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3,150,395 9/1964 Lucky 15/98
 3,150,396 9/1964 Unterbrink 15/98
 3,217,347 11/1965 Domecki 15/51
 3,244,139 4/1966 Brown 118/11

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[54] **AUTOMATIC FLOOR MAINTENANCE MACHINE**
14 Claims, 12 Drawing Figs.

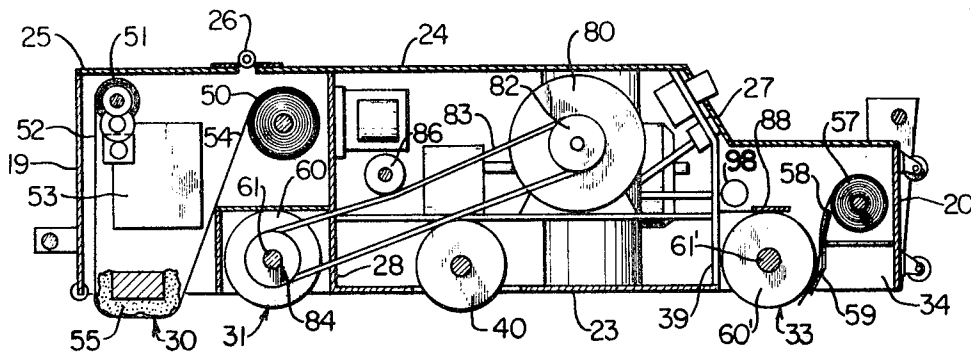
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 118/259, 207, 108, 110, 106, 11, 75, 8, 305

[56] **References Cited**

UNITED STATES PATENTS

3,204,280 9/1965 Campbell 15/340
 2,622,254 12/1952 Mendelson 15/320 X

ABSTRACT: The apparatus of the present invention is specifically adapted for use in dressing, buffing and cleaning bowling lanes automatically through a coordinated sequence of operations which can be preselected and automatically performed over a given distance of travel. The machine is equipped with retractable cleaning and dressing buffer units which are driven independently of the main drive to selectively engage the lane surface either independently of one another, or simultaneously; and in association with the activation of liquid- or fluid-dispensing units is capable of carrying out a variety of different operations at selected intervals automatically and without interruption along the course of travel of the apparatus.



