

May 27, 1952

F. HARRIS
SANDING MACHINE

2,598,053

Filed Sept. 27, 1948

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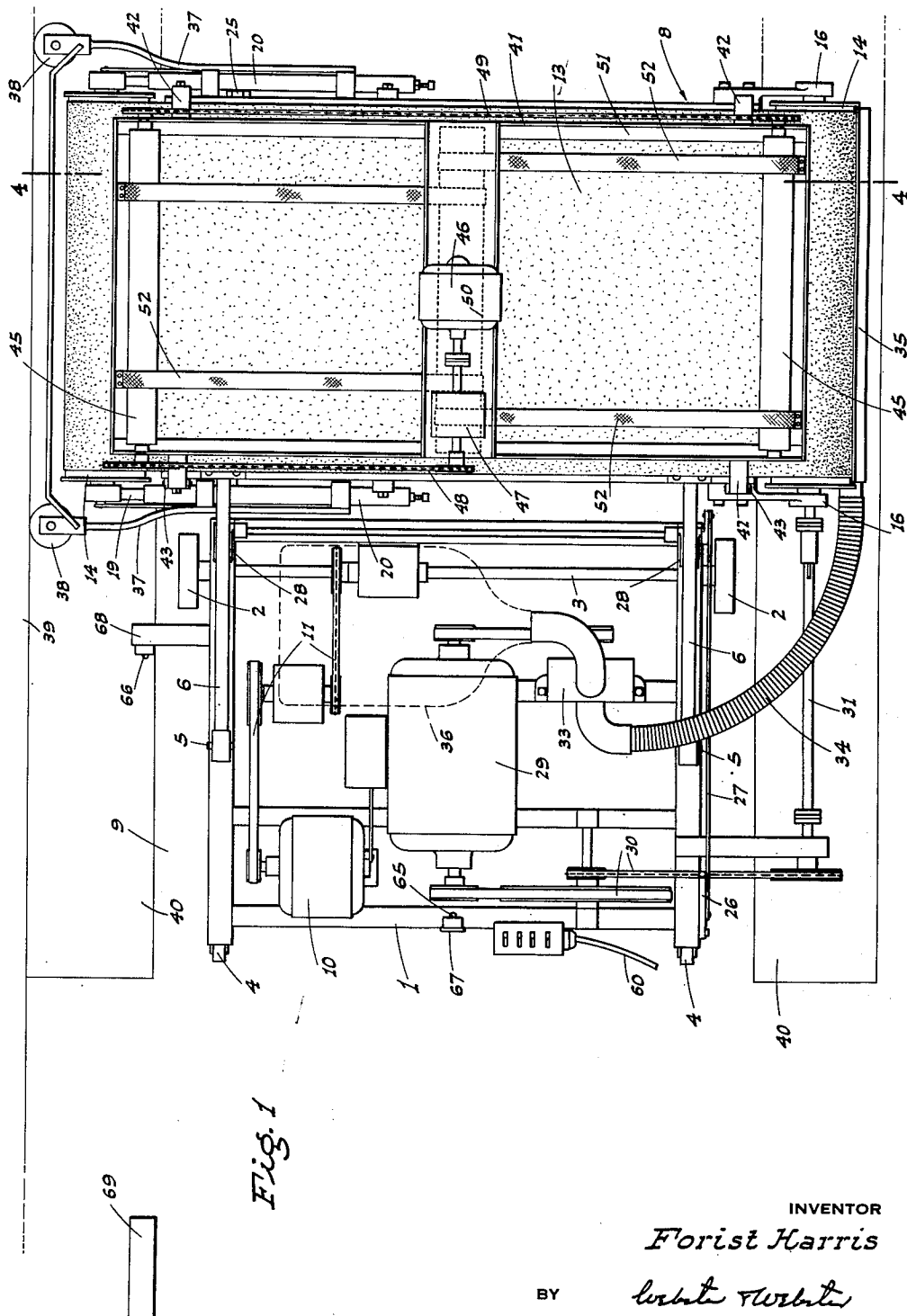


