Sept. 27, 1966 L. E. STATLER ET AL 3,275,048

APPARATUS FOR FINISHING SURFACES

Filed July 6, 1961 4 Sheets-Sheet 1

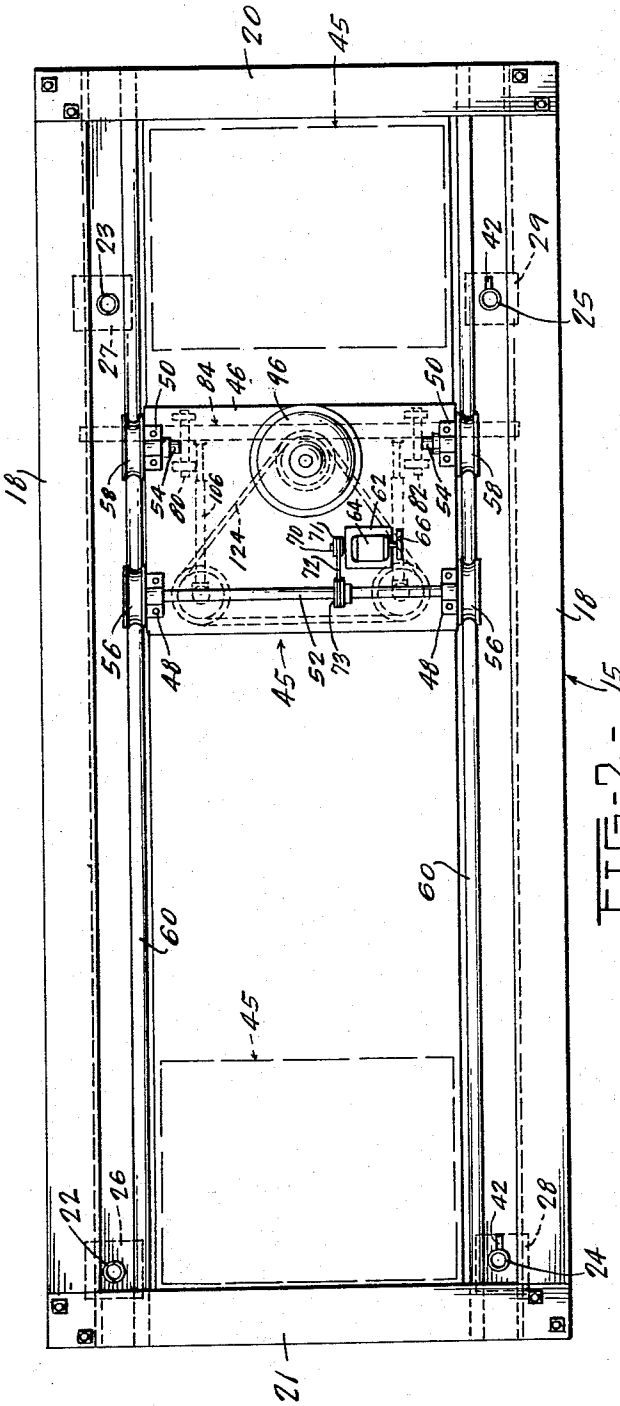

FIG-2-

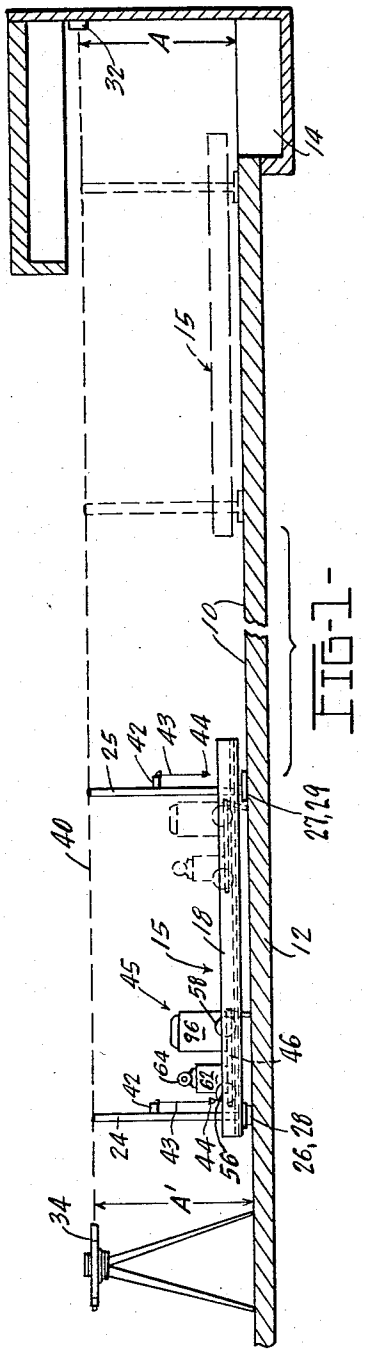

FIG-1-

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Filed July 6, 1961 4 Sheets-Sheet 2

