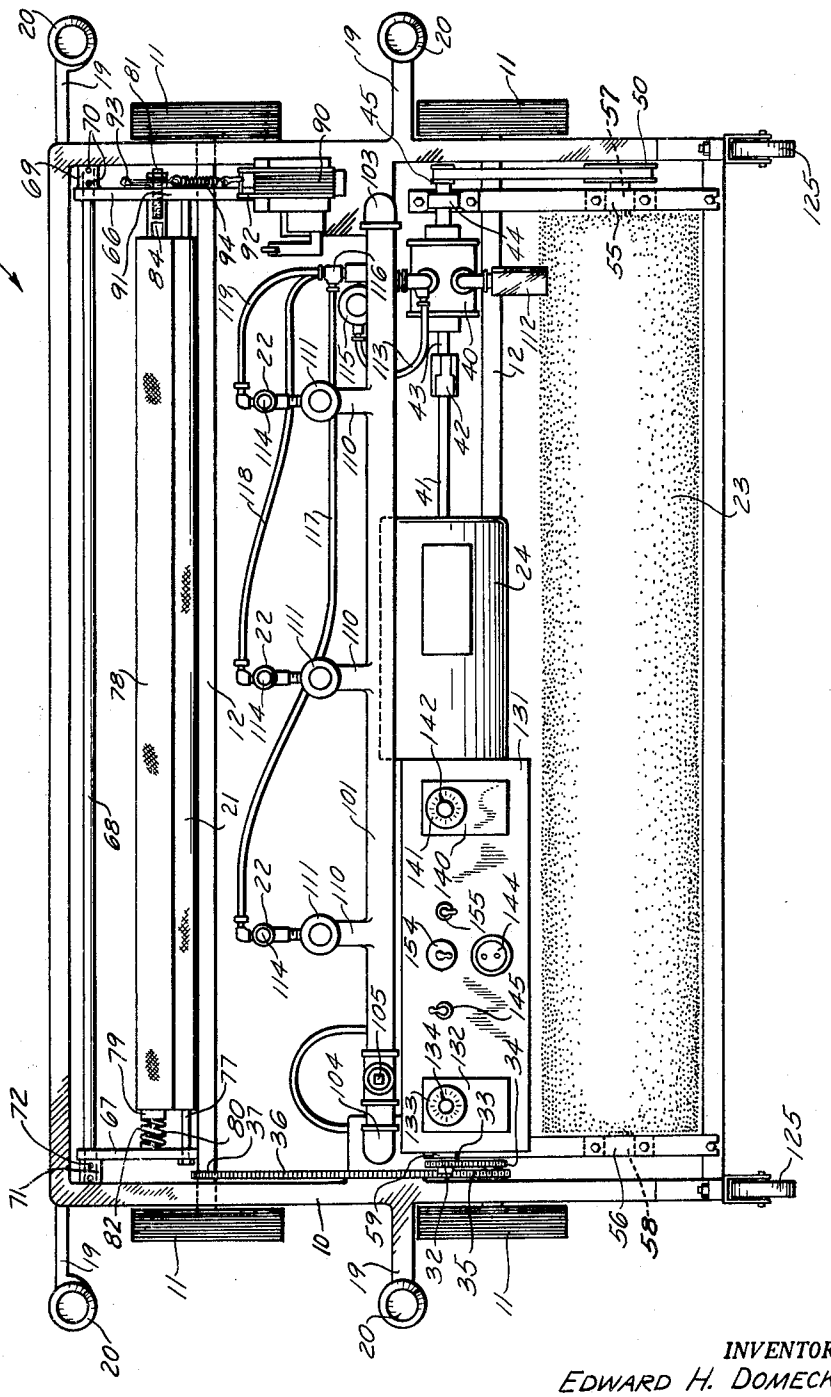
Nov. 16, 1965 E. H. DOMECKI 3,217,347

MACHINE FOR CLEANING AND POLISHING BOWLING LANES

Filed March 19, 1962 2 Sheets-Sheet 1

FIG. 1



INVENTOR.
EDWARD H. DOMECKI
BY
Cyril M. Hajewski
ATTORNEY

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Filed March 19, 1962 2 Sheets-Sheet 2