Fig. 1

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Fig. 2

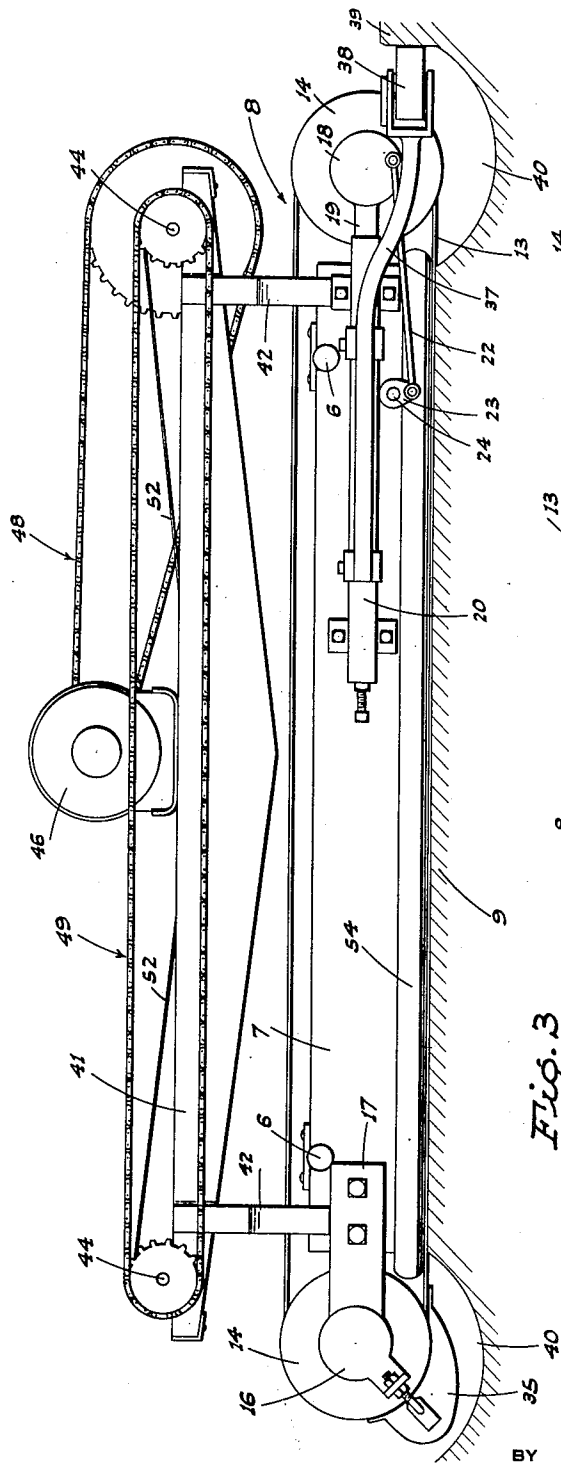
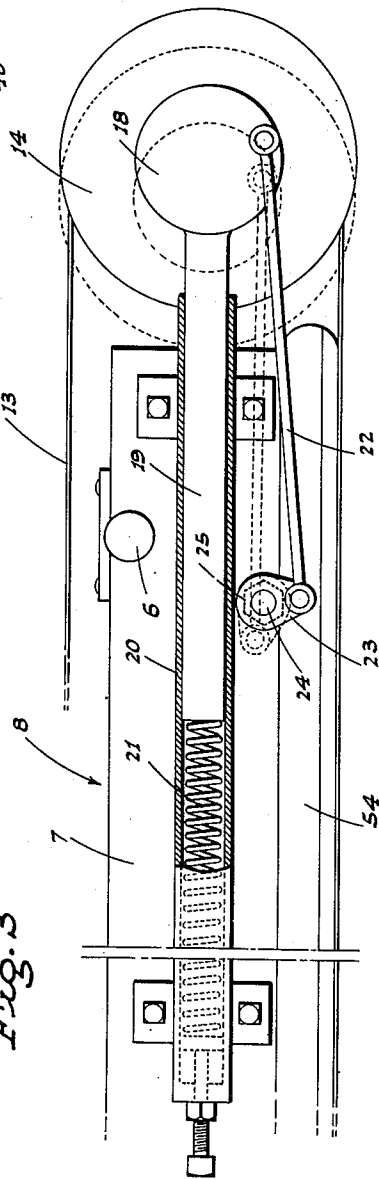


