Aug. 4, 1964 B. T. WALL 3,143,296

DISHWASHER IMPELLER ASSEMBLY HAVING A CHANGE OF PACE MECHANISM THEREFOR

Filed Nov. 16, 1962 4 Sheets-Sheet 1

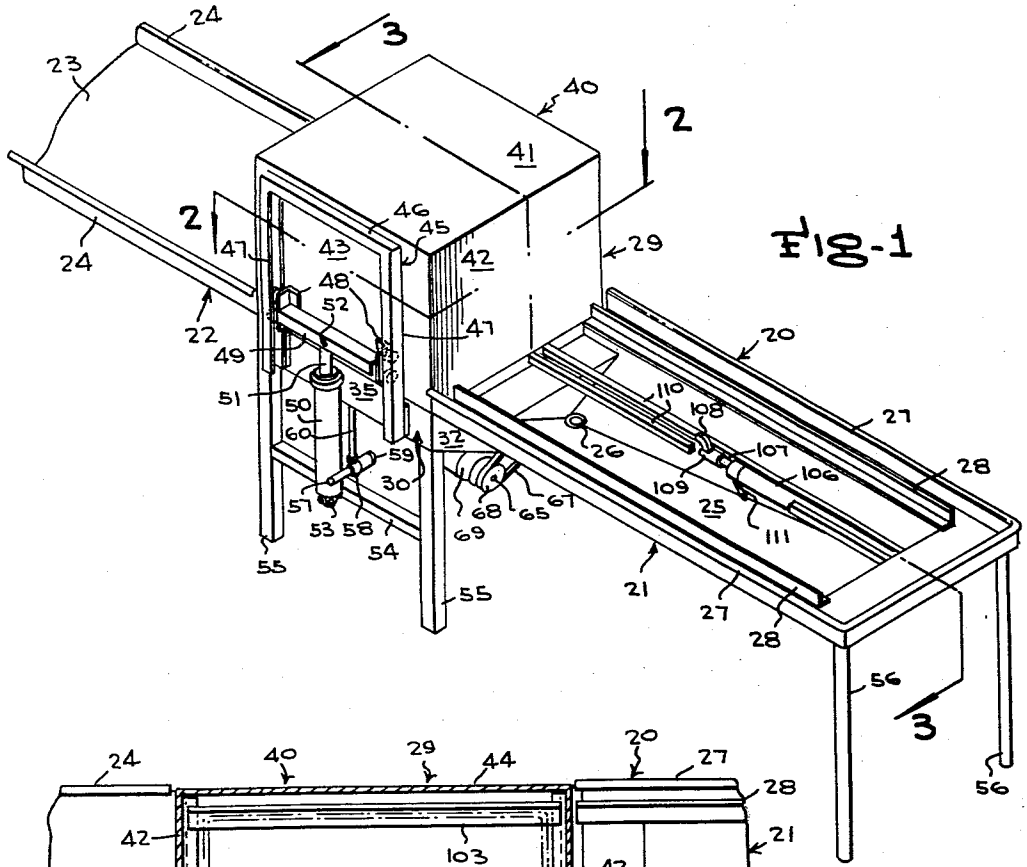


FIG-1

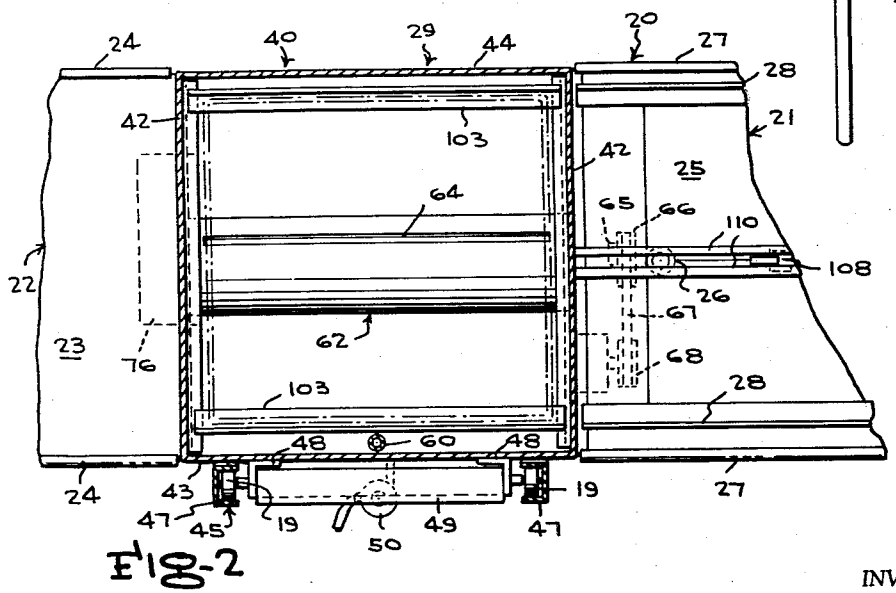


FIG-2

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Aug. 4, 1964 B. T. WALL 3,143,296