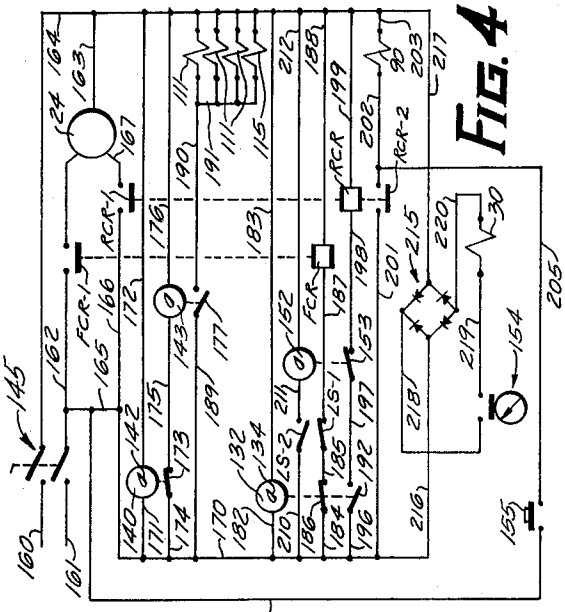

FIG. 4

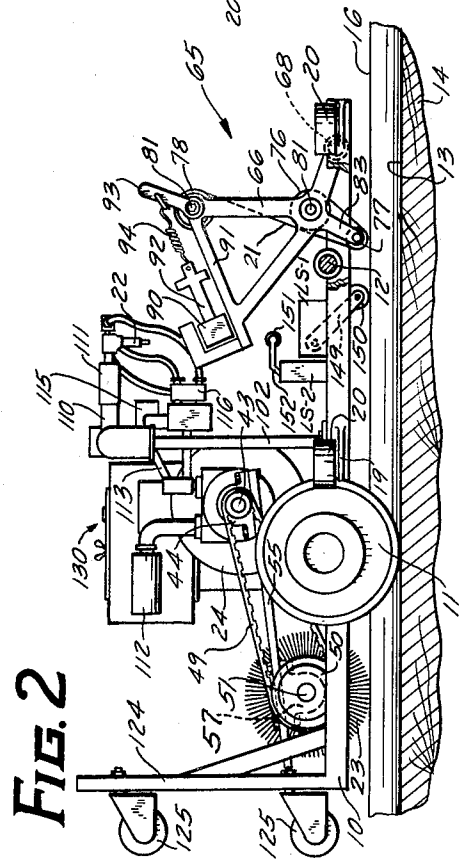

FIG. 2

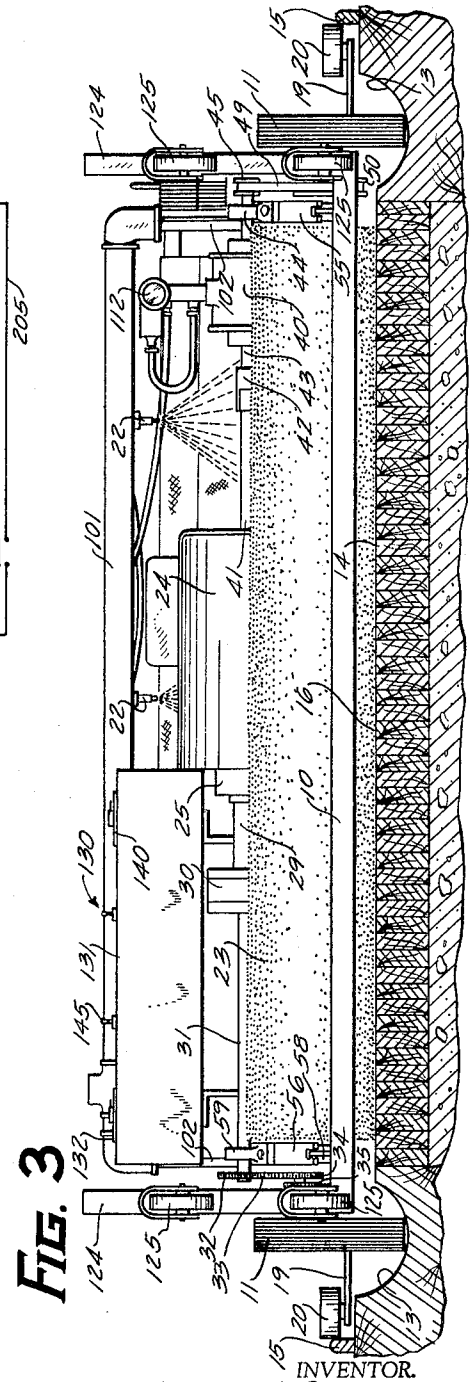

FIG. 3

INVENTOR.
EDWARD H. DOMECKI

BY Cyril M. Hajewski
ATTORNEY

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MACHINE FOR CLEANING AND POLISHING BOWLING LANES

Edward H. Domecki, Delafield, Wis., assignor to American Machine & Foundry Company, New York, N.Y., a corporation of New Jersey

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8 Claims. (Cl. 15—51)

This invention relates generally to a cleaning and polishing machine and more particularly to a machine that is especially adapted for cleaning and polishing the hardwood surfaces of bowling lanes which are used in playing the game of ten pins.

The game of ten pins or bowling is played by rolling a relatively heavy ball along a highly polished hardwood surface and directing it at a group of ten pins standing in a triangular pattern. The hardwood surface with its accessories is referred to as a bowling lane and it is essential that it be maintained in a uniform highly polished condition.

It is therefore a general object of the present invention to provide an improved machine for cleaning and polishing the hardwood surfaces of bowling lanes.

Another object of the present invention is to provide a machine which will automatically traverse the length of the bowling lane and return to its starting point without guidance by the operator.

Another object of the invention is to provide an improved bowling lane polishing machine supported by wheels that ride in the gutter of the lane for propelling the polishing machine along the length of the lane so that the wheels do not contact the polished surface of the bowling lane as the machine progresses along its path of travel.

Another object of the invention is to provide a bowling lane polishing and cleaning machine in which the cleaning and polishing members are adapted to float relative to their supporting frame for automatically retaining uniform engagement with the surface of the lane while the frame rises and falls due to irregularities in the surface upon which the wheels that support the machine ride.

Another object is to provide a cleaning and polishing machine with automatic timing devices for regulating the length of time that the machine is propelled along the lane as well as the length of time that spray nozzles remain in operation for spraying a polishing oil on the lane.

A further object is to provide a bowling lane polishing and cleaning machine with automatic feeding means for feeding a clean portion of cleaning cloth into engagement with the surface of the lane at predetermined intervals.

A still further object is to provide a bowling lane cleaning and polishing machine of improved efficiency which is reliable in operation and of sturdy but inexpensive construction.

According to this invention the improved bowling lane cleaning and polishing machine comprises a frame supported by four wheels that are spaced to ride in the gutters of the lane while a rotary brush and a roller covered with a cleaning cloth engage the surface of the lane. The cleaning cloth roller and the brush are supported on separate brackets which are pivotably mounted on the frame of the machine so that the cleaning cloth roller and brush are free to float relative to the frame of the machine. The brackets and their associated mechanism are balanced

in such a manner as to urge their cooperating brush and cleaning cloth roller into engagement with the lane, causing a pivoting of the brackets to accommodate the irregularities that are encountered by the wheels as they roll along the gutters as well as into and out of the gutters. With this arrangement the brush and cleaning cloth roller remain in operating engagement with the surface of the lane despite the irregularities in the surface that is engaged by the rolling wheels.

The machine is arranged for automatic operation so that it may be propelled from the forward end of the lane toward the far or rear end at which the bowling pins are set for playing the game. As the machine reaches the rear end of the lane it automatically reverses its direction to return to the forward end. The machine, therefore, automatically completes two passes along the length of the lane without any guidance by the operator.

An oil spray is also provided for the purposes of spraying a polishing oil on the surface of the lane as the machine progresses toward the rear of the lane and before the surface is engaged by the rotary polishing brush. On the return trip to the forward end of the lane, the oil spray nozzles are rendered inoperative and the rotary brush completes its polishing operation. Any excess oil that may remain is absorbed by the cleaning cloth which engages the surface of the lane after the brush completes its operation during the return trip of the machine toward the forward end of the lane. A suitable electrical control circuit is provided for automatically regulating the operation of the machine.

The foregoing and other objects of the invention which will become apparent from the following detailed specification setting forth an illustrative embodiment, may be achieved by the particular apparatus depicted in and described in connection with the accompanying drawings, in which:

FIGURE 1 is a plan view of a bowling lane cleaning and polishing machine which incorporates the features of the present invention;

FIGURE 2 is a view in right side elevation of the machine shown in FIGURE 1 with the front wheel omitted to reveal the cleaning cloth supporting bracket;

FIGURE 3 is a rear elevational view of the machine depicted in FIGURE 1; and

FIGURE 4 is a diagrammatic illustration of the electrical circuit for actuating and regulating the operation of the machine shown in FIGURE 1.