Fig. 3



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Fig. 4

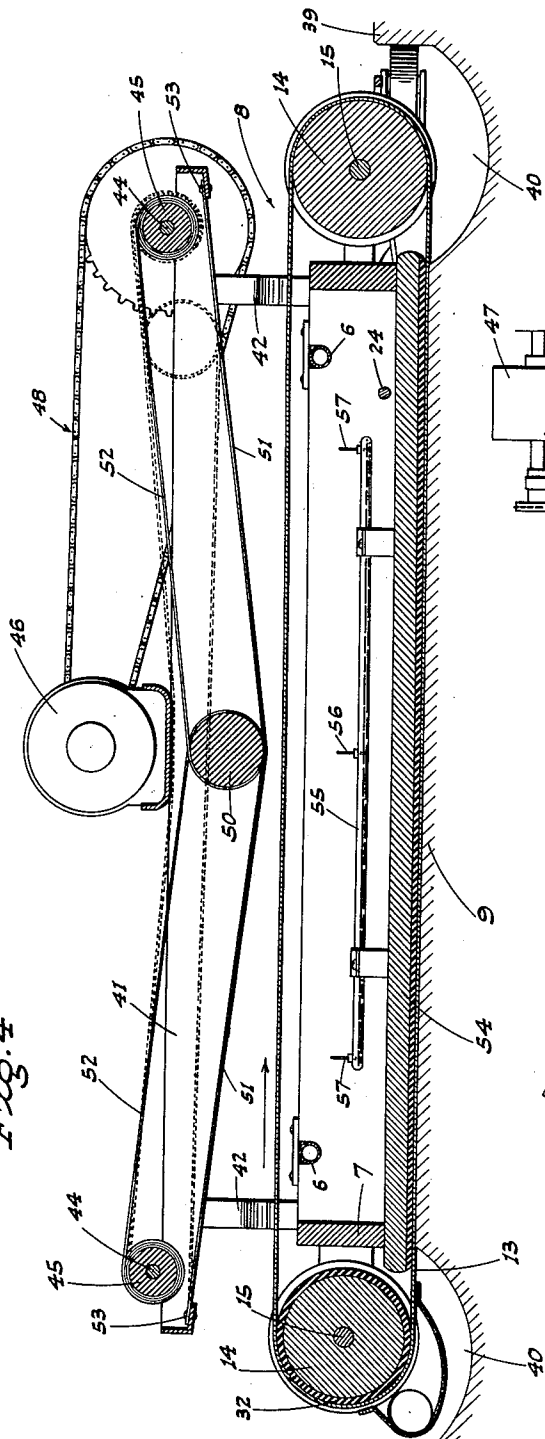
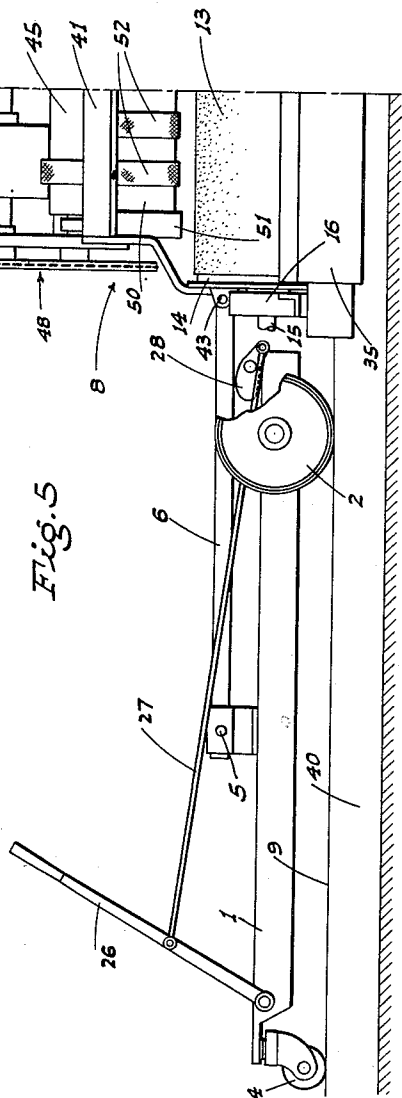