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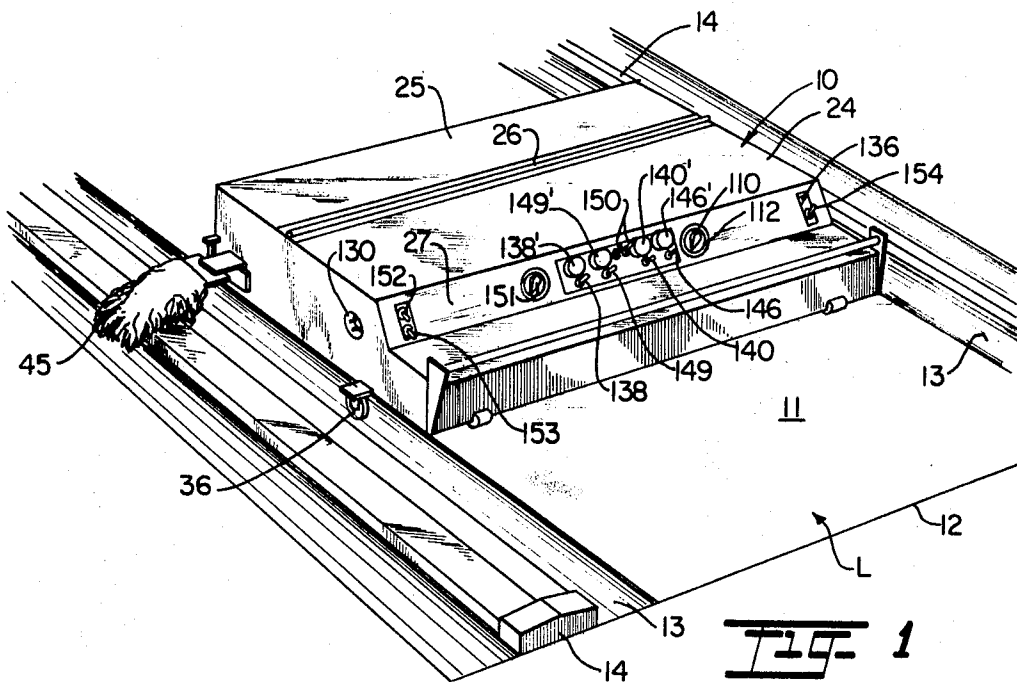
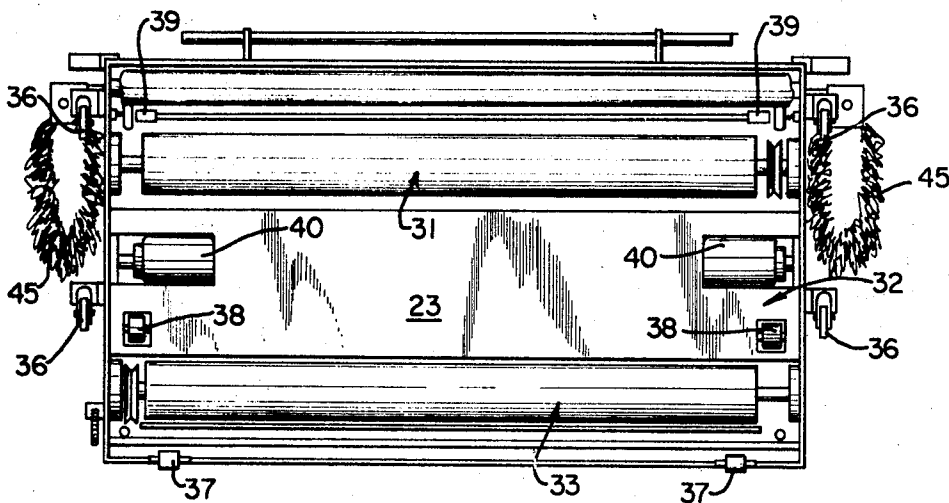
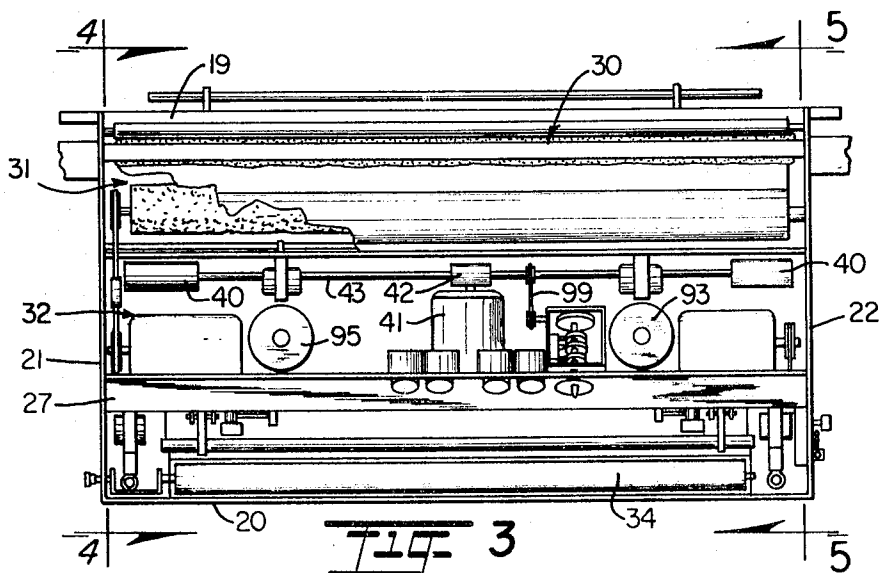
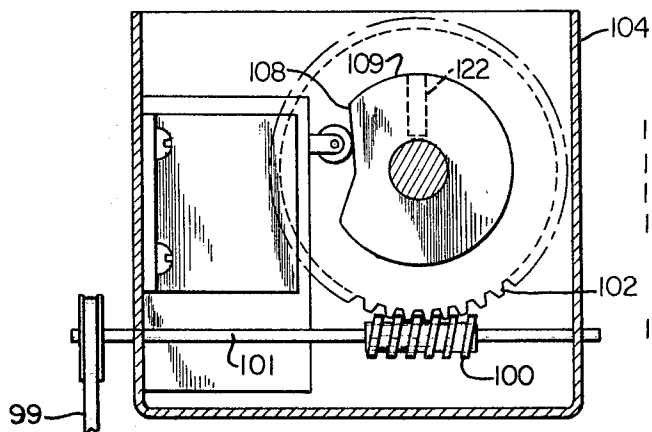
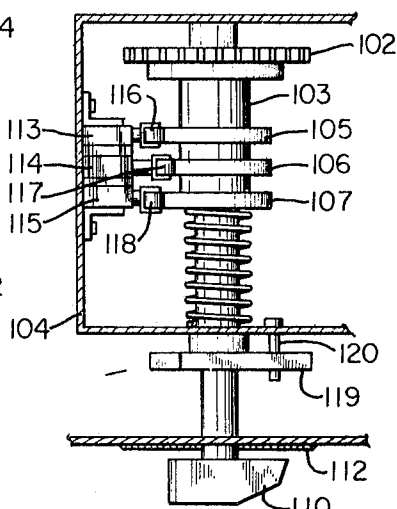
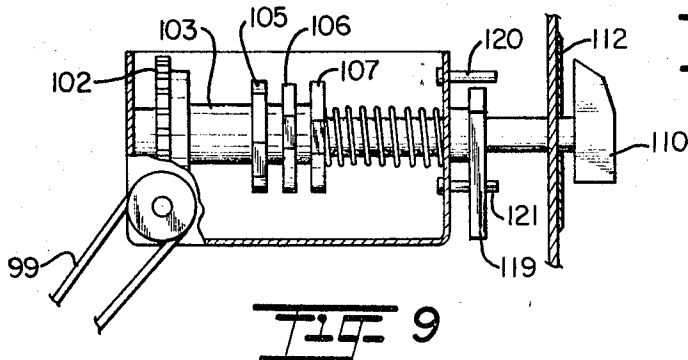
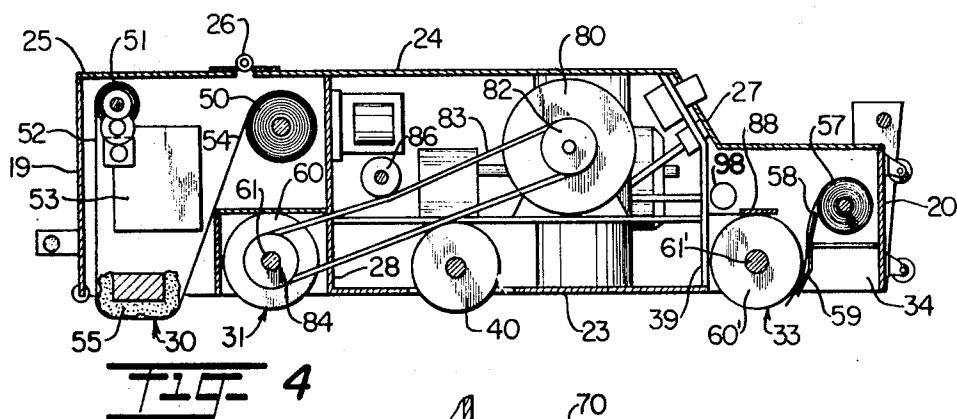
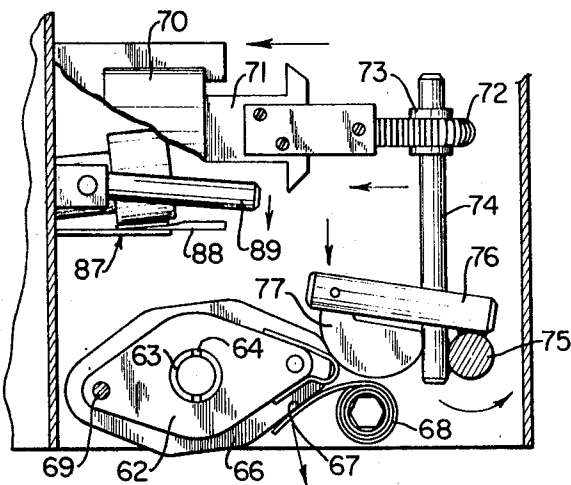
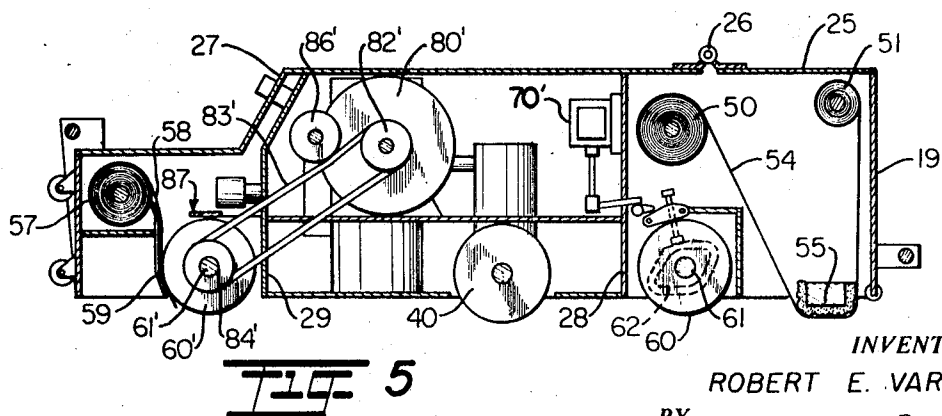