Reference is now made more particularly to the drawings and specifically to FIG. 1 which illustrates a bowling lane cleaning and polishing machine that incorporates the features of the present invention. As there shown, the improved cleaning and polishing machine comprises a frame **10** which is supported by four wheels **11** that are fixedly mounted on a pair of axles **12** which are journaled in the frame **10** and extend outwardly thereof for receiving the wheels **11**. Bowling lanes are of standard width and are bounded on each side along their entire length by gutters **13** as illustrated in FIG. 3 where the gutters **13** are shown on either side of a bowling lane **14**.

As depicted in FIG. 3, a rail **15** extends upwardly from the surface adjacent to the gutter **13**. This rail **15** is taken advantage of in the present invention to serve as a guide for guiding the machine along the length of the bowling lane **14**. To this end, the frame **10** is provided with four outwardly extending brackets **19** on

which are journaled four rollers 20 in position to engage the inner sides of the two rails 15. With this arrangement, the rollers 20 cooperate with the two rails 15 for guiding the cleaning and polishing machine in its path of travel along the length of the bowling lane while it is performing its cleaning and polishing function. The improved cleaning and polishing machine of the present invention is arranged to initiate its cleaning and polishing operation at the forward end of the lane where the ball is rolled by the player toward the bowling pins located at the opposite or rear end of the lane. The machine travels along the length of the lane without any guidance by the operator, being guided solely in its path of travel by the wheels 11 located in the gutters 13 and by the operation of the wheels 20 cooperating with the rails 15. When the machine reaches the far end of the lane it automatically reverses its direction of travel and returns to the forward end where the operator may manipulate the controls for terminating its operation.

As the machine begins its function of cleaning and polishing the bowling lane, when starting from the forward end of the lane a cleaning cloth or paper 21 engages a surface 16 of the lane 14 to remove the dust. Immediately thereafter, three spray nozzles 22 direct a spray of polishing oil onto the surface 16. The oiled surface is then engaged by a rotating polishing brush 23 which is driven in a rotary movement by a motor 24 while the machine is being propelled along the length of the lane. The brush 23 always rotates in a direction opposite to the direction of rotation of the wheels 11 so that its bristles move along the surface 16 against the movement of the machine to achieve better polishing contact with the surface 16. In addition, the rotation of the brush in this direction serves to increase the relative velocity of the bristles of the brush 23 relative to the surface 16 because the velocity of the machine is added to the velocity of the brush. If the brush 23 were rotated in the same direction as the direction of rotation of the wheels 11 the rate of travel of the machine would subtract from the velocity of the surface of the brush 23 relative to the surface 16.

On the return trip, when the machine is returning from the rear end of the lane to the forward end, the rotary brush 23 continues its polishing operation on the surface of the bowling lane 14 but the flow of oil into the spray nozzles 22 is terminated. The cleaning cloth or paper 21 engages the surface of the bowling lane 14 after the rotary brush has completed its second pass over the lane and the paper 21 functions to absorb any excess oil which may remain on the lane surface 16.

The power for propelling the machine is derived from the motor 24 which drives a speed reducing and reversing unit 25 that is provided with an output shaft 29 connected to drive an electric clutch 30 as best shown in FIG. 3. It should be noted that the unit 25 serves to reverse the direction of rotation of the shaft 29 as well as to reduce the output speed of the motor 24. The clutch 30 transmits the power from the shaft 29 to a drive shaft 31 which is provided with a sprocket 32 at its outermost end. The sprocket 32 is in engagement with a drive chain 33 that is also in operating engagement with a sprocket 34. The sprocket 34 is keyed to the left end of the lower axle 12 as viewed in FIG. 1. Another sprocket 35 is likewise keyed to this same axle 12 for engagement with a drive chain 36 that also engages a sprocket 37 keyed to the left end of the upper axle 12 as viewed in FIG. 1. Since the wheels 11 are mounted to rotate with the two axles 12, the power from the drive shaft 31 through the chains 33 and 36 serves to rotate the four wheels 11 for propelling the machine in the desired path of travel.

In addition to propelling the machine, the motor 24 also functions to drive an air compressor 40 and to rotate the polishing brush 23. To this end, the motor 24 is provided with a drive shaft 41 which extends from

the right side of the motor 24 as viewed in FIGS. 1 and 3. Since the right side of the motor is not provided with a speed reducer and reversing unit, the direction of rotation of the shaft 41 is opposite to the direction of rotation of the shafts 29 and 31 which transmit the power for propelling the machine.

A coupling 42 serves to connect the drive shaft 41 to an input shaft 43 of the air compressor 40. The shaft 43 of the air compressor 40 extends through the entire compressor housing to extend from the right side of the housing through a bearing block 44 to receive a pulley 45 at its outermost end. A timing belt 49 is in driving engagement with the pulley 45 as well as with a second pulley 50 that is keyed to a shaft 51 upon which the brush 23 is mounted for rotation therewith. It is therefore apparent that the motor 24 operates to drive the brush 23 through the pulley 50, the belt 49 and the pulley 45. Although the brush 23 is rotated by the same motor 24 that propels the vehicle, the drive to the brush 23 is independent of the drive for propelling the vehicle so that the brush 23 may be rotated while the clutch 30 is disengaged to interrupt the transmission of power to the wheel 11 for propelling the vehicle.

Another important feature of the invention lies in the fact that the brush 23 is supported in such a manner as to permit it to float relative to the frame 10 while it is rotating in order to accommodate any irregularities that may be encountered by the wheels 11 as they progress along the surface of the gutters 13. The floating movement of the brush 23 also permits the wheels 11 to roll into and out of the gutters without interferring with the operation of the brush 23.

In order to achieve the floating movement of the brush 23, it is supported by a pair of brackets 55 and 56. As best shown in FIGS. 1 and 3, the brackets 55 and 56 are supported for pivotal movement about the axis of the aligned drive shafts 31 and 43. To this end, the shaft 43 extending from the compressor 40 is journaled in the bearing block 44 which is secured to one end of the bracket 55 so that the latter may pivot relative to the shaft 43. The bearing block 44 is fixed to one end of the bracket 55 and another bearing block 57 is mounted on the underside of the opposite end of the bracket 55. The bearing 57 rotatably supports one end of the shaft 51 which carries the brush 23 and the other end of the shaft 51 is journaled in a bearing block 58 which is attached to the underside of the bracket 56 on the other side of the machine. The opposite end of the bracket 56 is supported for pivotal movement about the shaft 31 by a bearing block 59 that is mounted on the upper end of the bracket 56 in position to receive the shaft 31 which is journaled therein. It is therefore apparent that both brackets 55 and 56 are mounted for pivotal movement in their respective vertical planes, the bracket 55 being pivotable about the output shaft 43 of the compressor 40 while the bracket 56 is pivotable about the shaft 31.

