitchen linoleum surface and developing a sink hole. Without the weight of the range on the roller, the load is disconnected from the drive motor 55. The preferred manner of accomplishing this result may be understood by studying the technique of attaching the propulsion system to the base of the range. First it will be recognized that the range is designed to move in either front or back directions as is evident from the showing in FIG. 2 where the roller axle 44 extends in a direction transverse of the range. The range is furnished with a fixed supporting member in the form of an inverted channel beam 60 which extends in a horizontal plane from front-to-back of the range and is supported at its opposite ends from the range body, as is best seen in FIG. 2. This inverted channel member 60 has a top wall 62 and a pair of parallel, downwardly extending side walls 63 and 64. The side walls 63 and 64 are spaced by a distance only slightly greater than the distance between the side walls 50 and 51 of the inverted U-shaped roller housing 46. Thus, the side walls 63 and 64 serve as restraining means to prevent the roller housing from turning in a horizontal plane about an imaginary vertical axis through the roller. Hence, the roller is held or restrained from movement except in front-to-back directions which, of course, are the desired directions of movement of the range. It will be understood by those skilled in this art that the propulsion system of the present invention could be used on a structure where it would be desirable to move the structure in side-to-side directions rather than in front-to-back directions as outlined above, and this can be accomplished simply by repositioning the propulsion system and its supporting structure at right angles to its present position as illustrated in the drawings.

Turning now to a consideration of the method of assembling the propulsion system 40 to the channel-shaped supporting beam 46, attention is directed to the right side elevational view of FIG. 2. There is vertical lost motion built into the connection between the roller housing 46 and the range channel 60 by means of bracket members 66 and 68 which are fastened to the channel 60 fore and aft of the roller housing 46. Each bracket 66 and 68 is shown as having a Z-shaped, transverse cross-section, where a top flange 69 of each bracket underlies the top wall 62 of the channel and is fastened thereto by means of fastening screws 70. A bottom flange 72 of each bracket underlies the top wall 48 of the roller housing 46. This bottom flange or ledge 72 is spaced from the top wall 62 of the supporting channel 60 by a distance of about $\frac{3}{4}$ of an inch so that there is slack or play between the top wall 48 of the roller housing 46 and the top wall 62 of the channel support member. The propulsion system is so dimensioned that in the at-rest or parked condition the drive roller 42 merely rests on the floor and the top wall 48 of the roller housing 46 is more or less centered between the top wall 62 of the channel support member 60 and the underlying ledges 72 of the brackets 66 and 68, as is clearly seen in FIGS. 1 and 2.

The electrical power circuit for the reversible drive motor 55 is illustrated in the schematic diagram of FIG. 4. As an example of simplicity, low cost and low power, two small motors such as are used for driving the rotisserie spit of an oven are combined in a reversed manner. There is an elongated shaft 75 shown diagrammatically in FIG. 4 and it carries a pair of spaced rotors 76 and 77 which are adapted to rotate in stators 78 and 79, respectively. One stator such as 78 would be the clockwise stator causing the shaft 75 to turn in the clockwise direction, and the alternate stator 79 would cause the shaft 75 to turn in the counterclockwise direction.

5

Accordingly, the reversible drive motor 55 has been assembled out of low cost fractional horsepower, rotisserie motors so that it is in effect two motors with a common shaft; one for turning the shaft in one direction and a second for turning the shaft in the opposite direction. Obviously, other readily available reversible motors could also be used in this application.

There is a three position motor control switch 81 fed by a line wire L1 of a two wire, 120 volt A.C. supply cable. The switch has a single line terminal 83 and two load terminals 84 and 85. The switch has a manually operated contact blade 87 and two fixed contacts 90 and 91. There is a lead wire 93 connected from load terminal 84 of the switch 81 to the stator 78, and a second lead wire 95 connected between the stator 78 and the neutral conductor N of the supply cable 82. As to the remaining stator 79, there is a lead wire 97 joining the stator 79 to the load terminal 85 of the switch, and a lead wire 98 connecting the stator 79 to the lead wire 95 and finally to neutral conductor N. The lead wires 93 and 97 and the neutral conductor 95 are bound together in a three wire motor control cable 82. Looking at FIG. 1, the three position motor control switch 81 is mounted in the control panel of the backplasher 14 of the range. The movable contact blade 87 is acted upon by a switch actuator 100 that has a rocking action with a central STOP position as shown in FIG. 4 and a FORWARD position connecting the movable contact blade 87 with the fixed contact 91, and a BACKWARD position connecting the movable contact blade 87 and fixed contact 90.