Fig. 5



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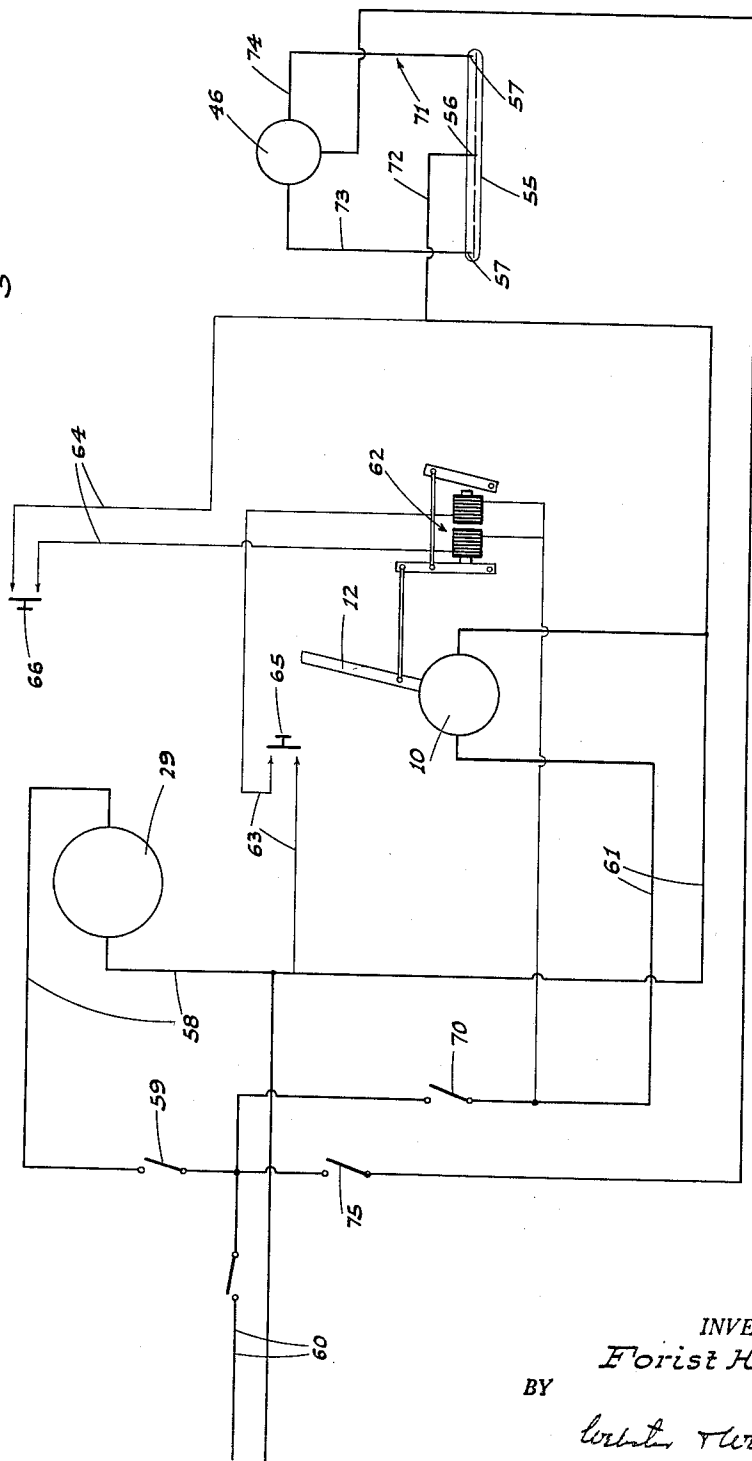
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Fig. 6



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2,598,053

SANDING MACHINE

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Application September 27, 1948, Serial No. 51,387

11 Claims. (Cl. 51-174)

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This invention has for an object the provision of an automatic sanding machine for bowling alleys; there being a novel arrangement to accomplish effective guiding of the machine along an alley, and the machine being arranged to automatically reverse at the ends of the alley.

Another object of the invention is to provide a sanding machine, for bowling alleys, which includes a novel leveling mechanism; such mechanism being operative, automatically, to cause the sanding unit—by reason of weight transfer—to cut faster on relatively high areas, whereby the surface of an alley is sanded to a common transverse level and within very close limits.

A further object of the invention is to provide a sanding machine, for bowling alleys, which is arranged to take advantage of the lateral thrust, or side draft, imposed on the machine by the transversely disposed endless sanding belt, to cause guide elements of said machine to remain at all times in machine guiding engagement with the upstanding longitudinal shoulder of one gutter of the alley being sanded.

An additional object of the invention is to provide the machine with a novel, endless belt sanding unit; said unit being arranged for easy and convenient removal and replacement of the sanding belt by the operator on a job.

It is also an object of the present invention to provide a sanding machine for bowling alleys, which includes novel driving means for the power actuated mechanisms on the machine.

A further object of the invention is to provide a practical, reliable, and accurate automatic sanding machine for bowling alleys, and one which will be exceedingly effective for the purpose for which it is designed.

These objects are accomplished by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings:

Fig. 1 is a top plan view of the machine; the electric wiring being omitted for clarity.

Fig. 2 is an enlarged front end elevation of the machine.

Fig. 3 is an enlarged fragmentary elevation, partly in section, of one of the spring-urged but retractable endless sanding belt tightening assemblies.

Fig. 4 is an enlarged cross section on line 4-4 of Fig. 1, and shows the main portion of the automatic leveling mechanism.

Fig. 5 is an enlarged fragmentary side elevation of the machine, showing the device employed to

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cause the sanding unit to raise above the floor for removal and replacement of a sanding belt.

Fig. 6 is a diagram of the electric circuit employed.

Referring now more particularly to the characters of reference on the drawings, the machine comprises a rectangular traction frame, indicated generally at 1, supported at its front end, and on opposite sides, by driven floor engaging wheels 2 fixed on opposite ends of a cross shaft 3. At its opposite or rear end the traction frame 1 is supported by transversely spaced casters 4.