Since the shaft 51 which carries the brush 23 is journaled in the bearing blocks 57 and 58 that are carried by the brackets 55 and 56 respectively, the brush 23 is free to float in a veritcal direction with the pivotal movement of the brackets 55 and 56. As a result, if the wheels 11 meet a depression in the surface upon which they ride, or if they enter into the gutters 13, the brackets 55 and 56 will automatically pivot upwardly to accommodate the downward movement of the frame 10 and the brush 23 will maintain uniform contact with the surface of the bowling lane 14. In like manner, if the wheels 11 encounter a rise in the surface upon which they ride, the upper movement of the frame 10 will permit the weight of the brush 23 to cause a pivotal movement of the brackets 55 and 56 to permit a downward movement of the brush 23 relative to the frame 10 for maintaining the uniform contact with the surface of the bowling lane 14.

As previously mentioned, the bowling lane surface 16 is wiped clean by a cleaning cloth prior to the application of the polishing oil and again after the brush 23 has completed its polishing operation during the return trip of the machine toward the forward end of the bowling lane. This cleaning operation is performed by a cleaning cloth assembly 65 shown in FIGS. 1 and 2. The cleaning cloth assembly 65 comprises a bracket 66 on the right side of the machine as viewed in FIG. 1 and another bracket 67 disposed at the left side of the machine as viewed in FIG. 1. Both brackets 66 and 67 are mounted on a rod 68 that extends across the entire width of the machine and is journaled at both ends in the frame 10. The bracket 66 is provided with a boss 69 having a bore through which the rod extends. The boss 69 is secured to the rod 68 for pivotal movement therewith by a pair of set screws 70 and the right end of the boss 69, as viewed in FIG. 1 bears against the frame 10 to limit the rightward movement of the rod 68. In like manner, the bracket 67 is supported by the left end of the rod 68. To this end, the rod 68 extends through a bore formed in a boss 71 which is provided on the bracket 67. The boss 71 is fixed to the rod 68 by a pair of set screws 72 and the left end of the boss 71 bears against the frame 10 to limit the leftward movement of the rod 68. The brackets 66 and 67 are therefore supported by the rod 68 for pivotal movement and the rod 68 is retained in journaled engagement with the frame 10 by the bosses 69 and 71.

The cleaning operation on the surface 16 of the bowling lane is performed by a cleaning cloth or paper 21 that is carried between the two brackets 66 and 67. The clean paper 21 is contained on a roll 76 and extends downwardly therefrom about a cleaning roller or wiper 77 and thence upwardly where the used or dirty cloth 21 is wound into a take up roll 78.

As shown in FIG. 1, the used roll of paper 78 is coiled about a cylinder 79 which is carried at one end by a stub shaft 80 and at its other end by another stub shaft 81. The stub shaft 80 is rigidly secured to the bracket 67 and extends inwardly therefrom into a bore in the left end of the cylinder 79 as viewed in FIG. 1. The right end of the cylinder 79 is slotted for receiving a flattened end 84 of the stub shaft 81 so that the shaft 79 will rotate with the shaft 81 but is free to rotate on the stub shaft 80. The cylinder 79 is thereby supported by the two shafts 80 and 81 and is urged rightwardly, as viewed in FIG. 1, toward the bracket 66 by a spring 82 which is coiled about the stub shaft 80 to bear against the left end of the cylinder 79.

The spring 82 serves to maintain the slot in the right end of the cylinder 79 in engagement with the flattened end 84 of the stub shaft 81. In order to remove the roll of paper 78 from the assembly, it is only necessary to urge the cylinder 79 leftwardly, as viewed in FIG. 1, against the pressure of the spring 82 until the right end of the cylinder 79 clears the flattened end 84 of the shaft 81. The right end of the cylinder 79 can then be moved out of alignment with the stub shaft 81 and the left end of the cylinder withdrawn from the stub shaft 80. The procedure is reversed for replacing the cylinder 79 in the assembly. The clean roll of paper 76 is carried between the brackets 66 and 67 in the same manner so that it too can be conveniently removed and replaced. The mechanism for supporting the clean roll of paper 76 is identical to the mechanism for carrying the used roll of paper 78 except that the slot at the right end of the cylinder 79 is omitted in favor of a bore and the flattened end portion 84 is deleted from the stub shaft 81 in favor of a completely cylindrical shaft so that the cylinder 79 which carries the clean roll of paper 76 is free to rotate on its supporting shafts 80 and 81. The spring 82 serves to place a drag on the roller 79 which carries the clean roll 76 so that the paper 21 will be maintained taut between the two rolls.

The cleaning roller 77 is journaled between the two brackets 66 and 67, being supported by two downwardly extending arms 83 carried by both brackets 66 and 67. It will be noted that the brackets 66 and 67 and their associated mechanism are disposed to the left of the rod 68, as viewed in FIG. 2, so that the weight of the assembly is continuously urging the unit in a counterclockwise direction, as viewed in FIG. 2, about the axis of the rod 68. As a result, the cleaning roller 77 and the cleaning cloth 21 disposed thereabout is maintained in contact with the surface 16 of the bowling lane 14. The arrangement causes the entire cleaning cloth assembly 65 to float for the purpose of accommodating any irregularities that may be encountered by the wheels 11 as they progress in their path of travel.

Thus, the cleaning cloth assembly 65 functions in the same manner as the brush 23 to move the cleaning roller 77 and the paper wound about it upwardly relative to the frame 10 when the wheels 11 encounter a depression which causes the frame to move to a lower level. In like manner, when the wheels 11 traverse a rise in the surface upon which they ride, the frame 10 will rise with the wheels 11 but the cleaning cloth assembly 65 will pivot in a counterclockwise direction to maintain the roller 77 and its cooperating paper 21 in engagement with the surface 16 of the bowling lane. This floating arrangement of the polishing brush 23 and the cleaning cloth assembly 65 permit the machine to operate very efficiently despite the fact that the wheels 11 ride in the gutters 13 of the bowling lane so that they do not mar the polished surface 16.

Although the gutters 13 present a relatively uneven surface, the floating mounting of the brush 23 and the cleaning cloth assembly 65 accommodate for such irregularities to maintain the proper contact with the surface 16. In the absence of such mountings of the brush 23 and cleaning cloth assembly 65, the wheels 11 would have to ride along the polished surface 16 and thereby detract from the finish obtained upon the surface to the extent that a limited amount of hand polishing might be required. Such hand polishing is eliminated entirely by the improved construction of the present invention which avoids the necessity of the wheels 11 rolling upon the finished surface 16.