DISHWASHER IMPELLER ASSEMBLY HAVING A CHANGE OF PACE MECHANISM THEREFOR

Filed Nov. 16, 1962 4 Sheets-Sheet 2

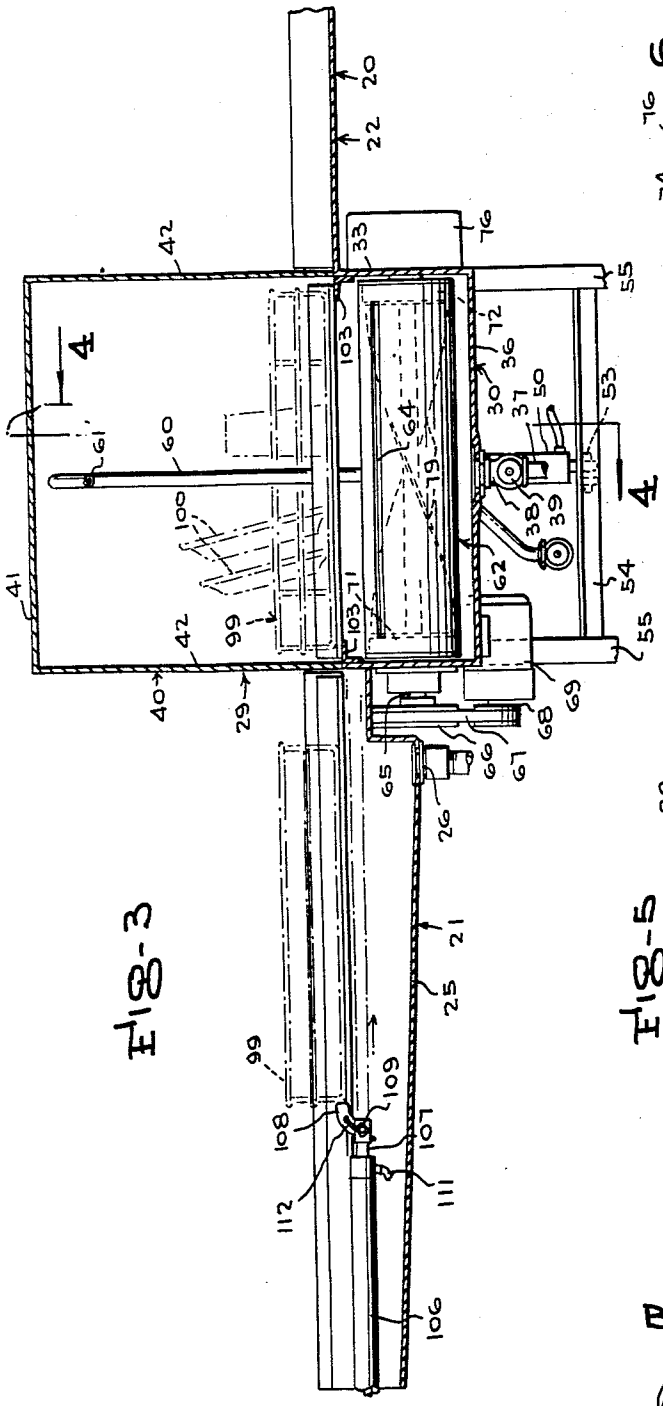


FIG-3

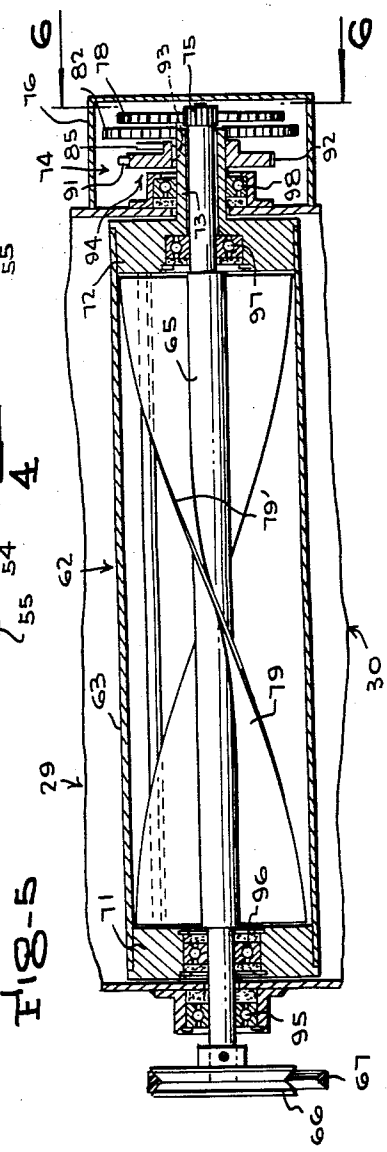


FIG-5

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Aug. 4, 1964 B. T. WALL 3,143,296