The above wheel-supported traction frame is pivotally secured, intermediate its ends and on opposite sides, as at 5, to the rear ends of a pair of forwardly projecting connection arms 6. Ahead of the traction frame 1, the connection arms 6 extend through, and are secured in connection with, a rectangular frame 7 of an endless belt, sanding unit, indicated generally at 8.

The rectangular frame 7 of the sanding unit 8 is of a width, transversely of the direction of travel, substantially that of the floor 9 of a bowling alley, while the traction frame 1 is somewhat narrower, as shown.

The machine is reversibly driven, as follows:

A reversible motor 10 is mounted on the traction frame 1 and drives the cross shaft 3 through the medium of a speed-reducing drive assembly 11. The motor 10 is of the type which includes a reversing lever 12, and the arrangement for controlling this lever is hereinafter described. It suffices at this point to state that the reversible motor 10 acts to advance the machine from one end of a bowling alley to the other end, and is then automatically reversed to return the machine to its starting position.

The endless belt, sanding unit 8 comprises a transversely extending, endless sanding belt 13 carried, at opposite ends, on end rollers 14 supported by end shafts 15 mounted in connection with the frame 7, as follows:

One of the end shafts 15 has a fixed mount, including fixed end heads 16 on rigid arms 17. At the opposite end of the frame 7, the other end shaft 15 is journaled between adjustable end heads 18. The end heads 18 are fixed on the outer ends of rods 19 which extend inwardly in supported relation into sleeves 20 fixed on corresponding sides of said frame 7. Loaded helical springs 21 in the sleeves 20 normally urge the rods 19 outwardly, together with the heads 18 and the corresponding end shaft 15, whereby to maintain the endless sanding belt 13 under the desired working tension.

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For the purpose of facilitating the removal and replacement of the endless sanding belt 13, the end heads 18 can be drawn or adjusted inwardly, to loosen such belt, in the following manner:

A pull link 22 pivotally connects between each end head 18 and a radial lever 23 journaled on the corresponding side of the frame 7 by means of a stub shaft 24 having a nut 25 thereon. By applying a wrench to each nut 25 and rotating the same so as to swing the lever 23 and pull link 22 from the normal full-line position of Fig. 3 to the dotted-line position in said figure, the desired result is accomplished.

To further expedite removal and replacement of the endless sanding belt 13, the sanding unit 8 is elevated above the floor 9 of the alley by the following device:

A hand lever 26 is pivotally mounted on the rear end of the traction frame 1 at one side thereof, and a link 27 pivotally connects between the lever 26 and a cam assembly 28 mounted between the front end of the traction frame 1 and corresponding points on the connection arms 6. By swinging the hand lever 26 rearwardly, the link 27 causes the cam assembly 28 to push upwardly on the connection arms 6, raising the sanding unit 8 clear of the floor a short distance, but which clearance is sufficient to permit of the convenient removal and replacement of the sanding belt 13.

The endless sanding belt 13 is driven, in the direction indicated by the arrow in Fig. 4, by the following arrangement:

An electric motor 29 is mounted on the traction frame 1, and actuates a speed reducing drive assembly 30, which in turn actuates a universal drive shaft 31 which extends longitudinally along one side of the traction frame 1 and connects in driving relation to the corresponding end shaft 15. The end roller 14 on said driven end shaft 15 has a friction grip surface 32, while the surface of the opposite end roller is relatively smooth.

The motor 29 also drives a suction fan 33 having a pick-up hose 34 which leads from a dust collector 35 at the end of the sanding unit 8 toward which the bottom run of the belt 13 travels. The suction fan 33 discharges the dust into a bag 36.

When the machine is in operation with the endless sanding belt 13 driven in the direction indicated by the arrow in Fig. 4, the lower run of said belt, acting transversely on the floor 9 of the bowling alley, imparts side draft or lateral thrust to the machine in the same direction as indicated by said arrow. This lateral thrust is taken advantage of to maintain the machine in straight-line travel along the alley, in the following manner:

Transverse guide arms 37 are secured to the sleeves 20 and extend lengthwise thereof to a point beyond the corresponding end of the sanding unit 8, and at their outer ends such guide arms 37 carry guide rollers 38 which bear against the upstanding longitudinal shoulder 39 of the adjacent gutter 40. Thus, as the machine advances, the side draft or lateral thrust imparted thereto by the sanding belt 13 maintains the rollers 38 positively in contact with the shoulder 39, whereby the machine must, of necessity, travel in a straight line; i. e. parallel to said shoulder 39. The guide arms 37 are adjustably connected, at their inner ends, to the sleeves 20, whereby the machine may be initially positioned correctly.