FIG. 2

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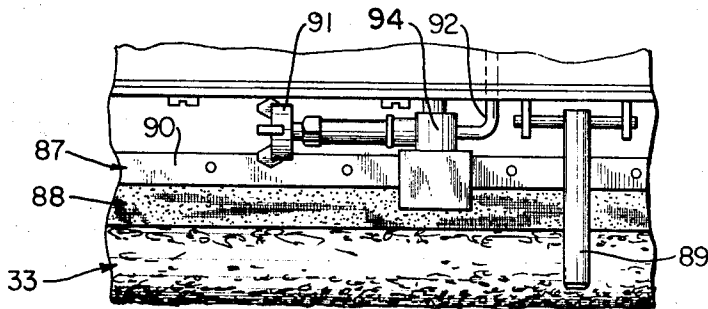


FIG. 8

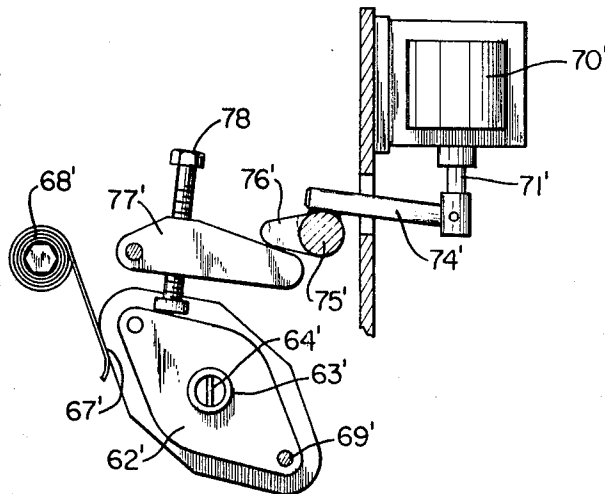


FIG. 7

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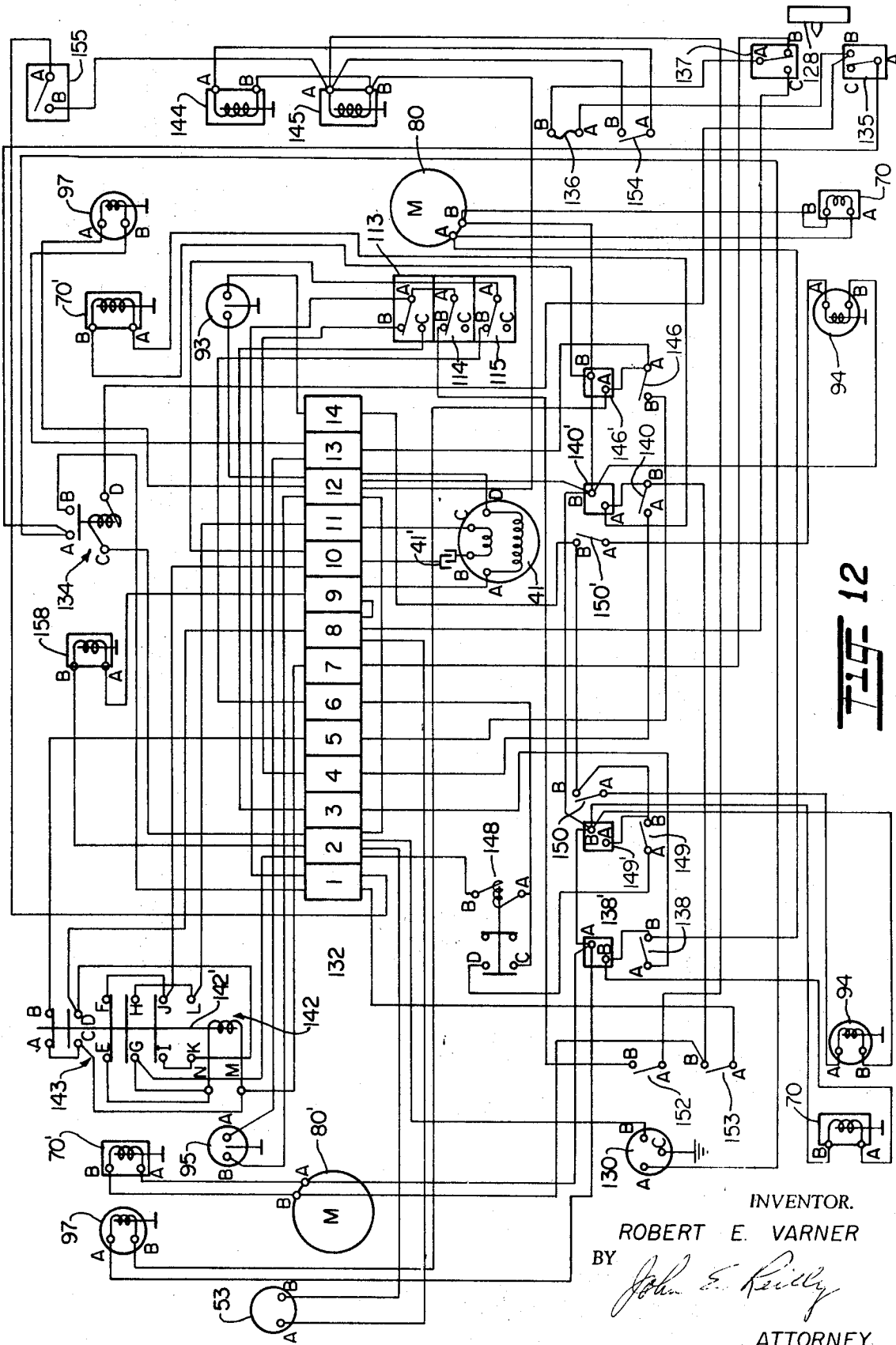


FIG. 12

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AUTOMATIC FLOOR MAINTENANCE MACHINE

This invention relates to floor maintenance apparatus; and more particular relates to a novel and improved bowling lane cleaning and maintenance machine of the type which is capable of performing a number of different cleaning and maintenance operations automatically and without interruption under forward and reverse travel over a selected distance of travel.