DISHWASHER IMPELLER ASSEMBLY HAVING A CHANGE OF PACE MECHANISM THEREFOR

Filed Nov. 16, 1962 4 Sheets-Sheet 3

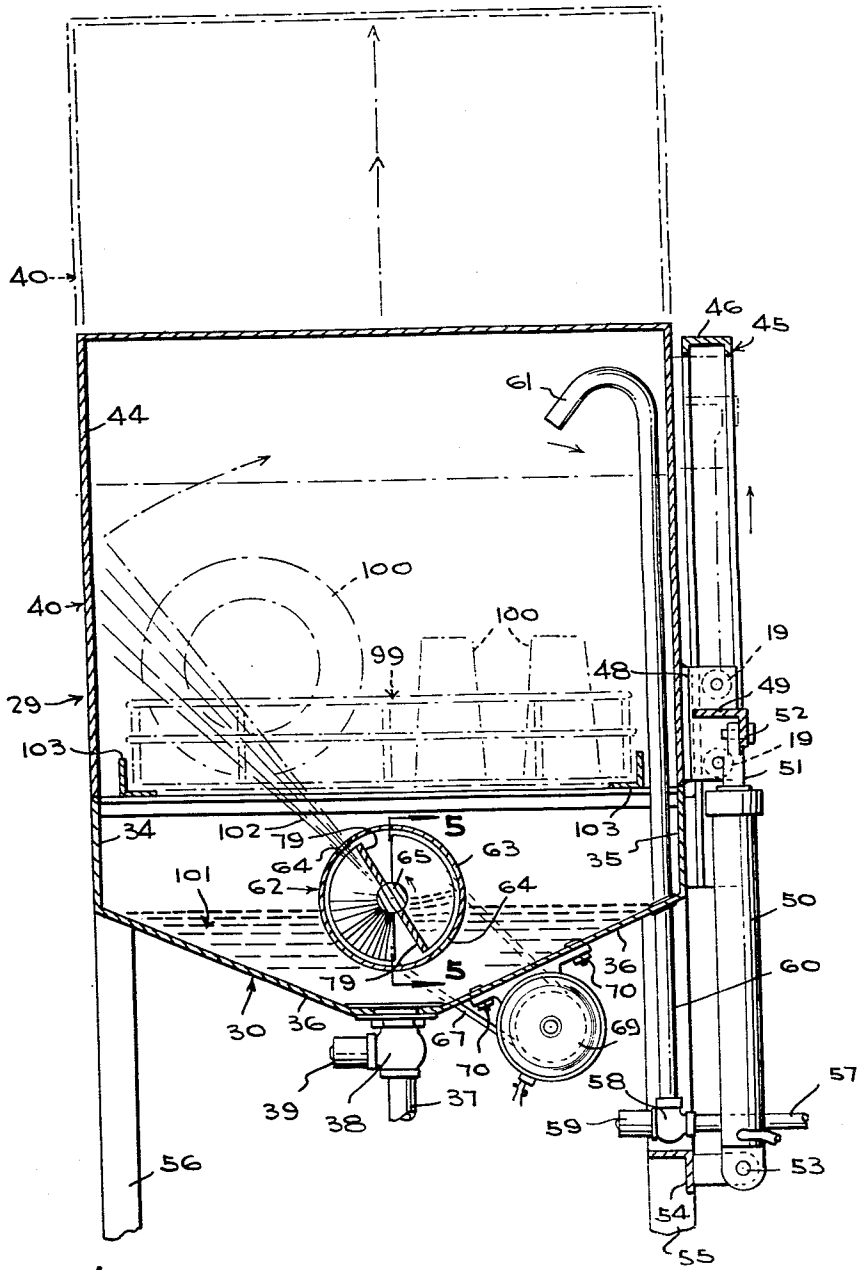


FIG-4

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Aug. 4, 1964 B. T. WALL 3,143,296