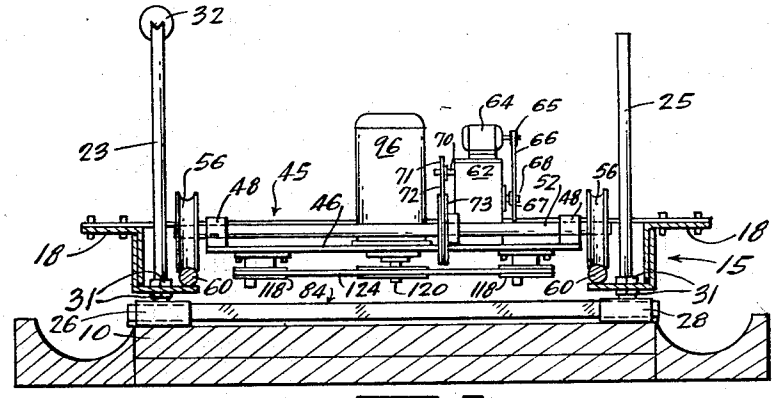

FIG-3-

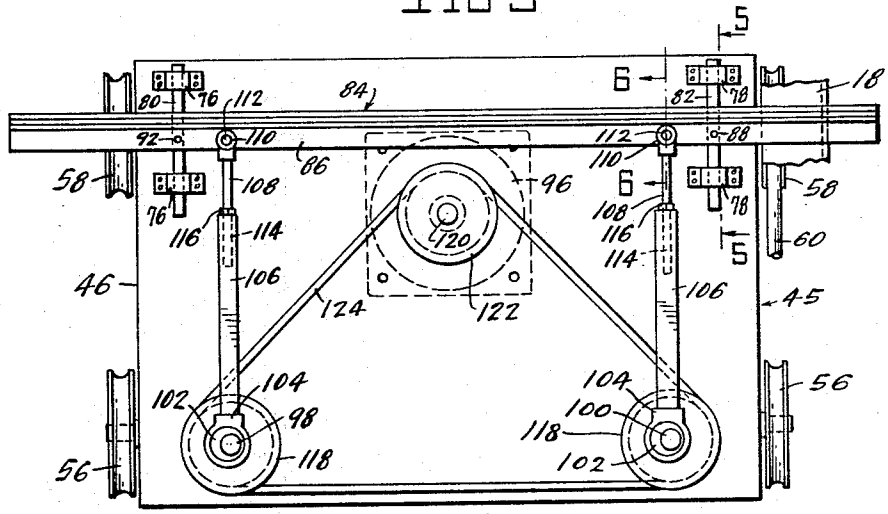

FIG-4-

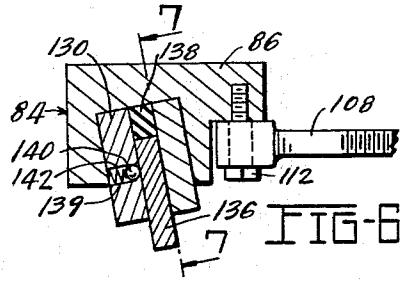

FIG-6-

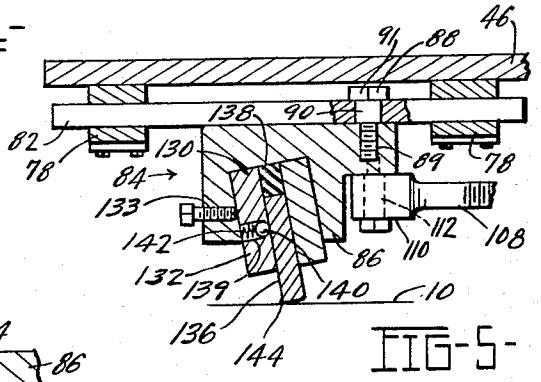

FIG-5-

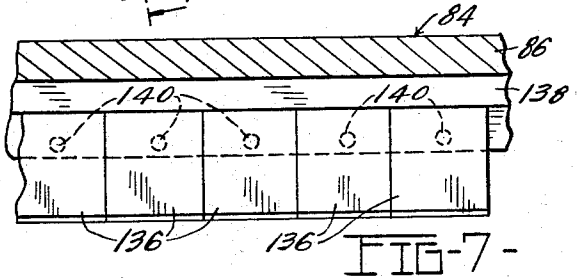

FIG-7-

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APPARATUS FOR FINISHING SURFACES

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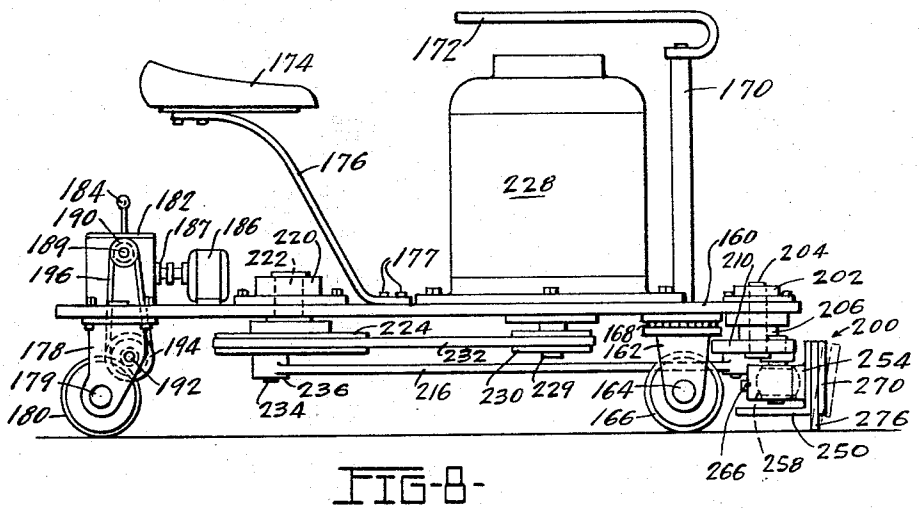