The sanding unit 8 is of a length transversely

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of the direction of travel of the machine such that the end portions of the sanding belt 13 overhang the gutters 40.

The following leveling mechanism is employed in the machine:

A secondary frame 41, of rigid rectangular construction, is disposed above the frame 7 of the sanding unit 8; being supported from the latter by corner legs 42. The forward pair of these legs merely rest on the frame 7, while the rearward pair are hinged, as at 43, whereby the secondary frame 41, and the parts mounted thereon, may be swung upwardly and rearwardly when a sanding belt is being removed and replaced.

At opposite ends thereof the secondary frame 41 carries cross shafts 44, each having a roller 45 thereon, and such rollers 45 are adapted to be simultaneously rotated in the same direction, but reversibly, from a reversible motor 46 mounted centrally on the secondary frame 41. The drive arrangement is as follows:

The reversible motor 46 is coupled to a fluid drive unit 47, and the latter in turn drives an endless chain and sprocket unit 48 which leads to one of the cross shafts 44. Another endless chain and sprocket unit 49 connects between said cross shafts. Thus, when the motor 46 turns in one direction or the other, there is a corresponding and simultaneous rotation of the rollers 45.

A very heavy steel roller or cylinder 50, disposed horizontally and extending lengthwise of the direction of travel of the machine, is normally in a position centrally between the ends of the sanding unit 7; such roller 50 being supported, at its opposite ends, in tracks 51 which extend transversely of said direction of travel of the machine; i. e. lengthwise of the sanding unit 7. The tracks 51 incline upwardly in opposite directions from their center points whereby the roller 50 tends at all times to return by gravity to its normal and central position, as in dotted lines in Fig. 1 and as in full lines in Fig. 4.

A pair of spaced tapes 52 is anchored, as at 53, to each end of the secondary frame 41, thence extends inwardly about the roller 50, and returns to the corresponding roller 45; winding about, and being secured to, the latter. With this arrangement of tapes, and upon reversible drive of the rollers 45, the steel roller 50 is pulled up the inclined tracks 51 to the right or left from its central position, dependent upon the direction of rotation. The purpose of this shifting of the steel roller 50 laterally of the direction of travel of the machine is to shift its effective weight transversely with respect to the floor 9 of the alley being sanded. The rectangular frame 7 of the sanding unit 8 includes, at the bottom, a platen 54, preferably resiliently surfaced on the under side; such platen being of a substantial area and operative to maintain the lower run of the sanding belt 13 flat.

As the machine travels along the alley, the steel roller 50 remains in its normal central position as long as the alley is transversely level. However, if a low spot or area is encountered to one side or the other of the longitudinal center of the alley, the steel roller 50 is automatically rolled or shifted in an opposite direction, whereby to impose its weight above the relatively higher area on the other side of the alley so that the sanding belt 13 is caused to cut faster on said relatively higher area. The result is that the machine cuts away such relatively higher area

down to the plane of the low area; thus leveling the alley transversely. As soon as such level is reached, the steel roller 50, previously shifted laterally as described, returns to its normal position; all automatically and by means including the following leveling control switch:

An elongated, transverse mercury tube switch 55 is mounted in the frame 7 intermediate its ends, and on top of the platen 54; such switch 55 including a central contact 56 and end contacts 57. The switch 55 responds to any variance from true transverse level of the floor 9 of the alley, to actuate the above described leveling mechanism; the circuit arrangement between switch 55 and reversible motor 46 being herein-after described.

The sanding machine, when in use, is first positioned at one end of the alley, and the guide rollers 38 properly adjusted in abutment with the adjacent gutter shoulder 39. Thereafter, the sanding unit 8 is placed in operation by starting the motor 29; the actuating circuit for the latter being indicated at 58 in Fig. 6. Such circuit includes a manual switch 59, and the circuit is energized from an electric power supply circuit 60.

With the sanding unit 8 in operation, the reversible drive motor 10 is placed in operation in a direction to cause the machine to advance along the alley, in sanding relation, from said one end thereof. The actuating circuit for the reversible motor 10 is indicated in Fig. 6 at 61; such motor, as previously described, being of a type which is reversed by movement of a lever 12 on said motor. This reversing lever is actuated in one direction or the other by means of a two-way electro-mechanical relay 62 to which are connected a pair of reversing circuits, indicated at 63 and 64. The reversing circuit 63 includes a normally open contactor 65, while the reversing circuit 64 includes a normally open contactor 66.

The contactor 65 is mounted, in forwardly-facing relation, on the upper end of a post 67 which upstands from the rear of the traction frame 1. The contactor 66 is mounted in rearwardly facing relation on a lateral arm 68 which projects from one side of said traction frame 1.