DISHWASHER IMPELLER ASSEMBLY HAVING A CHANGE OF PACE MECHANISM THEREFOR

Filed Nov. 16, 1962 4 Sheets-Sheet 4

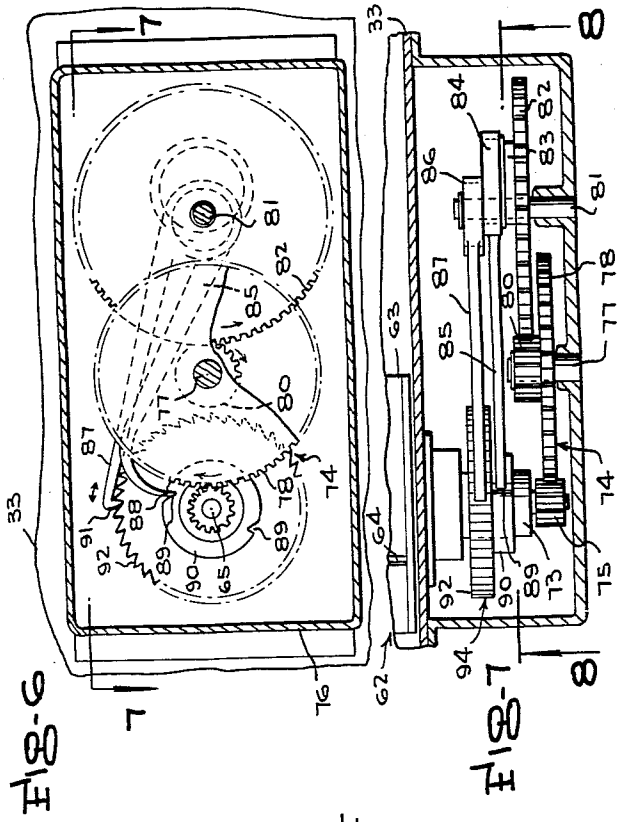


FIG-6

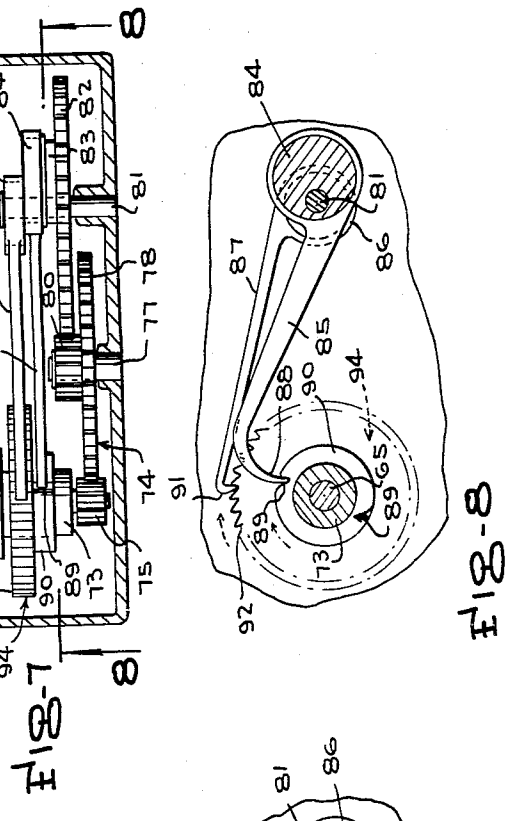


FIG-7

FIG-8

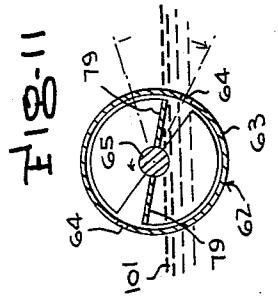


FIG-11

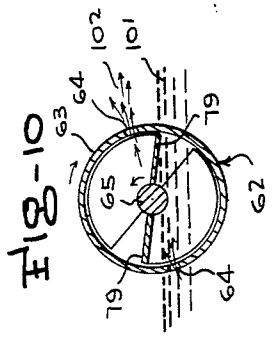


FIG-10

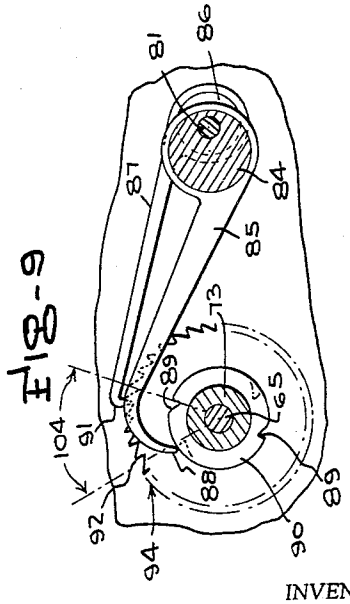


FIG-9

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United States Patent Office 3,143,296 Patented Aug. 4, 1964

3,143,296

DISHWASHER IMPELLER ASSEMBLY HAVING A CHANGE OF PACE MECHANISM THEREFOR

Byron T. Wall, Flushing, N.Y., assignor, by mesne assignments, to New Jersey Bank and Trust Company, Paterson, N.J., a New Jersey banking corporation

Filed Nov. 16, 1962, Ser. No. 238,162
6 Claims. (Cl. 239—242)

This invention relates to a dishwashing machine, and more particularly to a dishwashing machine which utilizes an impeller to direct a suitable quantity of liquid or water over the dishes or other articles being washed whereby such articles can be washed or cleaned in the most efficient or advantageous manner.

The primary object of the present invention is to provide a dishwasher which is constructed so that articles such as dishes which are to be washed can be conveniently positioned in proper location to receive a suitable quantity of hot water which is delivered from an impeller, the impeller including an outer cylindrical housing which revolves or rotates in one direction, and wherein there is provided within the housing of the impeller, vanes which revolve independently from the housing, and wherein the vanes turn at a high speed so that water will be discharged out through slots in the housing with a high velocity and under high pressure so as to insure that the dishes or other articles can be readily cleaned thoroughly in a minimum amount of time and with a minimum amount of effort.

A further object is to provide a dishwashing machine of the type stated which may utilize massive water flow to facilitate cleaning of the dishes or other articles, and wherein the present invention is particularly adaptable or suitable for commercial installations wherein large quantities of dishes or other articles are to be washed or cleaned thoroughly in a relatively short period of time and with a minimum amount of cost.

A still further object of the present invention is to provide a dishwasher which includes an impeller that revolves in a housing which has slots placed opposite to each other, and wherein the housing rotates slowly in a controlled sweeping motion directing fluid thrown off the inner impeller in a predetermined direction, and wherein the dishwasher of the present invention also includes a change of pace mechanism to minimize ineffective periods of direction of the flow of fluid, and wherein there is also provided a power operated hood which is adapted to be lifted or actuated by a cylinder mechanism.

Still another object is to provide such a dishwashing machine that is economical to manufacture and efficient in operation and which is rugged in structure and foolproof in use.

These and other objects of the invention will become apparent from a reading of the following specification and claims, together with the accompanying drawing, wherein like parts are referred to and indicated by like reference characters and wherein:

FIG. 1 is a fragmentary perspective view illustrating the dishwashing machine of the present invention, and with parts broken away.

FIG. 2 is a sectional view taken on the line 2—2 of FIG. 1.

FIG. 3 is a sectional view taken on the line 3—3 of FIG. 1.

FIG. 4 is a sectional view taken on the line 4—4 of FIG. 3.

FIG. 5 is a sectional view taken on the line 5—5 of FIG. 4.

FIG. 6 is a sectional view taken on the line 6—6 of FIG. 5.

FIG. 7 is a sectional view taken on the line 7—7 of FIG. 6.

FIG. 8 is a sectional view taken on the line 8—8 of FIG. 7.

FIG. 9 is a view generally similar to FIG. 8 but showing the parts in a different position.

FIG. 10 is a transverse sectional view taken through the impeller.

FIG. 11 is a view similar to FIG. 10 but showing the parts in a different or advanced position.