FIG-8-

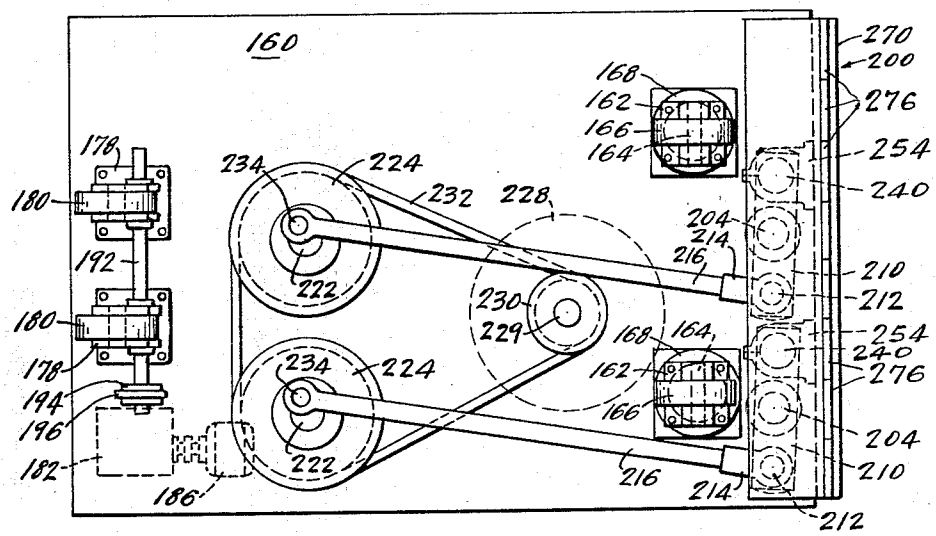

FIG-9-

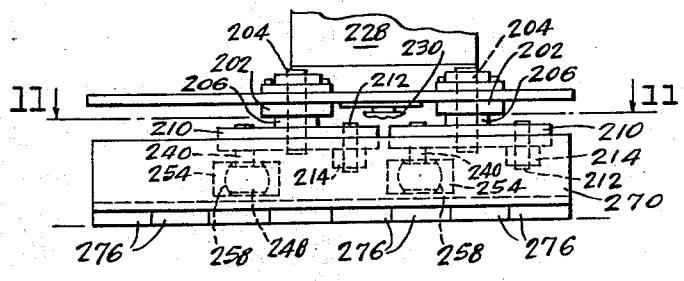

FIG-10-

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APPARATUS FOR FINISHING SURFACES

Filed July 6, 1961 4 Sheets-Sheet 4

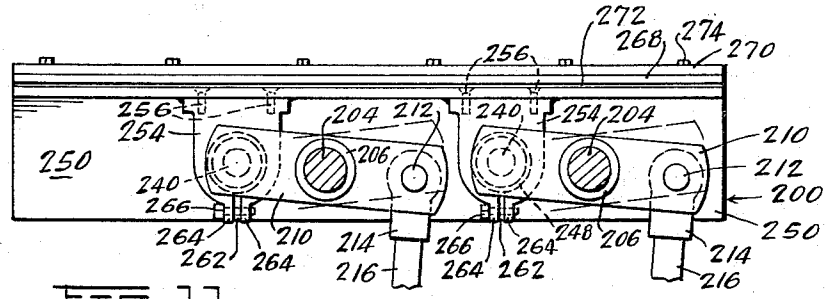

FIG-11-

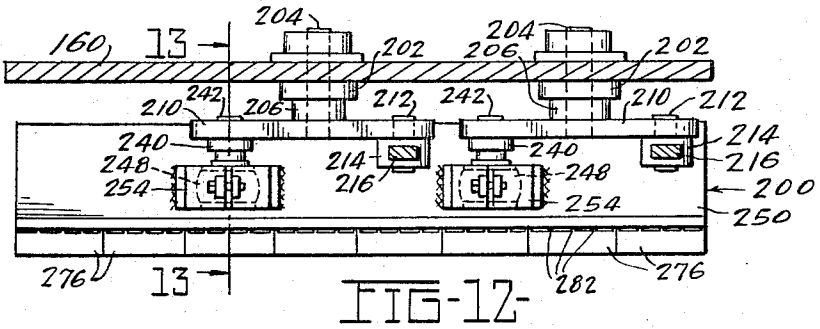

FIG-12-

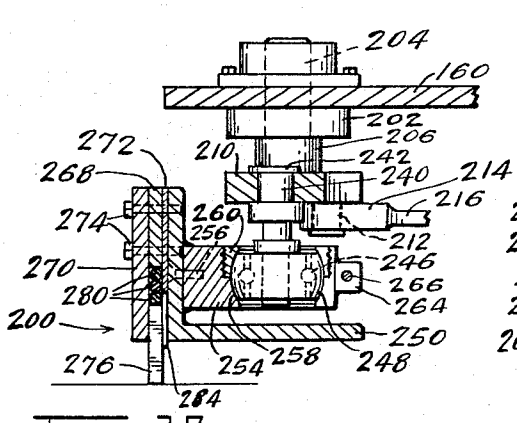

FIG-13-

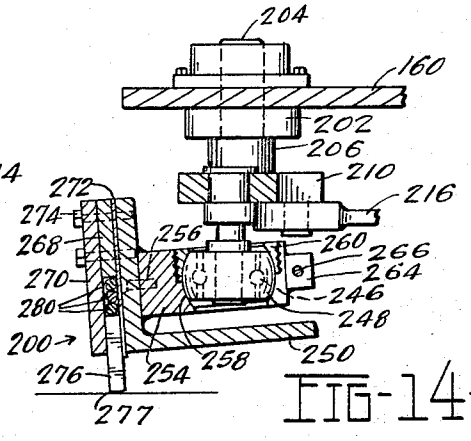

FIG-14-

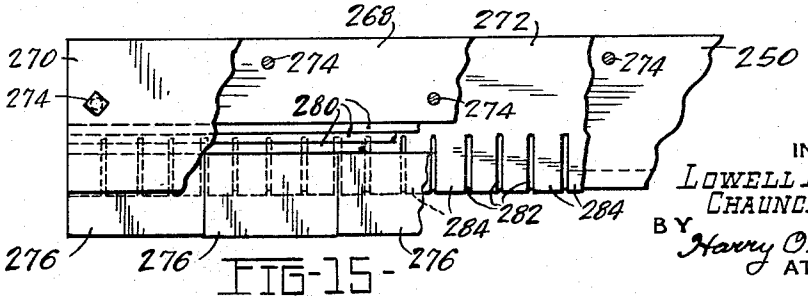

FIG-15-

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United States Patent Office 3,275,048 Patented Sept. 27, 1966

3,275,048

APPARATUS FOR FINISHING SURFACES

Lowell E. Statler, Bellevue, Ohio (Clyde, Ohio), and Chauncey A. R. Keller, Clyde, Ohio

Filed July 6, 1961, Ser. No. 122,258
3 Claims. (Cl. 144—115)

This invention relates to apparatus for finishing surfaces and more especially to an apparatus for cutting, scraping, planing, finishing or refinishing wood and other surfaces such as stone, terrazzo, cement and composition and more particularly surfaces of bowling alleys, gymnasiums, classrooms, lobbies, halls, walks and the like and to a method of finishing surfaces whereby the surfaces will be substantially free from cutter or planer marks.