A clean portion of cleaning cloth 21 is fed to the cleaning roller 77 from the clean roll 76 when the machine reverses its direction of movement at the rear end of the bowling lane. This is done automatically by a solenoid 90 that is carried on an upper arm 91 of the bracket 66. The solenoid 90 is provided with a slidable plunger 92 that is connected to a lever 93 by a spring 94. The lever 93 is connected by a ratchet mechanism (not shown) to the stub shaft 81 for rotating the shaft 81 and its associated flattened portion 84 for turning the used roll 78 in a counterclockwise direction, as viewed in FIG. 2, in response to actuation of the solenoid 90. When the solenoid 90 is energized, its cooperating plunger 92 is drawn inwardly into the body of the solenoid 90 to pivot the lever 93 in a counterclockwise direction for producing a partial revolution of its associated stub shaft 81 and the cylinder 79 that is driven by the flattened portion 84 of the shaft 81. This, of course, revolves the roll 78 in a counterclockwise direction causing it to draw a clean length of cleaning cloth from the roll 76 and thereby present a clean portion of cleaning cloth 21 about the roller 77 for engagement with the surface 16.

When the solenoid 90 is deenergized, the plunger 92 moves outwardly of the body of the solenoid and forces the lever 93 in a clockwise direction about the axis of the shaft 80. When the lever 93 is moved in this direction its associated ratchet releases the lever from engagement with the shaft 81 so that the latter does not rotate in the clockwise direction with the lever 93. In this manner, a length of cloth can be drawn from the clean roll 76 to present a clean portion about the roller 77 for engagement with the surface 16. The spring 94 serves as a safety device so that if the lever 93 or its cooperating mechanism are bound in any way, the solenoid 90 will stretch the spring

94 if energized in order to fully retract its plunger 92 to avoid damaging the solenoid.

As previously mentioned, when the polishing machine of the present invention is progressing from the forward end of the lane toward its rear end, a spray of polishing oil is directed onto the surface 16 after the latter has been wiped clean by the cleaning cloth 21. To this end, the three spray nozzles 22 are supported between the brush 23 and the cleaning cloth assembly 65 to direct a spray of oil downwardly onto the surface 16 of the bowling lane 14. The polishing oil supply is carried in a conduit 101 of relatively large diameter that is carried across the width of the machine at an elevated position by a pair of vertical pipes 102. An elbow 103 is threaded onto the upper end of one of the pipes 102 and a second elbow 104 is threaded onto the upper end of the other pipe 102. The supply pipe 101 is threaded into the two elbows 103 and 104 to be supported between them. A filler plug 105 is provided in the conduit 101 to provide access for replenishing the supply of oil in the conduit.

The conduit 101 is provided with three branch lines 110 that extend laterally from the conduit 101 in equally spaced relationship as clearly shown in FIG. 1. Each of the lateral branches 110 communicates with a solenoid valve 111 for furnishing a supply of oil to each of the three valves 111 from the conduit 101. The opposite side of each of the solenoid valves 111, in turn, is connected to suply oil to the three spray nozzles 22 respectively. The solenoid valves 111 are normally closed to interrupt the flow of oil from the conduit 101 to the spray nozzles 22, but may be actuated by energizing their respective solenoids to open the valve for permitting the flow of oil into the three spray nozzles 22.

Each of the spray nozzles 22 is provided with a rotary knob 114 that may be turned for actuating a plunger (not shown) in the nozzle to regulate the flow of oil through its associated spray nozzle 22. The plunger (not shown) in each of the nozzles may be adjusted to completely terminate the flow of oil through the nozzle. With this arrangement the operator can shut off one or more of the spray nozzles 22 to limit the application of polishing oil on the surface 16 to a certain area if he so desires.

In order to obtain a spray from the nozzles 22 it is necessary to direct air pressure into them. To this end, the air compressor 40, as previously mentioned, is driven by the motor 24 and draws air from the atmosphere through a filter 112. The air drawn through the filter 112 is compressed in the compressor 40 and directed into a tube 113 to a solenoid valve 115. The solenoid valve 115 is normally closed to interrupt the flow of air from the tube 113 but may be opened by energizing its solenoid to permit the free flow of air. The discharge end of the solenoid valve 115 is connected to communicate with a manifold 116 which distributes the air pressure into three flexible tubes 117, 118 and 119. These three tubes, in turn, are connected to the three spray nozzles 22 to furnish air pressure to the nozzles which serve to spray the oil from the conduit 101 onto the surface 16 when the three solenoid valves 111 are opened.

In order to facilitate the movement and storage of the polishing machine, the frame 10 is L shaped with its short leg 124 being in a vertical position when the machine itself is in the operating position as illustrated in FIG. 2. The short leg 124 is provided with four casters 125 for supporting the machine in an upright position. With this arrangement, the casters 125 and their supporting leg 124 do not interfere with the operation of the machine when the latter is in the operating position. However, when it is desired to move the machine manually it may be lifted from the operating position illustrated in FIG. 2 to an upright position so that the casters 125 are in engagement with the floor. The machine may be readily moved and stored in this position so that it occupies a minimum of storage space.

A control cabinet 130 is provided for housing the electrical circuit that regulates the operation of the machine. The cover 131 of the control cabinet 130 serves as a panel for mounting the manually operated switches and timers that are utilized in the operation of the machine. A travel timer 132 is provided with a dial 133 that is graduated in feet of travel to establish the distance that the machine will travel down the bowling lane before it will reverse its direction. In order to set the timer for the required distance it is only necessary for the operator to move a pointer 134 to the desired distance indicated on the dial 133.

In like manner, an oil timer 140 is provided for adjusting the distance of travel during which the spray nozzles 22 will spray a coating of oil on the surface 16 of the bowling lane 14. The timer 140 is provided with a dial 141 that is also graduated in feet of travel of the machine and a pointer 142 may be moved to the desired distance on the dial 141 to establish the distance that the machine will travel down the lane 14 before the flow of oil into the spray nozzles 22 will be terminated. Since the operator may desire to adjust the timer 140 relatively frequently, it is located on the panel 131 for his convenience.

Another timer 143 is illustrated diagrammatically in FIG. 4 and is located within the cabinet 130 since it will require adjustment rather infrequently. The timer 143 serves to establish the distance that the machine will travel down the lane 14 before the solenoid valves 111 open to admit the flow of oil into the spray nozzles 22. Thus, as the travel of the machine down the lane 14 is initiated, the solenoid valves 111 are closed so that no oil is sprayed onto the surface 16 of the lane 14 by the spray nozzles 22. After several feet of travel, as established by the timer 143, the solenoid valves 111 will be actuated to direct a flow of oil into the spray nozzles 22. As the machine progresses down the bowling lane 14, the nozzles 22 will continue to operate to apply the oil onto the surface 16 until the timer 140 functions to de-energize the solenoid valves 111 and terminate the flow of oil into the nozzles 22. It is therefore apparent that the operator can accurately regulate the point at which the spray of oil onto the surface 16 will be initiated and the point at which it will be terminated.