Referring in detail to the drawings, the numeral 20 indicates a portion of a table which includes an inlet side that is indicated generally by the numeral 21 and an outlet side 22. The outlet side 22 is of generally flat horizontal construction as indicated by the numeral 23, and upstanding flanges 24 are arranged contiguous to the flat surface or section 23, FIG. 1. The inlet side 21 has a somewhat recessed surface or portion 25 to facilitate drainage of water or waste material into a drainage outlet 26, and there is also provided upstanding flanges 27 on the inlet side or section 21. The numeral 28 designates spaced parallel horizontally disposed guide members which are suitably affixed on the inlet side 21 for a purpose to be later described.

As shown in the drawings there is provided a dishwashing machine which is indicated generally by the numeral 29, and the dishwashing machine 29 is interposed between the inlet and outlet sides 21 and 22. The dishwasher 29 includes a lower fluid compartment which is indicated generally by the numeral 30, FIG. 4, and the compartment 30 is defined by vertically disposed side walls 32 and 33 as well as by vertically disposed end walls 34 and 35 and inclined bottom wall portions 36, and the numeral 37 indicates a drain which is connected to the lower portion of the compartment 30. A valve 38 is arranged in the drain 37, and a solenoid 39 is adapted to be provided for controlling the opening or closing of the valve 38 in order to provide a means for controlling the discharge of water out through the drain 37.

The numeral 40 indicates a vertically adjustable hollow cover which is mounted for up and down movement towards and away from the fluid compartment 30, and as shown in the drawings the cover 40 includes a horizontally disposed top portion 41 as well as spaced parallel vertically disposed side portions 42 and spaced parallel vertically disposed end portions 43 and 44.

The numeral 45 indicates a channel member or track member of generally U-shaped formation, and the member 45 includes spaced parallel vertically disposed side sections 47 as well as a horizontally disposed top section 46, and the lower portions of the side sections 47 are adapted to be secured as by welding to the end wall 35 of the compartment 30.

The numeral 48 indicates spaced apart body pieces which are suitably affixed to the end portion 43 of the cover 40, and a horizontally disposed cross piece 49 is connected to the body piece 48. Rollers 19 are connected to the body pieces 48, and the rollers 19 are adapted to move or travel in the track sections 47. The numeral 50 indicates a vertically disposed cylinder which has a piston or rod 51 adjustably connected thereto, and the upper end of the piston rod 51 is connected as at 52 to the cross piece 49. The lower end of the cylinder 50 is connected as at 53 to a horizontally disposed brace 54, and the brace 54 is suitably affixed to vertically disposed legs 55. As shown in FIG. 1 other legs 56 may be provided where desired or required for supporting the various portions of the table.

As shown in FIG. 4 there is provided a fluid or water inlet line 57 which is adapted to be connected to a suitable source of supply of water, and a valve 58 is provided

for controlling the inflow of water through the line **57**, there being a solenoid **59** for controlling actuation or opening and closing of the valve **58**. The numeral **60** indicates an upstanding pipe or water discharge member which extends up through the compartment **30**, and the member **60** has its upper end terminating in a downwardly directed discharge end portion **61** which is adapted to discharge water downwardly into the compartment **30** at the proper time.

The numeral **62** indicates an impeller which is arranged in the compartment **30**, and the impeller **62** includes a cylindrical housing **63** which is provided with a pair of diametrically opposed elongated slots **64** therein, FIG. 4. The numeral **65** indicates a drive shaft which extends longitudinally through the housing **63**, FIG. 5, and a pulley **66** is mounted on one end of the shaft **65**, there being an endless belt **67** trained around the pulley **66**. The numeral **68** indicates a pulley which is adapted to be driven by a suitable motor **69** which may be arranged and supported in a suitable location, as for example the motor **69** may be supported as at **70** adjacent the bottom of the compartment **30**.

Spaced parallel circular end pieces **71** and **72** are mounted in the ends of the housing **63**, and as shown in FIG. 5 the end piece **72** has a cylindrical hub **73** integral therewith. The numeral **74** indicates a gear train or gear mechanism which includes a first gear **75** which is suitably affixed to an end of the drive shaft **65**, and the numeral **76** indicates a gear box or cover which is adapted to have a stub shaft **77** connected thereto, FIG. 7, there being a gear **78** mounted on the shaft **77**, and the gear **78** meshes with the gear **75**. As shown in FIG. 5 for example, vanes **79** are suitably affixed to the shaft **65**, and the vanes **79** are adapted to revolve or rotate independently of the housing **63**.

The numeral **80** indicates a gear which is integral with the gear **78**. The numeral **81** indicates a stub shaft which is suitably connected to the casing **76**, and a gear **82** is rotatably mounted on the stub shaft **81**, the gear **82** meshing with the gear **80**. An off-center shoulder **83** is integral with the gear **82**, and superposed offset cams **84** and **86** are integrally formed with the shoulder **83**. The numeral **85** indicates a ratchet arm which extends from the cam **84** and which is formed integral therewith or secured thereto, and there is also provided a similar ratchet arm **87** which extends from the cam **86** and which is affixed thereto.

As shown in FIG. 8 for example, the arm **85** terminates in a curved finger **88** which is adapted to selectively engage diametrically opposed notches or grooves **89** in a sleeve portion **90** which forms an integral part of a toothed gear wheel **94**. The other ratchet arm **87** has its outer end terminating in a hook or finger **91** which is adapted to engage teeth **92** on the outer periphery of the gear wheel **94**, and as shown in FIG. 5, the gear wheel **94** is adapted to be keyed as at **93** to the hub **73**.