Turning to FIG. 3, which illustrates the operative or running mode of the propulsion system, the drive roller 42 is shown turning in the counterclockwise or FORWARD direction at a slow rate of speed of about 4 to 6 revolutions per minute, and in so doing this causes the roller housing 46 to tilt upwardly in a clockwise direction in slow silent motion until the frontmost edge of the top wall 48 of the roller housing 46 engages the top wall 62 of the channel support member 60 at line 101. The small motor 55 will have enough time delay to come up to full speed, and it will have enough torque to reduce the weight of the range on its supporting feet, and in the majority of cases will raise the front of the range off the floor so that the front supporting feet 34 will be suspended in space, as is shown in FIG. 3. The roller 42 will continue to turn as long as the motor is energized thereby so that the system literally carries the range on its back so to speak and drags the range on the rear supporting feet 36 at the trailing edge of the range. When the motor 55 is de-energized the motor stops turning, but the weight of the range returns the roller housing 46 to its at-rest position of FIG. 2 by driving the motor in the reverse direction. It is possible to detect with the naked eye the slight relaxation or lowering of the ranges as the roller housing 46 moves from the position of FIG. 3 to the position of FIG. 2.

The action of the propulsion system 40 moving in the BACKWARD direction is just the reverse of the action in the above described FORWARD direction. This is as shown in dotted lines in FIG. 3, where the roller housing 46 would tilt in the counterclockwise direction and engage the top wall 62 of the channel 60 along line 102.

Notice that the drive roller 42 is positioned closely adjacent an imaginary vertical line drawn through the center of gravity (C.G.) 104 of the range 10 so that the leading edge of the range doesn't tip down when the roller is in its driving mode. Of course, the center of gravity of the range will vary depending on what external loads are applied to the range by way of storing cooking utensils in the lower drawers 26 and 28, by containers of food placed in the ovens 22 and 24 and finally by containers of food supported on the cooktop 11. Also, the oven doors 30 and 32 when placed in the open position would move the center of gravity. Thus under some unusual conditions the roller 42 might push the range

6

on the supporting feet at the leading edge of the range.

A second modification of the present invention is shown in FIGS. 6 and 7 where the drive motor 55 is not supported from the roller housing 46, but is positioned remote from the drive roller 42 in a stationary position. Suitable motor mounting means (not shown) would fasten the motor in an out-of-the-way location. The speed reduction unit or gear box 56 is shown joined with the motor 55 although this is a matter of choice as it could also be allowed to remain in its position of FIG. 1.

An extended drive shaft 106 is connected between the gear box 56 and the roller axle 44 although it will be understood by those skilled in this art that a length of flexible shaft or hose (not shown) could be used for joining the motor 55 with the roller 42.

The drive shaft 106 must be designed to accommodate the limited movements of the roller housing 46 as is best illustrated in FIG. 3. Hence, a simple type of universal or slip joint 108 is used at the two ends of the extension shaft 106 so that the shaft may have an angular displacement. Looking at FIG. 7, the end of the extension shaft 106 is provided with a through-pin 109, while the end of the roller axle 44 is supplied with a socket 110 that is capable of loosely receiving the end of the shaft 106. The end of the socket 110 is notched diagonally as at 112 for receiving the two ends of the pin 109 therein. Because of the loose fit of the shaft 106 in the socket 110 the shaft is capable of angular displacement with relation to the socket 110 and hence the roller axle 44. The universal or slip joint 108 at the opposite end of the extension shaft 106 may be made the same way as the joint 108 of FIG. 7. Thus the shaft 106 acts as a flexible shaft means as would an overall flexible shaft or a piece of hose.

It should be apparent to those skilled in this art that we have described what, at present, is considered to be the preferred embodiments of this invention in accordance with the patent statutes. Changes may be made in the disclosed invention without actually departing from the true spirit and scope of this invention.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. A domestic appliance having a cabinet structure with a generally rectangular base portion having supporting feet adjacent the corners thereof, and propulsion means located in the base portion for moving the appliance in both forward and reverse directions, said propulsion means including a drive roller means cooperating with both a speed reducing means and a reversible electric motor, said drive roller means including a metal housing, the said base portion having a mating and interlocking socket means for receiving the said roller housing with limited vertical adjustable movement therebetween, whereby when the motor is energized and the roller turns the housing for the roller means will be tilted at an upward angle in the direction of movement at a slow rate of motion about a horizontal axis through the centerline of the roller means to partially jack up the appliance and reduce the weight of the appliance on its supporting feet and carry it along.

2. An article of manufacture having a body with a base portion that includes a four point support system adjacent the extremities thereof, and propulsion means located in the base portion for moving the body in both forward and reverse directions, said propulsion means including a stationary supporting means and a drive roller means with a roller housing that is loosely connected to the supporting means so as to be restricted against turning movement in a horizontal plane about an imaginary vertical axis through the roller while being capable of limited vertical movement as well as a tilting movement of the roller housing in the front-to-back direction about a horizontal axis through the centerline of the roller means, the roller housing supporting a combined reversible motor and speed reduction means for driving the said roller means, whereby when the motor means is energized the torque of the motor will cause the roller housing to experience an upward

7

tilting movement in a direction opposite to the direction of rotation of the roller means thereby lifting some of the weight of the body off of the four points of the support system.