Heretofore surfaces of wood, stone, terrazzo, cement or composition have been refinished through the utilization of rotary surfacing mediums such as rotary knives, rotary scrapers, rotary and cylindrical sanders and the like and such surfacing media tend to form circular or irregular tool marks so that the finished surface is marred and is not smooth. It is especially desirable that the surfaces of bowling alleys be finished or refinished perfectly smooth and level.

Where a bowling alley surface is finished or refinished through the use of a rotary or cylindrical finishing machine, there is no assurance that the finished surface is horizontal and level and heretofore it has been virtually impossible to remove a uniform amount of material throughout the length of the alley.

Similar difficulties are encountered in finishing wood floors through the use of rotary cutting devices or rotary or cylindrical sanders. It has therefore required considerable skill on the part of an operator of a rotary cutter or rotary or cylindrical sanding machine or floor finishing machine to surface finish a floor or a bowling alley surface that is reasonably level or horizontal.

The present invention has for an object the provision of apparatus for scraping, planing, finishing or refinishing floors, bowling alley surfaces and the like through reciprocatory motion of cutting devices or surfacing tools thereby eliminating cutter or tool marks in the finished surface.

Another object of the invention resides in a floor finishing and refinishing apparatus employing reciprocatory scraping or planing devices or cutters which may be operated by an unskilled operator and attain a substantially smooth unblemished surface.

An object of the invention resides in an apparatus especially usable for finishing or refinishing bowling alley and other surfaces wherein sections or surface areas of the bowling alley or other surfaces are progressively finished or refinished to provide a level or horizontal surface without tool marks.

Still another object of the invention is the provision of a floor or surface finishing apparatus adapted for planing or scraping surfaces such as bowling alleys or floors used in connection with track means for a bowling alley or other surfaces or the same may be equipped with casters for traverse over a floor surface for finishing the latter.

Another object of the invention is the provision of a surface finishing or refinishing apparatus wherein a multiplicity or plurality of surface planing devices or cutters may be mounted in conjunction with resilient cushioning means to permit the cutter or planing devices to align themselves along the surface being finished with respect to the surface's high and low spots, planing or cutting pressure being applied to the entire surface covered by the cutter or planing devices but bearing more heavily upon the high spots and less heavily on the low spots, the resilient cushioning means also functioning to reduce vibration of the cutters or planing devices during surface finishing operations.

Another object of the invention resides in an apparatus for finishing surfaces embodying a cutter, scraper or planer unit which may be adjusted with a greater or lesser vertical angle with respect to the surface to be refinished and may be adjusted in order to obtain the most efficient planing or finishing action of the cutters or planers on the surface being finished.

Further objects and advantages are within the scope of this invention such as relate to the arrangement, operation and function of the related elements of the structure, to various details of construction and to combinations of parts, elements per se, and to economies of manufacture and numerous other features as will be apparent from a consideration of the specification and drawing of a form of the invention, which may be preferred, in which:

FIGURE 1 is a longitudinal elevational view of a bowling alley illustrating an elevational view of one form of surface finishing apparatus of the invention;

FIGURE 2 is a top plan view of a form of surface finishing apparatus of the invention particularly usable for finishing the surface of a bowling alley;

FIGURE 3 is a rear end elevational view of the surface finishing apparatus shown in FIGURE 2 disposed on a bowling alley;

FIGURE 4 is a bottom plan view of the construction shown in FIGURE 3;

FIGURE 5 is a fragmentary enlarged detail sectional view taken substantially on the line **5—5** of FIGURE 4;

FIGURE 6 is an enlarged detail sectional view taken substantially on the line **6—6** of FIGURE 4;

FIGURE 7 is a fragmentary sectional view taken substantially on the line **7—7** of FIGURE 6;

FIGURE 8 is an elevational view of a modified form of apparatus especially adapted for finishing floor surfaces;

FIGURE 9 is a bottom plan view of the apparatus illustrated in FIGURE 8;

FIGURE 10 is a front elevational view of the apparatus shown in FIGURE 8;

FIGURE 11 is a sectional view taken substantially on the line **11—11** of FIGURE 10;

FIGURE 12 is an elevational view of the structure shown in FIGURE 11;

FIGURE 13 is a sectional view taken substantially on the line **13—13** of FIGURE 12;

FIGURE 14 is a view similar to FIGURE 13 showing an angular adjustment of the scraping or cutting instrumentality of the apparatus, and

FIGURE 15 is a fragmentary elevational view of the cutting knives or blades illustrating the method of supporting the same.

The arrangement illustrated in the drawings embodies two forms of apparatus, one of which is especially adapted for finishing the surfaces of bowling alleys and the other of a character particularly adapted for finishing or refinishing wood floors or large surface areas.

With particular reference to FIGURES 1 through 7, the form of apparatus disclosed therein is especially adapted for finishing or refinishing bowling alley surfaces. FIGURE 1 illustrates the surfacing unit of the invention as particularly employed for finishing the upper surface **10** of a bowling alley **12**, the pin-receiving sump of the alley construction being shown at **14**. In the finishing or refinishing of bowling alley surfaces the invention is inclusive of a portable frame **15** which may be progressively advanced along the alley during finishing

operations, the surface planing or finishing unit being supported by track means carried by the frame whereby the surfacing unit is movable longitudinally of the portable frame to progressively finish a bowling alley surface.

The portable frame construction for guiding the surfacing unit is inclusive of longitudinally extending frame members or rails **18** arranged in parallel relation and joined by cross members **20** and **21**. Mounted in the side frame members **18** are upwardly extending legs **22**, **23**, **24** and **25**, the legs **22** and **23** being mounted on one frame member and the legs **24** and **25** being mounted on the other frame member.

Three of the legs are mounted for adjustment in a vertical direction by adjusting nuts **31** in order to level the frame **15** on the bowling alley surface. The legs are respectively provided with pads or feet designated **26**, **27**, **28** and **29**, the feet or pads being adapted to directly rest upon the bowling alley surface.