After the machine has advanced along the alley from one end thereof and reaches the opposite end, the contactor 65 strikes the normally raised pin setting frame or cage above the forward end of the alley. When this occurs the circuit 63 is closed, reversing the relay 62, and the latter in turn swings the lever 12 in a direction to reverse the drive motor 10. The result is that the machine stops its forward travel and is then retracted along the alley, by the then-reversed motor 10, to its starting position.

When the machine reaches its starting position, the contactor 66 engages a heavy block 69 disposed in predetermined position. Upon closing of the contactor 66, the circuit 64 again reverses the electromechanical relay 62 so that the lever 12 is swung to a position wherein the motor 10 drives the machine forwardly. At this point, the cycle of operation may be terminated by opening a manual switch 70 in the actuating circuit 61, or the machine may be permitted to again advance and retract along the alley until the same is completely sanded.

As the machine travels back and forth along the alley, the hereinbefore described leveling mechanism functions automatically to sand relatively high areas down to the level of transversely disposed, relatively low areas; the control

of the leveling mechanism being by the transversely elongated mercury tube switch 55, whose circuiting arrangement, with respect to the reversible motor 46, is as follows:

The reversible motor 46 is connected, as shown in Fig. 6, in a reversing circuit, indicated generally at 71, which reversing circuit includes one lead 72 connected to the central contact 56 of the switch 55, and which contact 56 is always in electrical engagement with the mercury in the tube. Additionally, the reversing circuit 71 includes reversing leads 73 and 74 extending between the motor 46 and corresponding ones of the end contacts 57; the latter being normally open; i. e. normally clear of the mercury in the tube of said switch 55.

If the machine as it travels rides onto an area which is relatively low on one side of the center line of the alley, the corresponding end of the tube of switch 55 will also lower, whereupon the mercury closes with the adjacent contact 57. This closes the reversing circuit 71 through either the lead 73 or 74, to cause the motor 46 to run in a direction to shift the steel roller 50 from its normal central position to a lateral position above the side of the alley opposite such relatively low area, for the purpose hereinbefore described; to wit automatic sanding down of the relatively higher area to the level of the relatively low area.

Should it be necessary to do so, the reversing circuit 71 for the leveling mechanism actuating motor 46 may be opened by a manual switch 75 interposed therein.

The steel roller 50 remains in such laterally shifted position as long as the reversing circuit 71 is closed and the motor 46 running; the fluid drive unit 47 permitting slippage in the drive after the motor has shifted the roller 50 to its lateral position.

As soon as the part of the alley which initially had differential transverse level is sanded to a common level, the switch 55 returns to its open position; the motor 46 ceases to run; and the steel roller 50 returns by gravity to its normal central position. It will thus be obvious that the leveling mechanism of the machine functions automatically, effectively, and accurately, whenever a transversely untrue area of a bowling alley is encountered by the traveling sanding machine.

The connection arms 6 are detachable from the traction frame 1 at the pivots 5; the hose 34 is detachably mounted; and the universal drive shaft 31 is separable; all for the purpose of permitting said traction frame and the parts mounted thereon to be separated from the remainder of the machine for transport.

The sanding machine, being wholly automatic, provides for the practical, effective, and economical sanding of bowling alleys; requiring a minimum of attendance while in operation, and yet performing the operation with greater accuracy than can otherwise be accomplished.

From the foregoing description it will be readily seen that there has been produced such a device as substantially fulfills the objects of the invention, as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described the invention, the fol-

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lowing is claimed as new and useful, and upon which Letters Patent are desired:

1. A bowling alley sanding machine comprising a frame, means adapted to move the frame lengthwise on an alley, a driven sanding unit mounted on the frame for alley engagement, a weight member mounted in connection with the frame for shifting motion transversely of the alley, and means operative, in response to transversely unlevel portions of the alley traversed by the machine, to shift said weight member toward and to a point above the high side, whereby to then impose a greater weight on the part of the sanding unit engaging said high side.

2. A bowling alley sanding machine comprising a frame, means adapted to move the frame lengthwise on an alley, a driven sanding unit mounted on the frame for alley engagement, a weight member mounted in connection with the frame for shifting motion transversely of the alley, and means operative, in response to transversely unlevel portions of the alley traversed by the machine, to shift said weight member toward and to a point above the high side, whereby then impose a greater weight on the part of the sanding unit engaging said high side; said last named means including a reversible electric motor, a reversing circuit for the motor, and a switch in the circuit responsive to transverse unlevel of the machine when on such portions of the alley.

3. A machine, as in claim 2, in which the switch is a mercury tube type, elongated transversely of the direction of travel and mounted in connection with the frame.