3. An article of manufacture comprising a body with a base having a plurality of supporting feet resting on the ground, and a propulsion means located in the base for moving the body in back and forth directions, the propulsion means including a drive roller resting on the ground and provided with an overhead housing, the base having a pair of parallel walls extending in the direction of movement of the body and in close proximity to the roller housing to restrain the housing from turning in a horizontal plane about an imaginary vertical axis through the drive roller, the base having attaching means with vertical slack for holding the roller housing to the base, a combined reversible motor and speed reduction unit supported from the roller housing for driving the roller, whereby when the motor is energized the torque of the motor will cause the roller housing to tilt up at an angle about the axis of rotation of the roller in a direction opposite to the direction of rotation of the roller at a slow rate of speed thereby lifting the weight of the body at the leading edge of the moving body and pulling the body on the supporting feet at the trailing edge of the body.

4. An article of manufacture comprising a body with a base having a plurality of supporting feet resting on the ground, and a propulsion system built into the base for driving the body in back and fourth directions, the propulsion system including a drive roller resting on the ground and provided with an overhead housing supporting an axle upon which the roller is supported, a combined reversible motor and speed reduction unit mounted on the housing for turning the said axle, a flexible electric power cable connected to the motor, the base having a saddle with side restraining means fitted over the roller housing to prevent the housing from turning in a horizontal plane about an imaginary vertical axis through the roller, the saddle including bracket means cooperating with the roller housing to permit limited vertical lost motion between the housing and the saddle, the top portion of the roller housing assuming a generally central position vertically with respect to the bracket means when the motor is inoperative, whereby when the motor is energized the roller housing will tilt upwardly above the longitudinal axis of the roller axis in a direction opposite to the direction of rotation of the roller until the housing engages the saddle and lifts and carries the weight of the body at the leading edge of the moving body while dragging the body on its supporting feet at the trailing edge of the body.

5. An article of manufacture as recited in claim 4 wherein the saddle is an inverted channel member, and the roller housing is also an inverted channel member having journal bearings for receiving the roller axis therein, the bracket means comprising angle brackets fastened to the channel and underlying the top portion of the roller housing channel in a loose fitting relationship.

6. A free-standing domestic appliance comprising a body with a rectangular base having a supporting foot adjacent each of the four corners thereof, and a propulsion system built into the base for driving the appliance in front and back directions, the propulsion system comprising a floor engaging drive roller and a combined reversible motor and speed reduction unit for driving the roller at a slow rate of speed, the roller being positioned closely adjacent an imaginary vertical line through the center of gravity of the appliance, the roller having an axle extend-

8

ing therethrough, a housing overhanging the roller and containing journal bearings receiving the ends of the axle, the housing having the said motor and speed reduction unit mounted thereto, the said base having an inverted socket in which the roller housing is fitted, and lost motion assembly means joining the roller housing to the base so that the housing is capable of limited tilting action within the socket in the front and back directions, whereby when the motor is energized the torque of the motor causes the roller housing to tilt upwardly in a direction opposite to the direction of rotation of the roller to assume and carry most of the weight of the appliance especially at the leading edge of the appliance.

7. A free-standing domestic appliance as recited in claim 6 wherein the said inverted socket is in the form of a channel member extending from front to back of the appliance, the roller housing fitting closely into the channel member and being prevented from turning in a horizontal plane about an imaginary vertical axis through the roller, the lost motion assembly means comprising bracket members fastened to the channel member fore and aft of the roller housing and underlying a portion of the roller housing while leaving a small clearance between the top of the roller housing and the top of the channel member.

8. An article of manufacture having a body with a base portion that includes a plurality of supporting feet, and propulsion means located in the base portion for moving the body in both forward and reverse directions, said propulsion means including a stationary supporting means and a drive roller means with a roller housing that is loosely connected to the supporting means so as to be substantially restricted against turning movement in a horizontal plane about an imaginary vertical axis through the roller while being capable of limited vertical movement as well as a tilting movement of the roller housing in both the front and rear directions about a horizontal axis through the centerline of the roller means, and a reversible motor and speed reduction means cooperating with the roller means for driving the same, whereby when the motor means is energized the torque of the motor will cause the roller housing to experience an upward tilting movement in a direction opposite to the direction of rotation of the roller means thereby lifting some of the weight of the body off of the nearest supporting feet so as to move the body with a slow motion on the remaining feet of the body.

9. An article of manufacture as recited in claim 8 wherein the reversible motor means is mounted stationary with respect to the said body and remote from the said roller housing, the motor means having a flexible shaft means connecting the motor to the drive roller means.

10. An article of manufacture as recited in claim 9 wherein the said flexible shaft means is an extended drive shaft having a universal joint at each end.

References Cited

UNITED STATES PATENTS

2,803,510	8/1957	Carbury	312—253
2,874,971	2/1959	Devery	312—249
3,297,336	1/1967	Lassen	280—43.21
3,380,546	4/1968	Rabjohn	180—65

CASMIR A. NUNBERG, Primary Examiner

U.S. Cl. X.R.

180—15, 60