The legs **22** through **25** are of the same length, and serve as a means for indicating a level position of the frame **15** on the bowling alley during finishing operations. As shown in FIGURE 1, a target member **32** is mounted on an end wall of the alley construction. A transit or theodolite **34** is adapted to be positioned adjacent the opposite end of the alley surface **10**.

The transit **34** is adapted to align the target **32** with the upper ends of the legs **22** and **23** to define a horizontal plane, the distance between the surface **10** and the target being indicated at A and the vertical distance from the surface **10** to the axis of the transit being indicated at A', the distances A and A' being identical. It will be noted in FIGURE 1 that the frame **15** carrying the surfacing unit may be several feet in length and is adapted to be periodically advanced along the alley **12** as successive areas of the alley are finished or refinished by the surfacing unit carried by the frame **15**.

Plumb means are provided for attaining transverse positioning of the frame **15** so that the frame may be adjusted transversely to secure a horizontal or level finish transversely of the alley.

As shown in FIGURES 1 and 2, the posts **24** and **25** are provided with projections **42**, and depending from each projection is a line **43** supporting at the lower end a plumb bob **44**. A suitable index point is inscribed in the upper surface of the adjacent frame member **18**. When the plumb bobs **44** are in alignment with the point indices on the frame member, the frame will then be in a horizontal or level position. The adjustment of the frame may be had by manipulation of the nuts **31** shown in FIGURE 3.

The surfacing unit **45** is illustrated in FIGURES 2, 3 and 4. The surfacing unit **45** is inclusive of a base, base frame or plate **46** formed of metal and which is of substantially rectangular shape and is of a thickness of one-half inch or more. The same is preferably fashioned of ferrous metal and is of a weight of several hundred pounds in order to provide stability and damping of vibration during floor or finishing operations.

Secured to the upper surface of the plate or base frame **46** are pairs of journal blocks **48** and **50**. Journaled in the blocks **48** is a shaft **52** and journaled in the blocks **50** are stub shafts **54**. Secured on the extremities of the shaft **52** are grooved wheels **56** and similar grooved wheels **58** are secured on the shafts **54** as shown in FIGURE 2. The frame **15** is equipped with rods **60** extending in parallel relation and lengthwise of the frame, the rods providing tracks or ways engaged by the pairs of grooved wheels **56** and **58** of the surfacing unit in the manner illustrated in FIGURES 2 and 3 whereby the surfacing unit is guided in a direction lengthwise of the frame **15** in carrying on surface finishing operations.

Means is provided for driving the shaft **52** and the wheels **56** to move the surface finishing unit lengthwise of the tracks **60**. Mounted upon the plate **46** is a housing **62** enclosing suitable speed reducing gearing (not shown).

Mounted upon the housing **62** is an electrically energizable reversible motor **64** which is controlled by reversible switch means (not shown) of conventional construction. The shaft of the motor **64** is provided with a pulley **65** connected by a belt **66** with a pulley **67** mounted upon a shaft **68** journaled in the housing **62** and connected with the speed reducing gearing in the housing.

An output shaft **70** driven by the speed reducing gearing is provided with a pulley **71** connected by a belt **72** with a driven pulley **73** fixed on the shaft **52**. By energizing the motor **64** to rotate in one direction the unit **45** is powered for movement in one direction at a comparatively slow speed through the speed reducing gearing or mechanism contained within the housing **62**.

By reversing the direction of rotation of the motor **64** the surfacing unit **45** is moved in a reverse direction along the ways or tracks **60**. It is to be understood that a reversible clutch means may be embodied in the housing **62** associated with the speed reducing gearing for changing the direction of movement of the carriage in lieu of the reversible motor **64**.

The base plate or member **46** provides a carriage for mounting the floor surfacing or scraping instrumentalities, cutter or blades. As shown in FIGURE 4, there is secured to the lower surface of the plate **46** two pairs of blocks or fittings **76** and **78**.

Each of the blocks or fittings **76** and **78** is provided with a channel or passage and disposed in each pair of passages are rods or members **80** and **82**, the rods being slidable with respect to the blocks or fittings. The rods **80** and **82** form reciprocable crossheads for mounting the floor scraping or surfacing head **84**, shown in FIGURES 4 through 7.

The surfacing head **84** includes a transversely extending bar or member **86**. As shown in FIGURE 5, the bar **86** is secured by means of a threaded member **88** with each of the crossheads **80** and **82**. A portion **89** of the member **88** is threaded into a bore in the bar **86** and a shoulder portion **90** is disposed in an opening in the bar, a head **91** of member **88** holding the member **86** in assembled relation to the adjacent crosshead **82**. The member or bar **86** is secured to the crosshead **80** by a member **92** of the same construction as the member **88**.

A driving means is provided for reciprocating the crossheads **80** and **82** and the transversely arranged bar **86** carrying the scraping or surfacing head **84** whereby to impart reciprocatory movement to the bar **86** in the direction of the slidable movement of the crosheads **80** and **82**. Mounted upon the plate or base member **46** is an electrically energizable motor **96** controlled by conventional switch means (not shown). Journaled in suitable bearings contained or supported by the base **46** are shafts **98** and **100**. Each of the shafts **98** and **100** is formed with an eccentric **102**, each eccentric being embraced by a journal fitting **104**.

Secured to each journal fitting **104** is a connecting rod **106** and adjustably secured to each connecting rod **106** is a rod or member **108**. Each rod **108** is provided with a journal portion **110** which is pivotally connected to the bar **86** by a pin or stub shaft **112** as shown in FIGURES 4, 5 and 6. Each of the rods **108** is provided with a threaded portion **114** threaded into a bore in the end of the adjacent rod **106** providing for adjustment of the bar **86** with respect to the connecting rods. Lock nuts **116** are provided cooperating with the threaded portions **114** for locking the rods **108** with respect to the connecting rods **106**.