As shown in FIG. 5, suitable bearings **95**, **96**, **97** and **98** are provided to insure that the rotating parts can turn with a minimum of friction and in the desired manner.

In the drawings the numeral **99** indicates a rack or tray which is adapted to hold or support the articles such as the dishes **100** which are to be washed in the machine of the present invention, and the numeral **101** indicates the water which is arranged in the compartment for use in washing the articles or dishes **100**, and as shown in FIG. 4 for example the water is adapted to be discharged in the form of a high pressure high velocity wall of water as indicated by the numeral **102** from the impeller **62** in order to effectively and efficiently wash the dishes in the desired manner. The tray **99** is adapted to rest on or be supported on horizontally disposed bars such as the bars **103** so as to permit the wall of water to properly and effectively wash the dishes in the tray or rack, and the rack **99** may be of a suitable open formation or construction so as to permit the water to pass upwardly therethrough in order to contact the dishes to be washed.

From the foregoing, it will be seen that there has been provided a dishwashing machine, and in use with the parts arranged as shown in the drawings a rack such as the rack **99** is adapted to be initially arranged on the inlet side **21** of the table **20**, as for example as shown in FIG. 3, and this rack **99** may be loaded with a suitable quantity of dishes or other articles **100** which are to be washed. Due to the sloping bottom surface **25**, trash or other waste material or liquid from the dirty dishes will have a tendency to move down the sloping bottom wall **25** and pass downwardly through the drain **26**, and such waste material can be discharged from the drain **26** into any suitable location such as a drainage pipe or outlet. Then, at the proper time the cylinder **50** is actuated, and the cylinder **50** may be actuated in any suitable manner as for example by means of a fluid under pressure so as to raise the piston rod **51**, and with the piston rod **51** connected to the cross piece **49** as at **52**, it will be seen that the cross piece **49** will be raised, and with the ends of the cross piece **49** connected to the pieces **48** which are fixedly secured to the cover **40**, this upward movement of the piston rod **51** will result in corresponding upward movement of the cover **40**. During this upward movement, the rollers **19** will travel in the tracks **47** so as to insure that the cover **40** will remain in its proper aligned position as it moves up and down. The lower ends of the tracks **47** are secured as by welding to the end wall **35**, as for example as shown in FIG. 1. With the cover **40** in raised position as for example as shown in broken lines in FIG. 4, the rack or tray **99** with the dirty dishes therein can be readily moved or positioned in place on the bars **103**, and then after the rack **99** is properly positioned on the bars **103**, the cylinder **50** is again properly actuated to cause the piston rod **51** to be retracted or lowered and this will result in downward movement of the cover **40** so that the cover **40** will move from the broken line position of FIG. 4 to a position such as that shown in solid lines in FIG. 4.

At this time a suitable quantity of water is adapted to be discharged into the compartment **30** through the pipe or line **60**, and this water is directed downwardly through the discharge end **61** so that the downwardly directed water will be beneficial in providing a certain amount of prerinsing or pre-washing of the dishes in the rack **99**. The inflow of water is adapted to be automatically controlled by the valve **58** which is opened or closed by actuation of the solenoid **59**, so that for example after a predetermined quantity of water is supplied to the compartment **30**, the valve **58** will be closed in order to prevent any further water from entering the machine from the inlet **57**. Also, a suitable amount of detergent or soap can be added if desired or required in any suitable manner.

With the cover **40** in lowered position, and with the compartment **30** supplied with the proper amount of water **101**, the motor **69** will be actuated, and this will result in rotation of the pulley **68** which will drive the pulley **66** by means of the endless belt **67**. As the pulley **66** turns, it revolves or rotates the drive shaft **65**, and since the vanes **79** are fixedly secured to the drive shaft **65**, the vanes **79** will likewise revolve along with the drive shaft **65**.

As the drive shaft **65** rotates, it turns the gear **75** which is fixedly mounted on the end of the drive shaft **65**, and this rotation of the gear **75** causes rotation of the gear **78**, FIG. 7, and with the gear **80** and gear **78** of integral or one-piece construction, it will be seen that this will result in corresponding movement of the gears **80** and **78** on the shaft **77**. As the gear **80** rotates, it rotates the gear **82** since the gears **80** and **82** are in mesh with each other, and the gear **82** rotates on the shaft **81** so as to move the shoulder **83** and also move the off-center cams **84** and **86**. As these cams **84** and **86** move, they cause corresponding back and forth movement of

the arms 85 and 87, and as the arm 87 moves, it causes the finger 91 to engage one tooth at a time of the gear wheel 94, the teeth thereof being indicated by the numeral 92, and with the gear wheel 94 keyed as at 93 to the hub 73, and with the hub 73 formed integrally with the end piece 72, it will be seen that this will result in rotation of the housing 63, and the housing 63 will rotate or revolve independently of rotation of the vanes 79. The housing 63 is adapted to be fixedly secured to the end pieces 71 and 72, and the bearings such as the bearings 95, 96, 97 and 98 serve to insure that the proper rotation can take place in the desired manner. The housing 63 has a pair of diametrically opposed slots 64 therein, and with the housing 63 rotating, it will be seen that the water 101 will be sucked in through the lowermost slot 64 and discharged out through the opposite or upper slot 64 and this water will be discharged in the form of a mass of water as indicated by the numeral 102, and this mass of water 102 will be discharged with great velocity and pressure to effectively and efficiently wash the dishes 100 which are supported in the rack 99.