The panel 131 of the control cabinet 130 is provided with a receptacle 144 for receiving the socket of an extension cord (not shown) which is connected to a source of electrical energy. After the extension cord (not shown) is connected to the receptacle 144, the operator may initiate the travel of the machine down the lane 14 by actuating a main switch 145. The machine will then travel toward the rear of the lane until the timer 132 functions to reverse its direction of motion. In the event that the timer 132 should fail to function or if it is improperly set, a limit switch LS–1, as shown in FIG. 2, will be actuated when the machine reaches the end of the lane to terminate its forward motion. The limit switch LS–1 is provided with an arm 149 which is pivotably connected at one end to the switch for actuating it and its free end is provided with a roller 150 that rolls on the surface 16 as the machine progresses along the lane 14. While the roller 150 is in contact with the surface 16, the switch LS–1 is closed so that the machine can continue to operate in a forward direction. When the end of the lane is reached, the roller 150 will advance beyond the end of surface 16 and drop downwardly to open the switch LS–1 and thereby terminate the forward motion of the machine.

The timer 132 will operate to automatically reverse the direction of rotation of the motor 24 to reverse the direction of motion of the machine after the latter has traveled the designated distance as established by the setting of the timer 132. The machine will then travel in a reverse direction toward the forward end of the lane until the first pair of wheels 11 roll out of the gutters 13 which causes the frame 10 to rise relative to the level

of the surface 16. As the frame 10 rises it moves the cleaning cloth assembly 65 with it to increase the distance between the axis of the shaft 80 and the surface 16. As a result, the entire cleaning cloth assembly 65 will pivot in a counterclockwise direction causing the arm 91 of the bracket 66 to move downwardly and engage a roller 151 at the end of an actuating arm 152 of a limit switch LS–2. The energization of the limit switch LS–2 serves to energize a timer 152 which is located in the control cabinet 130 and is illustrated schematically in FIG. 4.

The timer 152 is set to permit the motor 24 to continue to operate for propelling the machine after the limit switch LS–2 is actuated until all four wheels 11 have moved out of the gutters 13. The timer 152 then operates to open its associated contact 153, shown in FIG. 4, to de-energize the motor 24 and thereby terminate the travel of the machine. The operator may then open the main switch 145 which will serve to de-energize the clutch 30 and permit the machine to be readily rolled on the wheels 11. The clutch 30 may also be de-energized to disconnect the drive to the wheels 11 by opening a clutch switch 154 mounted on the panel 131. The panel 131 is also provided with a manually operated spring switch 155 that may be closed momentarily to energize the solenoid 90 for advancing a length of fresh cleaning cloth along the roll 77 for engagement with the surface 16.

The electrical control circuit for regulating the operation of the machine is illustrated diagramatically in FIG. 4. An alternating current for operating the machine is obtained from a pair of main lines 160 and 161 that are connected to the main switch 145. The motor 24 may be energized in a forward direction by closing a contact FCR–1 of a forward relay FCR to complete a circuit from the main line 161 through one contact of the switch 145 and a conductor 162 to the motor 24 with the voltage returning to its source through a conductor 163 and a return line 164 that is connected to the main line 160. The motor 24 may be operated in the opposite direction by closing a contact RCR–1 of a relay RCR to complete a circuit from the conductor 162 through a branch conductor 165 and a conductor 166 through the now closed contact RCR–1 and a conductor 167 to the motor 24. The current returns to its source through the conductor 163 and the return line 164.

With the machine at rest at the forward end of the bowling lane 14, the operator initiates the operation of the machine by closing the main switch 145. This initiates a flow of current through the branch conductor 165 and a common conductor 170. Energization of the conductor 170 completes a circuit through a conductor 171 to the timer 140 with the current returning to its source through a conductor 172 connected to the return line 164. The oil off timer 140 is provided with a normally closed contact 173 which will be opened by the timer 140 upon the expiration of the prescribed time.

The energization of the common conductor 170 also completes a circuit to initiate operation of the oil on timer 143, the circuit flowing from the conductor 170 into a conductor 174 through the normally closed contact 173 and a conductor 175 to the timer 143. From the timer 143 the current returns to its source through a conductor 176 to the return line 164. The timer 143 is provided with a normally open contact 177 which will be closed by the timing mechanism upon the expiration of the pre-established amount of time.

The closing of the main switch 145 also completes a circuit for energizing the travel reverse timer 132 to initiate its operation. The circuit is completed from the common conductor 170 through a conductor 182 to the timer 132 with the circuit being completed through a conductor 183 connected to the return line 164. It will therefore be noted that the closing of the main switch 145 initiates operation of the three timers, 140, 143, and 132, and each of these timers will actuate their associated contacts upon the expiration of the designated amount of time. Of course, as previously mentioned, the dials 133 and 141 of the timers 132 and 140 respectively are graduated in terms of feet of travel of the machine for the convenience of the operator in setting these timers according to the specific requirements.

In addition to energizing the three timers, the closing of the main switch 145 also energizes the motor 24 for propelling the machine in a forward direction toward the rear end of the bowling lane 14. To this end, a circuit is completed to the forward relay FCR, the current flowing from the common conductor 170 into a conductor 184 to the normally closed contact 186 of the timer 132. The circuit then continues through a conductor 185 to a normally closed contact of the limit switch LS–1 and thence through a conductor 187 to the coil of the relay FCR. The circuit is then completed through a conductor 188 connected to the return line 164.

Energization of the coil of the relay FCR serves to close its normally opened contact FCR–1 to complete the circuit previously described for energizing the motor 24 in a forward direction. At the same time, of course, the oil on timer 143 is energized as previously described and after the machine travels along the bowling lane 14 the designated distance, the timer 143 operates to close its normally open contact 177 for completing a circuit to the three oil solenoid valves 111 and the air solenoid valve 115 to initiate the application of a spray of oil upon the surface 16 of the bowling lane 14. This circuit is completed from the energized conductor 170 through a conductor 189 and the now closed contact 177 to a conductor 190 and a branch conductor 191 for energizing the four solenoids of the valves 111 and 115.

While the timer 143 remains energized, its contact 177 will be retained in the closed position for continuing the energization of the solenoid valves 111 and 115 so that the spray nozzles 22 will continue to spray an application of oil upon the surface 16. However, the oil timer 140 was set at the beginning of the cycle to establish the point on the bowling lane at which the application of oil will be terminated. Accordingly, when the machine has traveled the distance specified by the position of the pointer 142 on the dial 141 of the timer 140, the timer will actuate its normally closed contact 173 to the open position to interrupt the circuit to the timer 143. This serves to immediately reset the timer 143 to its starting position and thereby open its normally open contact 177. The opening of the contact 177 functions to interrupt the circuit to the solenoids 111 and 115 to close the respective valves and terminate the flow of oil to the spray nozzles 22.