Each of the shafts **98** and **100** is provided with a pulley **118** and the motor shaft **120** of the motor **96** is provided with a pulley **122**. A driving belt **124** engages or embraces the pulleys **118** and **122** whereby the shafts **98** and **100** are simultaneously driven at identical speeds by the motor **96**. It will be seen that through the medium of the eccentrics **102**, the rotation of the shafts **98** and **100** cause reciprocatory movement of the bar **86** by the con-

necting rods **106** and the coupling rods **108**. Through this arrangement the bar **86** is reciprocated through the same distances throughout its length.

One form of cutting or surfacing means is illustrated in FIGURES 5 through 7. The bar **86** of the surfacing head is provided with a longitudinal channel **130** in which is mounted an elongated cutter or blade holder **132**, the holder **132** being secured in the channel **130** by means of setscrews **133**, one of which is shown in FIGURE 5.

The cutter holder **132** is provided with a lengthwise arranged channel to accommodate a single elongated cutter or planer or, as illustrated, a plurality of cutters, blades or planers **136** which are of comparatively short length as shown in FIGURE 7.

The cutters **136** are provided with a resilient backing member or cushion **138** which may be fashioned of semi-hard rubber, plastic or other suitable material which tends to prevent vibration or chattering of the cutters or scrapers during surfacing operations. When the surfacing unit is employed for finishing a bowling alley surface, it is preferable to employ a single elongated cutter or planer in lieu of the plurality of cutters **136**, but the latter may be employed for the purpose if desired.

The holder **132** is provided with a plurality of bores **139**, a bore being provided adjacent the central region of each cutter **136**. Disposed in each of the bores is a detent or ball **140** which is biased toward the adjacent cutter **136** under the influence of an expansive spring **142** as shown in FIGURES 5 and 6. The detents **140**, under the influence of the springs **142**, serve to frictionally retain the cutters or scraper blades **136** in the holder **132** in aligned relation as shown in FIGURES 5 through 7. If desired, a thin metal plate (not shown) may be disposed between the detents **140** and the cutters or blades **136**.

It should be noted that the channel **130** in the bar **86** is arranged at an angle of several degrees with respect to a vertical plane.

Through the angular relation of the channel and hence the angular position of the holder **132**, an edge **144** of each cutter blade **136** is canted or tilted so as to present a cutting or planing edge engaging the surface **10** of the alley or other surface to be finished or scraped. The angularity of the blade or scraper **136** may be modified by employing a holder **86** having a channel **130** of different angularity or by adjusting the angularity of the blade or scraper by other suitable means.

As shown in FIGURE 7, the opposite vertical sides or edge regions of each of the cutting blades or planers **136** must be in parallel relation providing square configurations in order that the cutting edge regions **144** will be aligned to properly engage the surface to be planed or finished.

A typical series of operations in finishing or refinishing a surface **10** of a bowling alley is as follows: The frame **15** is positioned at the starting region or an end region of the alley **12** and the transit **34** disposed and aligned with the target **32** and the upper ends of the rods or legs **22** and **23**. The legs of the frame **15** are adjusted until the plumb bobs **44** are in registration with their index points so that the frame **18** is horizontal or level. The surfacing unit is then moved to the extreme right end of the frame **15** and the end of the alley **12** as viewed in FIGURE 1.

The motor **96** is energized to effect successive reciprocations of the crossheads **80** and **82**, the bar **86** and the cutters **136**.

The operator energizes the motor **64** to establish a drive to the shaft **52** and the wheels **56** whereby the unit **45** is moved comparatively slowly but at a uniform speed in a right-hand direction as viewed in FIGURE 1. Suitable electric power supply cables or conductors of flexible character are connected with the motors **64** and **96** to facilitate relative movement of the surfacing unit.

During lengthwise movement of the unit **45**, the reciprocating action of the cutters **136** planes or finishes the surface **10** of the alley. This action continues until the finishing unit **45** approaches the right-hand end of the frame construction **15** and the motors **64** and **96** deenergized. The frame **15** is then moved in a right-hand direction lengthwise of the alley **12**, as viewed in FIGURE 1, to a succeeding position and the carriage **45** is moved to the left end region of the frame **15** by reversing the motor **64**. The motor **64** is then reversed and motor **96** energized to reciprocate the cutters **136** and again slowly advance the surfacing unit **45** toward the right-hand end of the frame **15** in its second position while the cutters are performing surfacing operations.

After surfacing operations have been completed for the length of the frame **15**, the frame **15** is again moved to a succeeding position and surfacing and planing operations resumed as above described. This continues until the entire length of the surface **10** of the alley **12** is completely planed or surfaced by the apparatus.

It has been found that the blades or planers **136** may be set at angles of between eight degrees and twenty degrees with respect to a vertical plane for satisfactory finishing operations. The cutters **136** may be made of steel, metallic carbide, ceramics, diamonds or similar materials. As hereinbefore mentioned, a solid single cutting blade or surfacing instrumentality may be used for finishing bowling alley surfaces in lieu of the multisectional blades **136**.

FIGURES 8 through 15 illustrate a modified form of the surface finishing or refinishing apparatus of the invention. The arrangement illustrated in FIGURES 8 through 15 is a self-propelled type especially adapted for finishing wood, terrazzo, cement or composition floors of large areas such as gymnasiums, classroms, lobbies, halls, walks, walls or the like and is adapted for traverse over the surface to be finished or refinished without track means.

The construction is inclusive of a substantially rectangular base or frame plate **160** which is of substantial thickness and formed of cast or sheet metal, the weight of which together with the weight of the other components of the construction tends to eliminate or avoid vibration of the floor surfacing cutters or planing devices. The construction is of portable character and secured to the forward portion of the base plate **160** are brackets **162** provided with stub shafts **164** on which are journaled casters or wheels **166** adapted to engage the floor to be surface finished. Dead weights may be added to or removed from the frame plate in order to vary the pressure on the cutting instrumentalities in engagement with the surface to be finished.