While the finger 91 is engaging the teeth 92 to rotate the gear wheel 94, the finger 88 will normally be riding over the sleeve portion 90, without having any effect thereon. However, when the finger 88 reaches a notch or groove 89, the finger 88 will move the sleeve 90 an arcuate distance as indicated by the numeral 104 and this has the practical effect of quickly shifting the housing 63 away from the position wich occurs when the slots 64 are horizontally disposed, as for example as shown approximately in FIG. 11 and FIG. 10. That is, it is not desirable to have the water issue or be discharged from the slots 64 when the slots are in a generally horizontal position since this will result in wasted motion inasmuch as the water would not be directed upwardly to achieve the desired washing action. Thus, the notches 89 are properly positioned or arranged so that when the housing 63 is in a position whereby the slots 64 are horizontal, the finger 88 will be in a position to automatically engage a notch 89 to rotate the gear wheel 94 a distance measured by the arc indicated by the numeral 104 so that the housing will be quickly moved from such a dead-center position into a position whereby the slots will be arranged to insure that the mass of water will be directed upwardly as for example as shown in FIG. 4 so that there will be no wasted motion or a minimum amount of wasted effort or wasted energy or wasted usage of water. While the finger 88 is engaged in the groove 89 to rotate the housing the distance 104, the finger 91 is arranged so that it will be able to slide over the teeth 92, and after the housing has been moved the distance 104, the finger 91 will again cooperate with the teeth 92 to move the gear wheel 94 one step at a time so that the housing 63 will be gradually and rather slowly rotated in order to insure that there will be a uniform and desirable sweeping action by the flow of water 102 across the dishes 100.

After the washing and a rinse cycle has been completed as previously described, the cylinder 50 is again actuated to raise the cover or lid 40 so that the rack 99 with the clean dishes can be moved onto the outlet side 22, and at the same time a rack of dirty dishes can be inserted in place on the bars 103 as previously described, and the clean dishes can be moved or used in the desired manner, and the cycle of washing can be repeated over and over again in order to effectively and efficiently wash a large quantity of dishes in the most efficient manner and with a minimum amount of effort and expense.

The parts can be made of any suitable material and in different shapes or sizes.

The members 28 help guide the rack 99 as for example when the rack is being moved into position in the dishwashing machine. Suitable braces, bearings, legs or the like can be used wherever desired or required. It is to be understood that a suitable automatic timing mechanism is adapted to be utilized for properly timing the actuation of the cylinder 50 as well as the solenoid 39 and solenoid 59 and motor 69 so that the sequence of operation will be carried out in the desired and proper manner. After the dishes have been washed, the solenoid 39 is adapted to automatically open the valve 38 so as to permit the dirty water 101 to drain out through the line 37, and after this water has been drained out, the solenoid 39 is adapted to automatically close the valve 38 until the washing cycle is completed.

The dishwashing machine of the present invention is adapted to utilize a cylinder arrangement for pushing the tray such as the tray 99 into and out of position relative to the tank or compartment 30, and a suitable timing mechanism is adapted to be used for synchronizing the various solenoids and cylinders. The present invention is adapted to be used for washing and rinsing dishes, silverware, glasses, cups or the like, and wherein the wall or jet spray of liquid or water 102 is discharged under a considerable amount of pressure or velocity in such a manner that the water is properly distributed with a sweeping or oscillating movement over the dishes or other members being cleaned. The impeller includes the shaft 65 which has the blades such as the blades 79 thereon, and these blades may be of a spiral or straight configuration as desired or required. A suitable stop means is provided for limiting upward movement of the cover 40 upon actuation of the cylinder 50. The valves may be operated by solenoids or else they may be manually operated. Also the present invention is adapted to utilize a hydraulic means for advancing the dishes into and out of the dishwashing machine, and there is also provided a hydraulic means for raising and lowering the lid or cover of the device, and the construction of the impeller is also an important aspect or feature of the present invention. In addition the present invention is adapted to be used in conjunction with complete dishwashing table layouts or dish handling systems and food service equipment. The dimensions can be varied as for example depending upon an average number of dishes to be handled, and the present invention is constructed so that various local codes and the like will be properly complied with or satisfied. Where permitted, garbage disposal units can be used adjacent to or in conjunction with the dishwasher of the present invention. The present invention is particularly suitable for use in establishments or organizations such as churches, commercial establishments such as restaurants, cafeterias, industrial plants, or in schools or the like.

With further reference to the impeller, it is to be noted that the slots 64 extend longitudinally throughout the entire length of the housing 63 so that a wide wall of water will be effectively discharged under high velocity to achieve the desired cleaning action. An important feature of the present invention is the impeller which includes the outer cylinder or housing 63 that rotates slowly in conjunction with the inner vanes 79 which revolve or turn at a high speed independently from the outer cylinder so that the wall of water 102 will be discharged with a high velocity and pressure in order to thoroughly and efficiently wash the articles such as the dishes.

It will be seen that in the present invention there has been provided a dishwasher which includes the impeller that revolves in a housing which has slots placed opposite to each other, and the housing rotates slowly in a controlled sweeping motion to direct fluid thrown off the inner impeller in a predetermined direction, and there is also provided a change of pace mechanism to minimize ineffective periods of direction of the flow of liquid, and there is also the power operated hood and a cylinder mechanism for actuating the same.