The termination of the flow of oil through the spray nozzles 22 does not affect the travel of the machine and it will continue to move in a forward direction until the timer 132 is actuated in accordance with the setting of its pointer 134 on the dial 133. When the timer 132 is actuated after the machine has traveled the specified distance, it will actuate its normally closed contact 186 to an open position and its normally open contact 192 to a closed position. The opening of the normally closed contact 186 interrupts the circuit to the forward relay FCR to open its normally open contact FCR–1 and thereby interrupt the circuit for energizing the motor 24 in the forward direction. The travel of the machine in a forward direction is therefore terminated at the point designated by the setting of the timer 132.

However, the closure of the contact 192 of the timer 132 serves to complete a circuit to the reverse relay RCR. This circuit is completed from the common conductor 170 through a conductor 196 to the now closed contact 192. The circuit then continues through a conductor 197 and the normally closed contact 153 of the timer 152 and thence through a conductor 198 to the relay RCR. The

circuit is completetd from the relay RCR through a conductor 199 that is connected to the return line 164. The energization of the relay RCR closes its normally open contact RCR–1 to complete a circuit for energizing the motor 24 in a reverse direction. This, of course, initiates movement of the machine in a reverse direction toward the forward end of the bowling lane.

The relay RCR is provided with a second normally open contact RCR–2 which is also closed when the relay RCR is energized. The closing of the contact RCR–2 serves to complete a circuit to the solenoid 90 for drawing a clean length of cleaning cloth 21 about the cleaning roller 77 in the manner previously described. The circuit for energizing the solenoid 90 begins with the energized common conductor 170 and continues through a conductor 201, through the now closed contact RCR–2 and thence through a conductor 202 to the solenoid 90. The current returns to its source through a conductor 203 and the return line 164. It is therefore apparent, that a clean length of cleaning cloth 21 is automatically presented about the cleaning roller 77 for engagement with the surface 16 every time that the machine is reversed in its direction of travel.

If it is desired to draw a clean length of cloth from the roll 76 at any other time, the operator may do so by actuating the spring switch 155. This will serve to complete a circuit to the solenoid 90 from the branch line 165 and through a second branch line 204 through the manually closed contact of the switch 155. The circuit then continues from the contact of the switch 155 through a conductor 205 which is connected to the conductor 202 for energizing the solenoid 90. The actuation of the switch 155 is only momentary but this is sufficient to extract a clean length of cloth from the roll 76 and the solenoid 90 is then de-energized. On the other hand, when the solenoid 90 is energized by the closing of the contact RCR–2 it will remain energized until the relay RCR is de-energized to open its contact RCR–2 for interrupting the circuit to the solenoid 90.

The machine will proceed toward the forward end of the bowling lane 14 until one pair of wheels 11 moves out of the gutters 13 to an elevated position to cause the frame 10 to rise. This affects a pivotal movement of the bracket 66 in a counterclockwise direction to cause its upper arm 91 to actuate the limit switch LS–2. However, if the reverse motion of the machine were terminated at this point, it would stop with two wheels 11 out of the gutters 13 and two wheels remaining in the gutters 13. The de-energization of the motor 24 is therefore delayed by operation of the timer 152. To this end, the actuation of the limit switch LS–2 closes its normally open contact to complete a circuit for energizing the timer 152. This circuit is completed from the common conductor 170 through a conductor 210 and through the now closed contact of the limit switch LS–2 to a conductor 211 which is connected to the timer 152. The circuit is completed from the timer 152 through a conductor 212 which is connected to the return line 164. The timer 152 will then operate for a predetermined time before opening its normally closed contact 153. This timer arrangement delays the de-energization of the motor 24 to permit the machine to continue its travel after the limit switch LS–2 is actuated until all four wheels 11 have emerged from the gutter 13.

The opening of the contact 153 of the timer 152 functions to interrupt the circuit to the reverse relay RCR. This causes the normally closed contacts RCR–1 and RCR–2 to open to interrupt the circuits to the motor 24 and the solenoid 90 respectively. The reverse movement of the machine is thereby terminated and the plunger 92 of the solenoid 90 returns to its normal position.

The clutch 30 is energized by a rectifier 215 that is connected across the alternating current conductors 164 and 170 by a pair of conductors 216 and 217. The current flows from one terminal of the rectifier 215 through a conductor 218 to the contact of the switch 154. From the switch 154 the flow of current continues through a conductor 219 to the clutch 30 and returns to its source through a conductor 220 which is connected to the opposite terminal of the rectifier 215. With this arrangement, the circuit to the clutch 30 may be interrupted by manually opening the contact switch 154 or by opening the main switch 145.

Upon the completion of a polishing cycle by the machine, the operator will normally open the main switch 145 which de-energizes the clutch 30 so that the wheels 11 are free to rotate without actuating the associated transmission to avoid any resistance to the rolling of the machine. The opening of the main switch 145 will also operate to de-energize the several timers in the electrical circuit so that they may automatically return to their starting posiion. The operator is then ready to initiate the next cycle by closing the main switch 145.

From the foregoing detailed description of the structure and operation of the illustrative embodiment of the present invention, it will be apparent that a new and improved cleaning and polishing machine has been provided which will operate very efficiently and automatically with a minimum of effort on the part of the operator to clean and polish the surface of bowling lanes.

Although the illustrative embodiment of the invention has been described in considerable detail for the purpose of making a full disclosure of a practical operative arrangement by means of which the inventon may be practiced, it is to be understood that various novel features of the invention may be incorporated in other arrangements without departing from the spirit and scope of the invention as defined in the subjoined claims.

The principles of the invention having now been fully explained in connection with the foregoing description of embodying structure, I hereby claim as my invention:

1. In a machine for polishing bowling lanes that are bounded on each side along their length by gutters; a frame; a source of power; a plurality of wheels supporting said frame to render it mobile and connected to be driven by said source of power for propelling the frame, said wheels being spaced to conform to the spacing of the gutters so that the pair of wheels on one side of the frame roll in one of the gutters and the pair of wheels on the opposite side of the frame roll in the other gutter as the machine is progressing along the lane; a drive shaft connected to be rotated by said source of power; a bracket supported for pivotal movement about an axis that coincides with the axis of said drive shaft; a polishing member rotatably supported by said bracket; transmission means connected to transmit power from said drive shaft for rotating said polishing member; mounting means on said bracket supporting said polishing member for rotation about an axis that is parallel to and spaced from the pivotal axis of said bracket to enable said polishing member to rise and fall relative to said frame with the pivotal movement of said bracket while retaining a uniform driving connection with said drive shaft, said polishing member being yieldly urged into operating engagement with the surface of the bowling lane by a substantially uniform pressure to cause said polishing member to maintain operating engagement with the surface of the bowling lane when irregularities in the gutters are encountered by said wheels; and control means operably connected to regulate the transmission of power from said source to automatically reverse the direction of movement of the machine after it has traveled along the lane to a predetermined location and to terminate the reverse travel of the machine along the lane when it arrives at a second predetermined location.