Bowling lanes require close daily attention in order to be kept in the proper condition, and this is especially true where the lanes are in constant use and are subject to continual wear. In the cleaning and maintenance of the lanes, it is also important that any cleaning, dressing or buffing operations be uniform and consistent from lane to lane, particularly in tournament play where the bowling contestants bowl on several different lanes in the course of play. Generally, the lanes are of equal length and each characteristically includes a dressed area, which extends from the foul line to a selected point immediately in front of the pin zone, and a scoring area which is the area extending beyond the dressed area through the pin zone to the end of the lane or pit. Each area has a definite function to perform and therefore must be maintained in a different manner. Typically, an oil dressing is applied and buffed onto the dressed area, but the scoring area should be kept clean and free of the oil or any dirt accumulations; further to establish and maintain highest possible scoring conditions a dry-cleaning solvent should be applied to the scoring area. Presently, while automatic equipment is available to perform certain of the cleaning and maintenance operations required on a bowling lane, such equipment is limited in the extent and number of operations that it can perform, and coupled with the cost of hand labor involved, the absence of uniformity from lane to lane and the reluctance of maintenance personnel to perform daily maintenance by hand, has not been entirely satisfactory.

It is therefore highly desirable to provide maintenance apparatus which is capable of meeting virtually all of the cleaning and maintenance requirements of a bowling lane in an automated, uninterrupted sequence of operations, and specifically wherein the apparatus is capable of dusting and cleaning the channels, cappings and lane surfaces, applying and buffing an oil dressing to the dressed area of the lane, and by the interchange from one buffer unit to another at a preselected distance from the pin zone, continue to traverse the entire lane to apply a separate or different cleaning solution to the scoring area. At the same time, it is desirable that the apparatus be capable of performing any cleaning operations along the channels and cappings between lanes and be closely adjustable to regulate the distance of travel of the machine, the volume of liquid dispensed in each operation and the pressure applied in buffing the liquid dispensed both onto the dressed and scoring areas. Moreover, the apparatus should be sufficiently versatile to meet other special job requirements, such as, for example, coating and finishing operations or the application of special solvents or liquids when required.

It is therefore an object of the present invention to provide for novel and improved floor maintenance apparatus which is capable of performing a variety of floor-cleaning tasks automatically and without interruption over a given area in an efficient and highly dependable manner.

It is another object of the present invention to provide for bowling lane maintenance apparatus which can be preset to traverse the entire length of a bowling lane, forwardly and in reverse, and to carry out a coordinated sequence of cleaning, dressing and buffing operations automatically and without interruption.

It is a still further object of the present invention to provide for a novel and improved bowling lane maintenance machine capable of automatically traversing either a selected portion of or the entire length of a bowling lane and incorporating retractable buffer units which are driven and controlled independently of the main drive system and can be individually

regulated to selectively engage a lane surface either simultaneously or in sequence; and further, wherein the buffer units of the present invention may be operated either independently of or in correlation with liquid-dispensing controls in the apparatus to perform a number of different selected cleaning, dressing and buffing operations.

It is an additional object of the present invention to provide in bowling lane maintenance apparatus and the like for means directly associated with the apparatus and operable as the apparatus is advanced along the lane surface to dust and clean the entire lane surface, selectively apply and to buff a dressing over a selected area of the lane surface and to selectively apply and buff a dry-cleaning solvent over another selected area of the lane surface.

In accordance with the present invention, the preferred form of maintenance apparatus comprises a drive carriage with a reversible motor for traversing in a forward and reverse direction the entire length of a bowling lane surface, or any selected portion thereof; and, to perform the basic cleaning, dressing and buffing operations required includes a pair of retractable buffer units, each of which is separately driven and controlled to advance into rotatable engagement with the lane surface along all or any selected portion of the lane. Since the buffer units are operated independently of the main drive they are rotated in the same direction whether the machine is driven in the forward or reverse direction thereby avoiding possible damage to the grain of the lane surface. Each buffer traverses the width of the lane and through selective independent control liquid-dispensing units associated with the buffer units may selectively apply dressing or cleaning solutions through either one or both of the buffers in selected quantities and over selected distance intervals as the apparatus traverses the lane. Furthermore, a duster unit may be driven off the main drive system and is operative in cooperation with the buffer units both to clean the lane surface and to prevent undesired overlap in the cleaning and dressing operations performed at different selected areas along the bowling lane. A novel form of cam control unit is provided in association with the liquid-dispensing and buffing units to permit highly simplified but close control over the operations to be performed.

The above and other objects, advantages and features of the present invention will become more readily appreciated and understood from a consideration of the following detailed description of a preferred embodiment of the present invention when taken together with the accompanying drawings, in which:

FIG. 1 is a perspective view of the preferred form of apparatus illustrated in position to traverse a bowling lane.

FIG. 2 is a bottom plan view of the preferred form of apparatus shown in FIG. 1.

FIG. 3 is a top plan view of the apparatus with the cover panels removed and parts broken away to illustrate the internal construction and arrangement of the control system.

FIG. 4 is a section view taken about lines 4—4 of FIG. 3 from one side of the apparatus.

FIG. 5 is a section view taken along lines 5—5 of FIG. 3 and showing the opposite side of the apparatus.

FIG. 6 is an enlarged sectional view in detail of the dressing buffer unit.

FIG. 7 is an enlarged sectional view in detail of the cleaning buffer unit.

FIG. 8 is a top fragmentary plan view illustrating one of the spray nozzle portions of a liquid dispensing unit for the dressing buffer.

FIG. 9 is an enlarged side sectional view of the preferred form of cam control unit forming a part of the apparatus of the present invention.

Fig. 10 is a cross-sectional view on an enlarged scale of the cam control unit shown in FIG. 9.

Fig. 11 is a top view partially in section of an enlarged scale of the cam control unit shown in FIGS. 9 and 10; and

FIG. 12 is a schematic wiring diagram of the control system for the preferred form of apparatus of the present invention.

The present invention is best exemplified by illustrating and describing its use in the cleaning and maintenance of a bowling lane, although its ready conformability for other applications will be readily appreciated. In the preferred form, apparatus 10 is specifically adaptable for use in cleaning and otherwise maintaining a bowling lane represented at L. Typically, professional bowling lanes of standard length and width have a lane area 11 running from a foul line 12 to a pin zone, not shown, outer depressed gutters 13 and intermediate cappings 14 between adjacent lanes. The apparatus 10 is intended to travel along the lane from the foul line 12 through the pin zone, then to automatically reverse and return to the foul line. In traversing the entire length of the lane, the apparatus of the present invention can be preset to automatically perform various cleaning, dressing and buffing operations either simultaneously or in a selected sequence of steps. For this purpose the apparatus is broadly comprised of a relatively low, flat housing which as shown in FIGS. 1 to 4 comprises front and rear wall panels 19 and 20, respectively, sidewall panels 21 and 22, and a bottom intermediate panel 23. Upper hinged cover panels include a main cover panel 24 and a duster cover panel 25 hinged about a common axis 26. It will be noted that the main cover panel 24 includes an inclined panel control section 27 which contains a number of controls for regulating and determining the operations to be performed by the apparatus.