4. A bowling alley sanding machine comprising a frame, means adapted to move the frame lengthwise on an alley, a driven sanding unit mounted on the frame for alley engagement, a weight member mounted in connection with the frame for shifting motion transversely of the alley, the weight member being normally disposed substantially centrally with respect to the lengthwise path of the machine, mechanism operative to move the weight member laterally to one side or the other of its normal position, and means operative, in response to transversely unlevel portions of the alley traversed by the machine, to automatically cause said mechanism to move the weight member laterally to the side corresponding to the high side of the unlevel alley portion being traversed.

5. A machine, as in claim 4, in which the weight member is a relatively heavy metal roller disposed with its axis extending in the direction of travel; there being transverse tracks on the frame supporting the roller at opposite ends.

6. A machine, as in claim 5, in which each track inclines upward in opposite directions from an intermediate point; said mechanism, when inactive, releasing the roller to return by gravity to its normal position.

7. A bowling alley sanding machine comprising a frame, means adapted to move the frame lengthwise on an alley, a driven sanding unit mounted on the frame for alley engagement from side to side thereof, a pair of matching transverse tracks mounted in connection with the frame in spaced relation in the direction of travel, each track inclining upward in opposite directions from a central point, a relatively heavy metal roller extending between the tracks and supported thereby, the roller normally being at said central point by gravity, mechanism operative to move the weight member laterally to one side or the other of its normal position, and

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means operative, in response to transversely unlevel portions of the alley traversed by the machine, to automatically cause said mechanism to move the weight member laterally to the side corresponding to the high side of the unlevel alley portion being traversed.

8. A bowling alley sanding machine comprising a frame, means adapted to move the frame lengthwise on an alley, a driven sanding unit mounted on the frame for alley engagement from side to side thereof, a pair of matching transverse tracks mounted in connection with the frame in spaced relation in the direction of travel, each track inclining upward in opposite directions from a central point, a relatively heavy metal roller extending between the tracks and supported thereby, the roller normally being at said central point by gravity, mechanism operative to move the weight member laterally to one side or the other of its normal position, and means operative, in response to transversely unlevel portions of the alley traversed by the machine, to automatically cause said mechanism to move the weight member laterally to the side corresponding to the high side of the unlevel alley portion being traversed; said mechanism including transverse tapes anchored at one end to points on the frame at opposite sides of the weight roller and thence extending laterally inwardly and about said weight roller, power driven rollers mounted on the frame on opposite sides of the weight roller, the tapes connecting at their other ends to the power driven rollers, and a power drive operative to simultaneously rotate the power driven rollers in one direction or the other.

9. A bowling alley sanding machine adapted to move lengthwise on an alley, comprising a power driven sanding unit operative to engage and sand the alley from side to side thereof, a transversely shiftable weight on the machine, means responsive to transversely unlevel portions of the alley traversed by the machine operative to automatically shift the weight toward the high side of such portion as lowered, reversible power means to move the machine, and means operative to automatically reverse said power means upon predetermined travel of the machine on an alley.

10. A bowling alley sanding machine, comprising: a frame; motor means adapted to move the frame lengthwise on an alley; a driven sanding unit coupled with the frame to ride on the alley and to be carried along with movement of the frame over the alley, said sanding unit having a transversely moving sanding belt for alley engagement, a platen positioned above said belt and resting thereon for maintaining the belt in engagement with the alley, said sanding unit being free to tilt transversely to follow the transverse contour of the alley; means carried by the machine for exerting a greater pressure on one side of the sanding unit relative to the other side; and automatic means mounted on the machine in fixed relation to the platen and operative in response to tilting of the sanding unit on unlevel portions of the alley traversed by the machine to operate the pressure exerting means whereby to exert a greater pressure on the high side of the sanding unit relative to the other side.

11. A bowling alley sanding machine, comprising: a frame; motor means adapted to move the frame lengthwise on an alley; a driven sanding unit coupled with the frame to ride on

the alley and to be carried along with movement of the frame over the alley, said sanding unit having a transversely moving sanding belt for alley engagement, a platen positioned above said belt and resting thereon for maintaining the belt in engagement with the alley, said sanding unit being free to tilt transversely to follow the transverse contour of the alley and having its weight distributed substantially uniformly over the alley when the platen and alley are level; means carried by the machine for shifting the effective weight of the sanding unit toward one side thereof relative to the other side; and automatic means mounted on the machine in fixed relation to the platen and operative in response to tilting of the sanding unit on unlevel portions of the alley traversed by the machine to operate the weight shifting means to shift the effective weight of the sanding unit toward the high side of the platen.

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