2. In a machine for polishing bowling lanes; a frame; a plurality of wheels supporting said frame to render it mobile; polishing means carried by said frame to polish the surface of a bowling lane while said frame is traveling along the length of the lane; a source of power; a

reservoir carried by said frame for containing a supply of polishing oil; a plurality of spray nozzles supported in spaced relationship across said frame for applying a film of oil to the surface of the bowling lane as the machine progresses along the lane and before the surface is engaged by said polishing means; means connecting said reservoir to each of said spray nozzles for furnishing a supply of oil to said nozzles; an air compressor driven by said source of power and connected to said nozzles to furnish compressed air for actuating said nozzles; individual spray adjusting means on each of said spray nozzles for independently adjusting the spray pattern and the quantity of oil discharged by each of the spray nozzles so that the operator can vary the amount of oil applied to different longitudinal strips of the bowling lane surface; first control means adjustable for automatically initiating operation of said oiling means for applying oil to the surface of the lane after the machine has traveled a predetermined distance along the lane; and second control means adjustable for automatically terminating the operation of said oiling means after the machine has traveled a second predetermined distance along the lane.

3. In a machine for polishing the surfaces of bowling lanes; a source of power energizable by a source of electrical energy; a frame supported for mobility for traversing the length of the bowling lanes; a rotary polishing member operably connected to be rotated by said source of power for polishing the surface of the bowling lane while the machine is traversing the lane; a cylinder supported by said frame to carry a supply of cleaning cloth; a wiper adapted to maintain a length of the cleaning cloth from said cylinder in engagement with the surface of the bowling lane for wiping the surface of the bowling lane before the surface is engaged by said polishing member; a take-up roll rotatably supported by said frame to take up the used cleaning cloth from said wiper; a solenoid operably connected to rotate said take-up roll when energized to thereby draw a new length of cleaning cloth about said wiper from said cylinder, and means to selectively connect said solenoid to said source of electrical energy for energizing it.

4. In a machine for polishing bowling lanes that are bounded on each side along their length by gutters; a frame; a plurality of wheels rotatably mounted on said frame to render the machine mobile, said wheels being spaced to conform to the spacing of the gutters so that the wheels on one side of the frame roll in one of the gutters and the wheels on the opposite side of the frame roll in the other gutter as the machine is progressing along the lane; a polishing member supported for floating movement so that it is free to rise and fall relative to said frame, said polishing member being yieldably urged into engagement with the surface of the bowling lane while the machine is traveling along the lane to maintain uniform engagement with the surface despite irregularities that may be encountered by the wheels as they progress along the gutters; a source of power connected to drive the machine in its path of travel; control means connected to reverse the direction of travel of the machine after it has reached a predetermined point in its path of travel toward the pit end of the lane; and switching means actuated by the movement of the machine as said wheels roll out of the gutter at the forward end of the lane to terminate the movement of the machine.

5. In a machine for polishing bowling lanes that are bounded on each side along their length by gutters; a frame; a plurality of wheels rotatably mounted on said frame to render the machine mobile, said wheels being spaced to conform to the spacing of the gutters so that the wheels on one side of the frame roll in one of the gutters and the wheels on the opposite side of the frame roll in the other gutter as the machine is progressing along the lane; a polishing member supported for floating movement so that it is free to rise and fall relative to said frame and being yieldably urged into engagement with the surface of the bowling lane while the machine is traveling along the lane to maintain uniform engagement with the surface despite irregularities that may be encountered by the wheels as they progress along the gutters; a source of power connected to drive the machine in its path of travel; control means connected to reverse the direction of travel of the machine after it has reached a predetermined point in its path of travel toward the pit end of the lane; switch means connected to be actuated by the movement of the machine as the first wheels roll out of the gutter at the forward end of the lane, said switch being actuated for terminating the travel of the machine and delay means connected to delay the termination of the travel of the machine after the actuation of said switch means until the last of said wheels have rolled out of the gutter.

6. In a machine for polishing bowling lanes; a frame; a source of power; a plurality of wheels mounted on said frame to render the machine mobile and connected to be driven by said source of power for propelling the machine; polishing means carried by said frame for polishing the surface of a bowling lane while the machine is traveling along the length of the lane; a supply of cleaning cloth carried by said frame; a wiper adapted to maintain a length of the cleaning cloth from said supply in engagement with the surface of the lane for wiping it; control means operably connected to regulate the transmission of power from said source to automatically reverse the direction of movement of the machine when it reaches a predetermined point along the lane; and means operable when actuated to withdraw a length of cleaning cloth from said supply and apply it to said wiper for providing a fresh length of cleaning cloth to engage the surface of the lane, said means being actuated automatically when the machine arrives at a predetermined point along the lane.

7. In a machine for polishing bowling lanes; a frame; a source of power; a plurality of wheels mounted on said frame to render the machine mobile and connected to be driven by said source of power for propelling the machine; polishing means carried by said frame for polishing the surface of a bowling lane while the machine is traveling along the length of the lane; dusting means carried by said frame in position to engage the surface of lane for wiping the dust off of the lane before the latter is engaged by said polishing means; advancing means connected to advance said dusting means for moving a fresh area of said dusting means into engagement with the surface of the lanes; and actuating means connected to actuate said advancing means after the machine has travelled a predetermined distance along the lane.

8. In a machine for polishing bowling lanes; a frame; a source of power; a plurality of wheels mounted on said frame to render the machine mobile and connected to be driven by said source of power for propelling the machine; oiling means supported by said frame in position to apply a film of oil to the surface of the bowling lane; a rotary polishing member connected to be rotated by said source of power and to engage the surface of the lane after the oil has been applied to it for polishing the surface; wiping means carried by said frame in position to engage the lane for wiping off any excess oil that may remain on the surface after it has been operated on by said polishing member; advancing means connected to advance said wiping means for moving a fresh area of said wiping means into engagement with the surface of the lane; and actuating means connected to actuate said advancing means after the machine has travelled a predetermined distance along the lane.

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CHARLES A. WILLMUTH, *Primary Examiner.*