As best seen from a consideration of FIGS. 2 and 3, the apparatus is made up of a front duster section 30, a cleaning buffer section 31, an intermediate control section 32, followed by a rear dressing buffer section 33 and a duster or lint-collecting section 34. The control section 32 is internally divided from the buffer sections 31 and 33 by main partition walls 28 and 29 traversing the width of the apparatus.

Generally, the guide and drive systems employed for automatically advancing the apparatus along the lane is conventional and brief reference will therefore be made to these systems for the purpose of illustration but not limitation. Forward and rearward pairs of outer guide wheels 36 project laterally in spaced relation to opposite sides of the apparatus and a series of inner guide rolls include the rearward, laterally spaced rolls 37, rollers 38 beneath the control section and front rollers 39 at the front duster section 30. Relatively side drive wheels 40 are disposed on opposite sides of the apparatus beneath the control section and are driven by main motor drive 41 through speed reduction gearing 42 into drive shaft 43 with the side drive rollers 40 located at either end of the drive shaft.

In a conventional manner, capping and channel mops 45 are located toward the front end and at opposite sides of the apparatus, the mops being pivotally mounted to swing outwardly in order to towel or dust off the cappings 14 as the machine advances in one direction and to pivot inwardly to towel or dust off the channels 13 as the machine is run in the opposite direction.

Brief reference is made also to the duster sections 30 and 34 at the front and rear ends of the machine: The front duster section, as shown in FIGS. 2 and 3 and in the sectional views 4 and 5, comprises a main supply roll 50 and a takeup roll 51 which is continuously driven by speed reduction gearing 52 off an electrically energized speed reduction motor 53 to advance a dusting cloth 54 across a stationary, elongated pad 55 projecting slightly beneath the lower edge of the apparatus. The speed reduction unit may effect a substantial reduction in speed between the main drive motor and the takeup roll 51 so that the dusting cloth is very slowly but continuously drawn across the weight pad 55 and prevents the pushing of dust and other foreign matter onto the scoring area located directly in front of the pin zone. The section 34 at the rear end of the apparatus merely consists of a supply roll 57 for a lint cloth 58 which is passed downwardly along a vertical panel 59 into contact with the buffer for the dressing buffer section 33 and primarily serves to remove any lint from the buffer element as it is advanced along the lane.

An important feature of the present invention resides in the cooperative disposition and working relationship between the cleaning and dressing buffer sections 31 and 33. Like parts comprising each of the buffer sections are correspondingly enumerated with those of the cleaning buffer section designated by prime numbers. The common elements include a buffer roll 60 mounted on a shaft 61 and traversing the substantial width of the machine. Opposite ends of the shaft 61 project for mounting in pivotal bracket plates 62, the latter being pivotally mounted on inner surface of opposite sidewalls of the apparatus. Each bracket 62 includes an inwardly projecting sleeve 63 journaled therein with diametrically opposed slots 64 in the sleeve for insertion of a pin, not shown, at either end of the shaft 61, whereby the shaft is free to rotate independently of the bracket plates 62.

An enlarged plate 66 is keyed to the mounting bracket 62 and is provided with a bearing surface 67 bracket 62 and is provided with a bearing surface 67 engageable by the free end of a heavy duty coiled spring 68 which is attached to the sidewall alongside of the bracket member. The entire bracket assembly is pivotal about a pin 69 on one side of the bracket opposite the spring element 68 so that the bracket assembly and attached buffer are normally biased upwardly, as shown in FIG. 6, to a position in spaced relation above the lane surface. In order to force the buffer section downwardly into rolling engagement with the lane, a solenoid assembly 70 is mounted at opposite ends of each buffer unit and correspondingly includes a solenoid plunger 71 provided with a spring 72 at one end which is looped over a grooved ring 73, the latter being fixed to a rocker arm 74. When the solenoid for each buffer unit are energized, the plunger 71 is retracted to swing the rocker arm 74 about a fixed but rotatable shaft 75 as to cause a second rocker arm 76 and associated cam 77 to be urged downwardly against the free end of the pivotal bracket 62 opposite to the pivot pin 69 thereby urging the brackets and affixed buffer unit downwardly against the force of the spring element 68. In the solenoid-actuated assemblies 70' for the cleaning buffer unit the essential parts are the same but differ in configuration since the solenoids for space considerations are not mounted directly above the ends of the brackets but instead are located somewhat inwardly thereof, as seen from FIG. 3. Accordingly, the rocker arm 74' operates through an elongated rotatable shaft 75' with the second rocker arm 76' at the outer end of the shaft opposite to the rocker arm 74' but which swings downwardly in response to activation of the plunger arm 71' against the free end of the bracket assembly 62' and which motion is imparted through pivotal cam 77' to a threaded bolt 78 engageable with the free end of the bracket 62.

Each of the cleaning and dressing buffer units 33 is independently driven by a separate motor drive 80 which operates through a power transmission unit including drive pulley 82 on the motor drive shaft, a drive belt 83 and a driven pulley 84 at one end of the buffer unit. A tension roll 86 maintains the necessary tautness on the belt 83 to assure continuous transmission of power from the motor drive 80 to each of the buffer units whether in the raised or lowered positions.

In the buffer assemblies, the pressure of the dressing buffer on the lane surface is controlled by the setting of the cam 77, and that of the cleaning buffer is controlled by the setting of the pressure screw 78. In this connection, the cam 77 may be adjusted by a suitable locking bolt or shim, not shown, between the cam 77 and rocker arm 76.