Each of the brackets **162** is swivelly mounted by means of anti-friction or ball bearings **168** whereby the casters **166** are rendered dirigible. A steering means including a vertically disposed shaft **170** provided with a tiller type handle **172** is connected with the dirigibly supported brackets **162** by conventional linkage (not shown) whereby angular movement of the tiller or handle **172** controls the dirigibly supported brackets **162** for steering the apparatus in directions desired. A seat **174** supported upon a spring member **176** is secured to the frame plate **160** by means of bolts **177** enabling the operator to ride upon the apparatus.

Secured to the rear portion of the base plate **160** is a second pair of brackets **178** provided with stub shafts **179** on which are journaled casters or wheels **180** which engage the floor. The castors or wheels **166** and **180** are preferably provided with rubber-like treads. Supported upon the plate **160** is a transmission housing **182** containing speed reducing mechanism controlled by control handle **184**, the speed reducing mechanism or gearing being of conventional character. An electrically energizable motor **186** is connected with an input shaft **187** for driving the speed reducing mechanism contained within the housing **182**.

The output shaft **189** driven by the mechanism within the housing **182** is equipped with a pulley **190**. Journally

supported by the brackets **178** is a shaft or bar **192** the periphery of which is adapted for frictional engagement with the rubber treads or peripheral surfaces of the casters or wheels **180** to establish a friction drive for the casters or wheels.

Fixedly mounted upon the shaft **192** is a pulley **194** connected with the pulley **190** by means of a belt **196**. The control lever **184** may be arranged to actuate a clutch to control the drive to the casters or wheels **180**.

The speed reducing mechanism within the housing **182** is of a character to propel the apparatus over the floor surface at a comparatively low speed of from five to fifteen feet per minute and the speed reducing mechanism is preferably of a variable type in order to vary the speed of propulsion of the apparatus. Any suitable conventional variable speed transmission mechanism or speed reducing gearing may be employed for the purpose.

The surfacing head or unit construction **200** is adapted to be reciprocated in directions lengthwise of the base plate or frame **160**. The plate **160** is provided with openings to accommodate fittings or bushings **202**, the bushings forming journals for stub shafts or pins **204**. Each of the pins **204** is provided with a thrust collar **206** which engages the lower end of each bushing **202**. Secured to each stub shaft **204** is an oscillating arm or member **210**, each member **210** being adapted to oscillate or pivot about the axis of the adjacent stub shaft **204**.

One end of each of the members **210** is provided with a pin **212** to which is connected a clevis **214**. A connecting rod **216** is connected with each of the clevis members **214**, as shown in FIGURE 9. Mounted upon the base plate or frame member **160** is a pair of journal blocks or members **220** in which are journally mounted stub shafts **222**, shown in FIGURE 8.

Secured to or formed integrally with each of the stub shafts **222** is a pully **224**. Supported upon the base plate **160** is an electrically energizable motor **228**, the shaft **229** of which is provided with a pulley **230**.

A driving belt **232** embraces or engages the pulleys **230** and **224** whereby the motor driven pulley drives the pulleys **224**, the pulleys **224** being of the same size so as to rotate at the same speed. Provided upon each of the pulleys **224** is a crank pin **234**, each crank pin being eccentric with respect to the axis of the adjacent stub shaft **222**. Each of the connecting rods **216** is provided with a boss portion **236** which is bored to accommodate the adjacent crank pin **234** whereby rotation of the stub shaft **222** and the crank pin associated therewith effects lengthwise reciprocation of each of the connecting rods **216** to effect oscillation of the beams or members **210**.

As the distances from the axis of each of the shafts **204** to the axis of the pins **212** are identical, the arms **210** are oscillated to the same extent by reciprocation of the connecting rods **216**. The structural arrangement of the floor surfacing head or unit **200** is best illustrated in FIGURES 11 through 15. Secured to the opposite end regions of each of the members **210** is a shaft or member **240** which may be secured to the member **210** by swaging the portion **242** in engagement with the upper surface of each of the members **210**.

Each of the members **240** supports at its lower end the inner race of an anti-friction or ball bearing **246**, the outer race **248** of each of the anti-friction bearings **246** being of partial spherical curvature or shape as particularly shown in FIGURES 13 and 14.

The cutter or scraper holding means or head **200** is inclusive of an elongated bar **250** preferably of L-shape cross-section as shown in FIGURES 13 and 14, the L-shaped configuration providing for stability of the cutter supporting arrangement. Secured to the member **250** are brackets **254** fastened by screws **256**. The member **250** may be of rectangular cross-section.

The brackets **254** are each formed with a spherically shaped recess **258** to accommodate the spherically shaped outer race **248** of each of the bearing constructions **246**. Each of the brackets is formed with a threaded bore to receive a threaded securing ring **260** to accommodate assembly of the race **248** in each of the brackets and to prevent dislodgment of the bearing races **248**. Each of the brackets is provided with a split region or slot **262** and the portions **264** adjacent the slots **262** are bored to accommodate clamping bolts **266** for clamping the brackets **254** to the outer races **248** of the bearings **246**.

By releasing the clamping bolts **266**, the head **200** may be angularly adjusted to a position such as that illustrated in FIGURE 14 to dispose the cutting instrumentalities or blades in angular positions with respect to the floor or surface to be planed or finished. When the proper angle of the head **200** has been attained, the clamping bolts **266** may be drawn up to hold the head in adjusted angular position.

The cutter or planer assembly is particularly illustrated in FIGURES 13 through 15. The assembly includes a backing plate **268**, a front or frontal plate **270** and a plate spring or member **272**, the members **268**, **270** and **272** being secured to the member or holder **250** by means of a plurality of screws **274**.

Disposed between the spring plate **272** and the frontal plate **270** are the cutting instrumentalities or planers **276** each of which is of substantially rectangular shape.

Disposed between the upper edges of each of the cutters **276** and the lower edge of the backing plate **268** is a plurality of members, rods or cords **280** of resilient material such as semihard rubber or the like. An intermediate member of the group of members **280** may be of metal, which, in conjunction with the resilient or yieldable members of the group provides an equalizing means which tends to permit each cutter or planer to apply pressure against the surface being finished irrespective of whether the surface being reworked is level or whether it has high or low spots. The use of such metal rod slightly restricts cushioning for each cutter or scraper and causes somewhat greater pressure to be applied to high spots and conversely causes somewhat less pressure to be applied to low spots than if only the resilient backing material were used. The resilient backing means also tends to reduce vibration or chattering of the cutters or planers during surfacing operations.