As shown in FIG. 1 for example, a cylinder 106 is adapted to have a piston or rod 107 extended therefrom, and a push dog 108 is pivotally connected to the outer

end portion of the piston 107 by means of a pivot pin 109. The numeral 110 indicates guide strips or members which serve to insure that the dog 108 and its associated parts will be maintained in their proper aligned position as they move back and forth. The cylinder 106 is adapted to be connected to a suitable source of supply of actuating fluid by means of lines or conduits 111. The numeral 112 indicates a spring member associated with the dog 108. The purpose of the parts including the dog 108 is to selectively push a rack 99 into place to permit the dirty dishes and the like to be washed, and due to the provision of the pivot pin 109 and spring 112, the dog 108 can pivot or turn so that the piston rod 107 can retract without becoming jammed on or interfering with the next rack which is to be pushed in place to have the dishes thereon washed.

Minor changes in shape, size and rearrangement of details coming within the field of invention claimed may be resorted to in actual practice, if desired.

What is claimed is:

1. In a dishwasher, a fluid compartment, an impeller in said compartment and said impeller including a drive shaft having vanes thereon, and a slowly revolving cylinder surrounding said vanes, said vanes and cylinder revolving independently relative to each other, said cylinder having a pair of diametrically opposed slots therein, means for introducing water into the compartment, and a change of pace mechanism for said impeller for minimizing ineffective periods of direction of the flow of fluid from the impeller, said change of pace mechanism being operatively connected to said drive shaft and cylinder, and said change of pace mechanism including interengaging gears operatively connected to said drive shaft, cams operatively connected to said gears, and arms operatively connected to said cams whereby the arms are actuated by said cams, and whereby the speed of rotation of the cylinder is periodically varied.

2. In a device of the character described, a dishwasher including an impeller, said impeller comprising a cylindrical housing having diametrically opposed slots therein, a drive shaft extending through said housing and said drive shaft having vanes thereon, a motor operatively connected to said drive shaft, first and second spaced apart circular end pieces mounted on the ends of the housing, an outwardly projecting hub integral with one of said end pieces, a gear mechanism including a first gear connected to an end of said drive shaft, a gear casing having a stub shaft connected thereto and said stub shaft having a second gear journaled thereon and said second gear meshing with said first gear, a third gear integral with said second gear and said third gear being mounted on said stub shaft, a second stub shaft connected to said gear casing, a fourth gear on said second stub shaft and said fourth gear meshing with said third gear, an offset shoulder integral with said fourth gear, first and second superposed cams integral with said shoulder, arms affixed to said cams and said arm having fingers on the ends thereof, a toothed gear wheel keyed to said hub and said gear wheel being engaged by the fingers of one of said arms, and said gear wheel including a cylindrical sleeve having a pair of diametrically opposed notches therein for selective engagement by the finger of the other arm.

3. The structure as defined in claim 2 wherein said vanes and cylindrical housing revolve independently relative to each other, and wherein the housing revolves at a relatively slow speed while the vanes turn at a relatively high speed.

4. In a dishwasher, a fluid compartment having an impeller therein, said impeller including a cylindrical housing having a pair of diametrically opposed slots therein, a drive shaft extending through said housing and having vanes thereon, said vanes and housing rotating independently relative to each other, motor means for rotating said drive shaft, end pieces mounted in the ends of the housing, a hub integral with one of said end pieces, and a change of pace mechanism for said impeller for minimizing ineffective periods of direction of the flow of fluid from the impeller, said change of pace mechanism being operatively connected to said drive shaft and housing and including interengaging gears operatively connected to said drive shaft, cams operatively connected to said gears, and arms operatively connected to said cams whereby the arms are actuated by said cams, and whereby the speed of rotation of the cylindrical housing is periodically varied.

5. In a dishwasher, a fluid compartment having an impeller therein, said impeller including a cylindrical housing having a pair of diametrically opposed slots therein, a drive shaft extending through said housing and having vanes thereon, said vanes and housing rotating independently relative to each other, motor means for rotating said drive shaft, end pieces mounted in the ends of the housing, a hub integral with one of said end pieces, and gear means operatively connected to said drive shaft, said gear means including a first gear affixed to an end of said drive shaft, a gear casing having a first stub shaft connected thereto, a second gear on said stub shaft and said second gear meshing with said first gear, a third gear integral with said second gear, a second stub shaft connected to said gear casing, a fourth gear on said second stub shaft and said fourth gear meshing with said third gear, first and second offset cams integral with said fourth gear, arms connected to said cams and said arms having fingers thereon, a toothed gear wheel keyed to a hub portion of an end piece and said gear wheel adapted to be engaged by a finger of one of the arms, and said gear wheel further including a cylindrical sleeve portion having a pair of diametrically opposed notches therein for selective engagement by the finger of the other arm.

6. In a dishwasher, a housing provided with diametrically opposed slots therein, an impeller revolving in said housing, said housing rotating slowly in a controlled sweeping motion directing fluid thrown off the impeller in a predetermined direction, a change of pace mechanism for said impeller for minimizing ineffective periods of direction of flow of fluid from said impeller, said change of pace mechanism being operatively connected to said impeller and housing and including interengaging gears operatively connected to said drive shaft, cams operatively connected to said gears, and arms operatively connected to said cams whereby the arms are actuated by said cams, and whereby the speed of rotation of the housing is periodically varied.

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