As illustrated in FIGS. 6 and 8 for the dressing buffer unit, each of the buffer units further includes a pivotal applicator is pivotally mounted directly above each buffer and is weighted as at 89 so as to be free to swing downwardly against the top surface of the buffer pad. The applicator body 87 may be slightly recessed or channeled as to 90 along its upper surface to receive a spray solution from inwardly directed spray nozzles 91 located at opposite ends of the buffer and connected through oil lines 92 to a pressurized oil tank 93 or cleaning solvent tank 95, as shown in FIG. 3. In the dressing buffer unit, as

further schematically shown in FIG. 12 the oil or other solution is contained under pressure in the tank 93 and a solenoid control valve 94 is positioned in each of the oil lines to control delivery of the oil solution to the nozzles 91 above the dressing buffer unit. In a similar manner, a cleaning solvent may be contained under pressure in a second tank 95 which through delivery lines 96, each having a solenoid or pilot control valve 97, may be connected into the spray nozzles 91' above the cleaning buffer. In addition, a delivery pipe 98 may extend above and along the length of the cleaning buffer unit to receive a cleaning solvent from a source of supply, such as, a chlorinator cup, not shown, which may be mounted on one side of the machine in communication with the pipe 98. The pipe is provided with a series of openings which are normally directed upwardly but which upon activation of a solenoid are rotated downwardly to spill the solvent onto the applicator 87.

In a manner to be described, the oil is supplied through the spray nozzles 91 preferably over a limited distance from the foul line to a point in front of the pin zone then is cut off as the machine advances in its travel through the pin zone; and upon reversal, a cleaning solution is delivered to spray nozzles 91' for application to the pin zone. In either case, the oil or cleaning solution is distributed by spraying directly onto the applicator and saturating the felt insert which in turn will uniformly apply the liquid to the rotating buffer pads. As designated in FIG. 12, the oil and solvent tanks 93 and 95 are suitably equipped with safety solenoid valves 93' and 95' respectively, which in a conventional manner regulate the maximum pressure levels in the tanks.

In order to automatically regulate the operations performed by the apparatus, the main drive 41 for the drive wheels 40 has a power transmission belt unit, represented at 99, for rotation of a worm 100 through drive shaft 101, at a selected speed reduction from the rate of advancement of the machine. In FIGS. 9 to 11, it will be noted that the worm drives a worm gear 102 at the end of a spring-loaded shaft 103 which is located in a cam block housing 104. Cams 105, 106 and 107 are fixed for rotation with the shaft and, as shown in FIG. 10, each cam has a notched surface area 108, hereafter referred to as the "low side," and an outer peripheral surface area 109 hereafter referred to as the "high side" of the cam. The end of the shaft opposite the gear 102 projects through the control panel 27 and has a manually adjustable pointer 110 as at its outer end which can be set to predetermined distances on a footage dial 112 on the cover panel.

A bank microswitches 113, 114 and 115 are mounted in the cam block housing 104, and the microswitches include roller arms 116, 117 and 118, respectively, which are spring biased against the outer surface of an aligned cam whereby rotation of the cam will control the contact position of the microswitch through its spring-loaded roller arm member. In addition, a locking arm 119 is located on the shaft 103 just inwardly of the cover panel to control the position of start of the dressing or oil spray and as a safety feature to limit the distance of dressing by restricting movement of the arm between limit screws 120 and 121. It will be noted that each cam is also provided with a releasable locking or setscrew 122 for initial adjustment of the cam relative to the shaft 103 and the cam microswitch members.

In the cam control unit, the shaft 103 is rotated by the main motor drive wherever the machine is activated and set in motion. Under rotation when the high side of the cam 105 is engagement with the roller arm 116 it will close one contact C of its microswitch whereby to energize the oil buffer motor drive, as will be seen by reference to FIG. 12. Here the cam 105 is preset so that when the pointer has advanced to a predetermined point on the dial indicating the distance of travel of the machine, the low side of the cam 105 moves into engagement with the arm 116 causing the microswitch 113 to be switched over to contact point B in order to deenergize the oil buffer motor drive and at the same time energize the cleaning buffer motor drive.

The cam 106 is associated with a "short run" toggle switch 152 on the control panel and is preset so that when the low side moves into engagement with the roller arm 117 at the end of microswitch 114 it will close contact B of the microswitch to cause reversal of the machine at a given distance from the foul line in a manner to be described. The short run toggle 152 is manually switched on only when it is desired to run the machine over some distance less than the full course of travel of the lane. Otherwise, in normal operation, a tripper or feeler switch which although not shown in FIGS. 1 to 5, is represented at 155 in FIG. 12 and is located at the leading end of the machine will, upon reaching the end of the pin zone, be activated to reverse the machine through the same circuitry as the cam control microswitch 114.

The cam 107 is preset to regulate the oil spray system. On its high side, the oil spray solenoids 94 are deenergized and, as the low side moves into engagement with the arm 118 will switch microswitch 115 to close its contact B thereby energizing the oil spray solenoids 94 for the limited time interval that the cam remains on its low side. As will become more apparent, in normal operation the oil spray solenoids are energized only in the forward run toward the pin zone but not on the return run.

These is shown in FIG. 12 a preferred form of control system for the apparatus of the present invention. At the outset, it will be noted that a grounded male inlet 130 is recessed in one side of the machine for electrical connection to an outside electrical source. A main terminal block 132 contains a bank of 14 terminals, the terminal 2 being connected over one line to the terminal B of inlet 130 and by a jumper to terminal 12. Inlet 130 has another line connected to terminal A of the relay 134 which is in turn electrically connected to the terminal A of a master control microswitch 135 associated with the started button 128. The started button is depressed to close terminal B of the microswitch 135 which is connected through drive motor fuse 136 into a second directional traverse control microswitch 137. Also, terminal C of the microswitch 137 is connected to terminal 8 in the terminal block thereby energizing the solenoid of relay 134 and causing contact between terminals A and B of the relay to energize terminal 1 in the terminal block 132. This terminal is connected to the common terminal A of microswitch 113; and through the contact C which is closed by the high side of the cam 105 is connected to the main terminal 3 and the terminal A of an oil buffer and motor control toggle 138. When closed, the toggle 138 completes the circuit to the pilot light 138' and terminal A of oil buffer motor 80. In addition, terminal A of pilot light 138' is closed through terminal A of one of the oil buffer solenoids 70 while terminal A of the motor 80 is closed through terminal A of the other oil buffer solenoid 70 thereby energizing the solenoids to cause the buffer unit to be lowered into contact with the lane surface when the motor 80 is energized.

After the apparatus has advanced through a selected distance interval set on the dial 112, the low side of the cam 105 moves into engagement with the pressure arm of its microswitch 113 thereby shifting the microswitch from terminal C to terminal B, the latter being connected to main terminal 4 in the terminal block which in turn is connected to terminal A of a cleaning buffer control toggle switch 140. In the "on" position this toggle will complete the circuit through pilot light 140' to terminal A of one of the solenoids 70' for the cleaner buffer unit. Terminal B of the toggle switch 140 is also connected to terminal B of the motor 80' for the cleaning buffer unit and the terminal B of the other of the solenoids 70'. Accordingly, both of the buffer solenoids 70' are energized to force cleaning buffer unit downwardly into engagement with the lane surface when the motor 80' is energized and, since the dressing buffer unit solenoids and motor are deenergized, the dressing buffer is urged by the spring mechanism to the raised position away from the lane surface.