As shown in FIGURE 15, the region of the spring plate **272** adjacent the cutting or planing instrumentalities **276** may be provided with a plurality of spaced slots or kerfs **282** to provide a series of resilient or spring-like fingers **284**.

The fingers **284** frictionally engage a major surface of each of the cutters **276** to frictionally retain the cutters in position in the holder. The cutters or cutting instrumentalities **276** may be made of hardened steel, metallic carbide, ceramic, diamonds or other material suitable for finishing or refinishing wood, concrete, terrazzo or composition surfaces.

The apparatus shown in FIGURES 8 through 15 is operated in the following manner: The motors **186** and **228** are supplied with electric energy from a suitable source through extension cords or conductors (not shown) of sufficient length to permit traverse of the apparatus over the floor surface area to be finished or refinished.

The operator manipulates the clamping screws **266** and adjusts the angularity of the head **200** to position the cutting instrumentalities **276** at a desired angle to the floor to be surfaced so that a cutting edge **277** of each of the cutters or cutting instrumentalities **276** engages the floor or surface at an efficient cutting or planing angle.

The operator then clamps the screws **266** to hold the head construction **200** in the proper adjusted position. The motor **228** is energized and through the power transmission provided by the pulleys **230** and **224**, the belt **232**, the crank pins **234**, connecting rods **216** and the arms **210**, the arms are oscillated and the oscillation transmitted thereby to the member **250** which together

with the cutting instrumentalities **276** is reciprocated in directions lengthwise of the frame plate **160.**

As the edges **277** of the cutters **276** are reciprocated, the cutters remove material from the surface to be refinished. The operator, through the control **184**, establishes a drive to the casters **180** to propel the apparatus over the surface to be finished or refinished at a desired rate of speed. The operator controls or guides the direction of traverse of the apparatus over the floor surface by manipulation of the tiller **172** to control the dirigible wheels **166.**

Through this arrangement the cutting or scraping strokes of the instrumentalities **276** are in rectilinear directions and all of the cutters move through the same rectilinear distances so that no score marks remain on the finished surface. It is to be understood that a single elongated cutting instrumentality may be carried by the head **200** in lieu of the individual cutters **276** if desired.

It is apparent that, within the scope of the invention, modifications and different arrangements may be made other than as herein disclosed, and the present disclosure is illustrative merely, the invention comprehending all variations thereof.

We claim:

1. In a surfacing apparatus, in combination, a base member having a fore and aft end, a surface finishing instrumentality, electrically energizable motor means mounted on said base member, means mounting the surface finishing instrumentality on the fore end of said base member in such fashion that said instrumentality is reciprocable lengthwise relative to said base member and in contact with the surface to be surfaced, means driven by said motor means for recopricating said surface finishing instrumentality, and a plurality of supporting casters for the base member, said instrumentality including a head mounted transversely to the longitudinal axis of said base, a plurality of vertically-depending, side-by-side, blade-like cutter elements adjustably carried on said head and means allowing said blade elements to individually move vertically responsive to surface irregularities..

2. A surface finishing apparatus for wood surfaces including, in combination, a base member having a fore and aft end, a plurality of depending wheels mounted on the base member for supporting and steering the same, electrically energizable motor means mounted on the base member, means establishing a driving connection between the motor means and at least one of said wheels for propelling the apparatus to and fro over a surface to be finished, a bar mounted dependingly on said fore end and transversely to the longitudinal axis of said base member, a surface finishing instrumentality mounted on said bar, said instrumentality including a plurality of vertically-depending, side-by-side, blade-like elements adjustably mounted on said bar, said instrumentality including means allowing said blade elements to move vertically responsive to surface irregularities contacted thereby, a pair of connecting rods, means establishing operative connection between the rods and said bar, power transmission mechanism connected with said motor means and said connecting rods arranged to actuate the connecting rods to reciprocate the bar and surface finishing instrumentality in such fashion that said instrumentality reciprocates to and fro in the direction of travel, a pair of pulleys mounted on said base member, disposed for rotation in a horizontal plane, said connecting rod ends opposite said bar being eccentrically connected to said pulleys, said power transmission mechanism including a motor means connecting said motor to said pulleys for rotation thereof in the same direction.

3. A surface finishing apparatus for wood surfaces including, in combination, a metal base member of planar shape having a fore and aft end, a plurality of wheels mounted by the base member for supporting and steering the latter, an elongate surfacing head located along the fore end of said apparatus, a coextensive cutter holder secured to the surfacing head, a plurality of vertically-depending cutter blades adjustably carried by said holder in transverse aligned relation, adjustable friction means for retaining the cutter blades in the holder, a resilient cushion mounted in said holder and engageable with a rear edge of each of the cutter blades, a pair of pivot arms mounted on said base member and arranged for piovtal oscillatory movement of the ends of said arms, means connecting said surfacing head with one end of each of said arms, a motor mounted upon the base member, a pair of pulleys journally supported on the base member and adapted to be rotated by said motor, connecting rods connecting with the other end of said pivot arms and said pulleys respectively, and eccentric means joining the connecting rods with the pulleys and arranged whereby rotation of the pulleys effects reciprocatory lengthwise movements of the surfacing head, the holder and the cutter blades effecting abrading contact of the cutting instrumentality in the direction of movement.

References Cited by the Examiner

UNITED STATES PATENTS

567,821	9/1896	Emig	144—119
687,795	12/1901	Tullock	51—175
758,424	4/1904	Darrell	144—119 X
817,013	4/1906	Spence et al.	51—175
890,312	6/1908	Stoll	144—119 X
928,702	7/1909	Rodman	51—175
1,407,161	2/1922	Klocke	74—40
1,829,531	10/1931	Neilsen	144—115
2,288,782	7/1942	Brown	144—119
2,389,549	11/1945	Ross	51—58
2,620,244	12/1952	Beatty	308—29

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