In the terminal block, it will be seen that the terminal 8 is jumpered to terminal 9 which in turn is connected to the

duster gear reduction motor 53 as well as terminal D, K and I of a time delay circuit 142 associated with reversing switch unit 143. Terminal 9 is also connected to terminal A of the main motor drive 41, and the contact J in the time delay circuit is connected to terminal 10 of the terminal block as well as the starter winding through capacitor 41' at terminal B of the motor 41. Contact L in the time delay circuit is connected to terminal 11 which in turn is connected to starter winding terminal C of the motor 41; and terminal 12 is jumpered to terminal 2 and in turn is connected to terminal D of the motor 41 thereby completing the circuit to the main motor drive for forward operation. When the machine reaches the end of the lane the trigger microswitch 155 at the front end of the machine is spring biased to close terminal B and energize reversing solenoid 145 which mechanically shifts terminal C to terminal B in the directional control traverse microswitch 137. The terminal B is connected through main terminal 7 to terminal M of the time delay circuit thereby to energize the time delay coil and through switch control arm 142' change the contact points in the reversing unit 143. As a result, the feed current to the terminals B and C of the motor drive 41 is reversed to cause the machine to reverse its direction of travel toward the foul line. The main terminal 7 is also connected to terminal B of the directional control microswitch 137 and to terminal A of the reversing switch 143 so as to complete the circuit through terminal B of the reversing switch 143 to terminal 5 for a predetermined time interval, as governed by the time setting of the time delay circuit. Assuming that the solvent spray control toggle switch 146 is in the "on" position it will complete the connection from terminal 5 to terminal 13 thereby energizing the solvent control solenoids 97 to apply solvent to the cleaning buffer unit. The pilot light 146' will be turned on for the duration of time that the solenoids 97 are energized to spray the solvent onto the cleaning buffer, generally over a portion of the time interval required to return through the pin zone. Thereafter, as the high side of the cam 105 returns into engagement with the arm of the microswitch 113 the cleaning buffer solenoids 70' and motor will be deenergized at the end of the scoring area and the return run is completed toward the foul line.

In the forward run, the oil spray is regulated through terminal 10 which is connected to terminal J of the reversing switch 143 and in turn is connected to terminal A of the cam control microswitch 107. When the low side of the cam moves against the pressure arm of the microswitch 115, the microswitch is shifted for connection through terminal 6 with oil control time delay 148 and with oil spray control toggle switch 149 and its associated pilot light 149'. Preferably on the time delay 148 is pneumatic timer, and the amount of oil dressing applied can be regulated by a manually adjustable pointer 151 on the control panel 27 which is operative through setting of the pneumatic timer control the length of time that the solenoid valves 94 are energized. Solenoid control switches 150 and 150' are interconnected between the toggle switch 149 and the coil control solenoid valves 93 and 94 for the predetermined time setting of the delay unit 148. Thus the oil is sprayed immediately upon movement of the low side of the cam into engagement with the pressure arm of its microswitch 115 and will continue over the time setting of the delay unit. In this connection, the toggle switches 150 are manually controllable to permit the operator to shut off each of the oil control solenoid valves 94 to the spray nozzle 70 for either side of the lane. While the run distance of the oil buffer and cleaning buffer units are controlled through the high and low dwell of the cam 105, the time duration and area over which the oil is sprayed is separately controlled through the cam 107.

The middle cam 106 independently controls travel of the unit over a shortened distance less than the full run traversing the entire lane. The terminal A of microswitch 114 completes its circuit through short run toggle switch 152 each time that the low side of the cam moves into engagement with its pressure arm. If the toggle switch 152 is in the "on" position the

reversing solenoid 145 is energized when the low side of the cam moves into engagement with the pressure arm thereby causing reversal of the unit in the same manner that normally obtains when the machine reaches the end of the lane as previously described.

If desired, the machine can be operated with both buffer units engaging the lane surface. To this end, a toggle switch 153 to the buffer motor 80' and to pressure solenoids 70' when closed will cause the buffer unit to engage the lane surface when the other buffer unit is engaging the surface. In addition, a chlorinator toggle switch 154 when closed will interconnect the reversing microswitch 155 and reversing solenoid 145 so as to energize chlorinator solenoid 144 and effect release of a chlorine solution through the openings by rotation of the delivery pipe 98 each time that the machine is reversed. This will permit heavy duty cleaning in the pin zone where it is most needed as the machine begins its return toward the foul line.

Preferably the main motor drive 41 is provided with a built-in braking system which may be a spring-loaded braking member, not shown, including a braking solenoid represented at 158 and which is activated from terminal 8 through terminal 9 of the main terminal block. For instance, when the machine is started by the starter button 128 the solenoid 158 is energized to remove a suitable plunger element from the brake disc and permit forward travel of the machine. However when the machine reverses at the end of the lane, the circuit to terminal 8 is interrupted thereby deenergizing the braking solenoid to permit momentary braking. The time delay coil which was energized upon reversal of the unit will through terminals 7, 8 and 9 once again energize the braking solenoid to release the braking unit for movement of the machine in the reverse direction.

It will be helpful to consideration of the operation of the unit to refer to the toggle switches and controls mounted on the control panel 27 and as broadly designated in FIG. 1. When viewed from the rear of the machine, the short run toggle switch 152 and the continuous run toggle switch 153 are located on the left side of the control panel. Briefly, as described, the toggle switch 152 is turned off if the machine is to run its full course, and the toggle switch 153 is turned off if the buffer units are to be alternately raised and lowered in a typical operation under the control of the cam 105.

The distance pointer 110 is set to the desired footage on the dial 112 for application of the oil spray, the setting on the dial being intended to indicate the distance from the head pin at which the dressing operation is to be terminated. Thus, when the machine is started at the foul line, the dressing buffer unit is lowered, if the toggle switch 138 is turned on, and the pilot light 138' will remain lighted for the entire distance that is dressed with oil by the buffer unit. In turn, if the toggle switch 149 is "on" oil is sprayed onto the dressing buffer over the distance controlled by the cam 107 and time delay unit 148, and the pilot light 149' will be lighted over that distance.

When the cam 105 deenergizes the dressing buffer solenoids and energizes the cleaning buffer solenoids 70', the light 140' is energized, and the light 146' is energized over the time interval selected to spray solvent onto the cleaning buffer unit, as determined by the timer delay circuit 142. The chlorinator toggle switch 154 merely controls a separate source of chlorine solution for application to the cleaning buffer unit as previously described.

It will be evident that a great number of operations can be performed by the apparatus through a minimum number of control elements. If it is desired to perform only a dressing operation, the toggle switch 152 is turned on and the toggle switches 140 and 146 are turned off. The machine will then advance a predetermined distance controlled by the cam 106 and reverse itself for return to the starting point. Moreover, both the dressing and cleaning buffers can be held down for engagement over a short run or the entire run by flipping on the toggle switch 153. Either one or both sides of the lane can be dressed by suitable regulation through the toggle switches 150.

Accordingly, the apparatus of the present invention is characterized by its versatility as well as its dependability in carrying out each desired maintenance operation. Of course the apparatus is readily conformable for other applications, such as, gym floors or other large floor areas.

Although the present invention has been described with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that changes in details of structure and system components may be made without departing from the spirit scope thereof.

What is claimed is:

1. In automatic bowling lane maintenance apparatus having a support frame and a reversible drive system including surface-engaging drive wheels to advance the apparatus along a predetermined course in a forward and reverse direction, the combination therewith comprising:

a plurality of generally cylindrical retractable rollers mounted for rotation about axes which extend transversely of the direction of travel of said apparatus and parallel to the floor surface, said rollers being movable between a raised position above the floor surface and a lowered, surface-engaging position, independent drive means for rotating said retractable rollers in a given direction of rotation independently of the direction of advancement of the apparatus, and roller actuating means for selectively actuating each of said rollers between said raised and lowered positions for predetermined intervals over the course of travel of said apparatus.

2. In automatic bowling lane maintenance apparatus according to claim 1, said roller actuating means for each of said rollers being operative automatically to sequentially actuate said roller between the raised and lowered positions in response to the distance of travel of said apparatus.

3. In automatic bowling lane maintenance apparatus according to claim 2, said actuating means for each of said rollers being further operative to simultaneously actuate said rollers from the raised to the lowered positions.

4. In automatic bowling lane maintenance apparatus according to claim 1, one of said rollers being an oil dressing roller, and further including liquid-dispensing means for applying liquid to said dressing roller when said roller is in the lowered surface-engaging position.

5. In automatic bowling lane maintenance apparatus according to claim 1, one of said rollers being a cleaning roller, and liquid-dispensing means associated with said cleaning roller for selectively applying liquid to said roller when in the surface-engaging position.

6. In automatic floor maintenance apparatus having a support frame and a drive system including surface-engaging drive wheels to advance the apparatus along a predetermined course, the combination therewith comprising:

a plurality of retractable rollers mounted for rotation on axes extending transversely of the direction of travel of said apparatus, said rollers being movable between a raised position above the floor surface and a lowered, surface-engaging position, each of said retractable roller units including a rotatable shaft and end brackets for pivotal mounting of each roller on said support frame, drive means for rotating said retractable rollers, and roller actuating means for selectively actuating each of said rollers between said raised and lowered positions for predetermined intervals over the course of travel of said apparatus, biasing means yieldingly urging each said roller to normally raised position, and said actuating means being selectively energized to overcome said biasing means to positively force said roller downwardly into the surface-engaging position.

7. In automatic floor maintenance apparatus according to claim 6, said actuating means being further characterized by including a rocker arm provided with a cam surface thereon engageable with the pivotal bracket at each end of said rotatable shaft, and a solenoid being selectively energized to pivot the cam surface on said rocker arm downwardly against said bracket to force said roller into the surface-engaging position.

8. In automatic floor maintenance apparatus according to claim 7 said actuating means further including means correlated with advancement of said apparatus over the course of travel of said apparatus to selectively energize each of said solenoid for a predetermined distance interval, means to maintain each of said rollers in the surface-engaging position over the entire course of travel of said apparatus, and means to selectively disable said actuating means for each of said rollers over the predetermined course of travel of said apparatus.

9. In automatic floor maintenance apparatus according to claim 6, further including a duster unit including a supply roll for an endless cloth, a surface-engaging pad, a takeup roller, and an independent drive system to advance the endless cloth continuously beneath said surface-engaging pad over the course of travel of said apparatus.

10. An automatic bowling lane maintenance machine comprising in combination:

a drive carriage and a drive mechanism including lane-engaging drive wheels for advancement of the machine from a selected starting point along the lane, guide wheels to maintain the machine in aligned relation to the lane, and a reversing mechanism including a feeler switch to sense the end of the lane and to effect automatic reversal of the machine for return to the starting point,

generally cylindrical, retractable rollers mounted for rotation on the drive carriage on axes which extend transversely of its direction of travel and traversing the width of the lane, said roller each being independently movable between a raised position retracted within the drive carriage and a lower, lane surface-engaging position, drive means for each of said rollers being operative to rotate each of said rollers independently of one another and independently of said main drive mechanism and roller actuating means for selectively and individually advancing each of said roller units between a raised and lowered position as said machine is advanced along the lane.

11. An automatic bowling lane maintenance machine according to claim 10, said roller actuating means including means responsive to energization and advancement of the machine by said main drive mechanism to sequentially actuate said roller units between the raised and lowered positions over predetermined distances of travel along the lane surface.

12. An automatic bowling lane maintenance machine according to claim 11, further including liquid-dispensing means for each of said roller units, each of said dispensing means including valve means selectively opened to dispense liquid to each of said roller units for a predetermined time interval when the associated roller unit is advanced to its lowered, surface-engaging position, and the opening of said valve means being correlated with the distance of travel of said machine over the lane.

13. An automatic bowling lane maintenance machine according to claim 12, wherein further characterized in that the roller-actuating means and valve means for one of said roller units is responsive to activation of said reversing mechanism at the end of the lane to apply liquid to said roller unit advance said roller unit into the lane-engaging position as the machine is advanced in the reverse direction.

14. An automatic bowling lane maintenance machine according to claim 10 further including first control means responsive to starting and advancement of said machine from the foul line to a predetermined point ahead of the pin zone to activate one of said roller actuating means to advance its associated roller unit into surface-engaging position, liquid-dispensing means for selectively applying liquid to said one roller unit when said roller unit is in the surface-engaging position, second control means for deenergizing said one-roller-actuating means for return of said one roller unit to the raised position and simultaneously activate the other of said roller-actuating means to advance said other roller unit to the lowered, lane-engaging position as the machine is advanced from a selected point in front of the pin zone through the pin zone, is reversed and returns to the selected point whereupon

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said control means is further operative to deenergize the other of said roller actuating means and energize the one actuating means for advancement of the one roller unit into the lane-en-

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gaging position over the remaining distance of travel of said machine to the foul line.

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