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Wynn

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[54] **THREE AXIS ADJUSTABLE DISC SANDER**

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[52] **U.S. Cl.** **51/109;** 51/358; 254/126

[51] **Int. Cl.²** .. **B24B 7/00;** B24B 9/00; B24D 17/00; B66F 3/00

[58] **Field of Search** ..... 51/109, 99, 126, 358; 214/1 D; 254/122, 126

[56] **References Cited**

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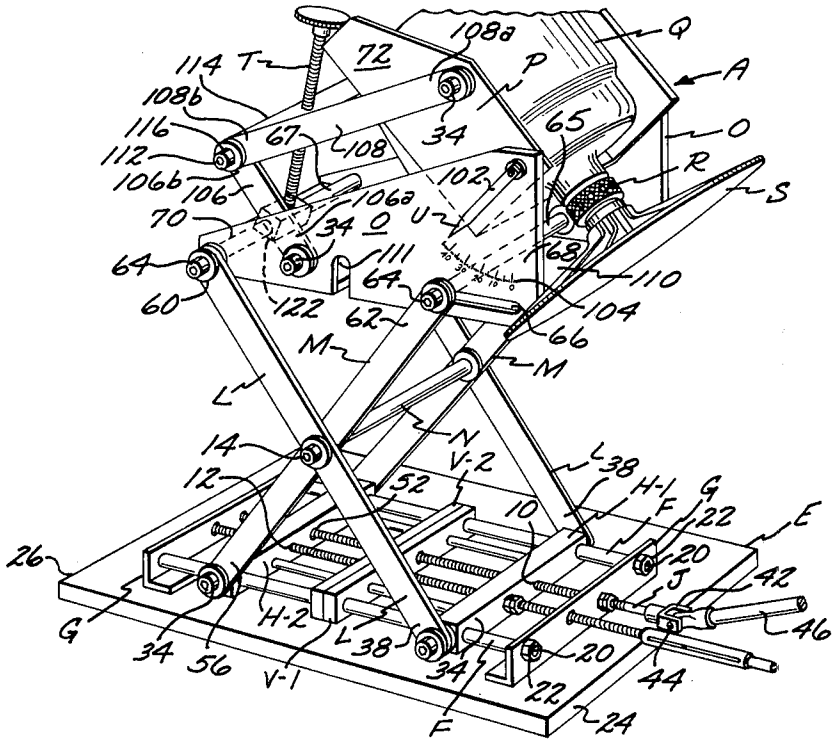
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Primary Examiner—Othell M. Simpson

[57] **ABSTRACT**

A three axis, manually adjustable disc sander which may be disposed in a fixed position relative to a horizontal support that includes an elongate guide, and on which support a workpiece is slidably movable in a first direction when in abutting contact with the guide. The adjustable disc sander is of articulated structure, and by use of first, second and third manually operable means forming a part thereof the motor-driven sander disc may be moved laterally, vertically or angularly relative to the workpiece to contact the latter.

9 Claims, 9 Drawing Figures



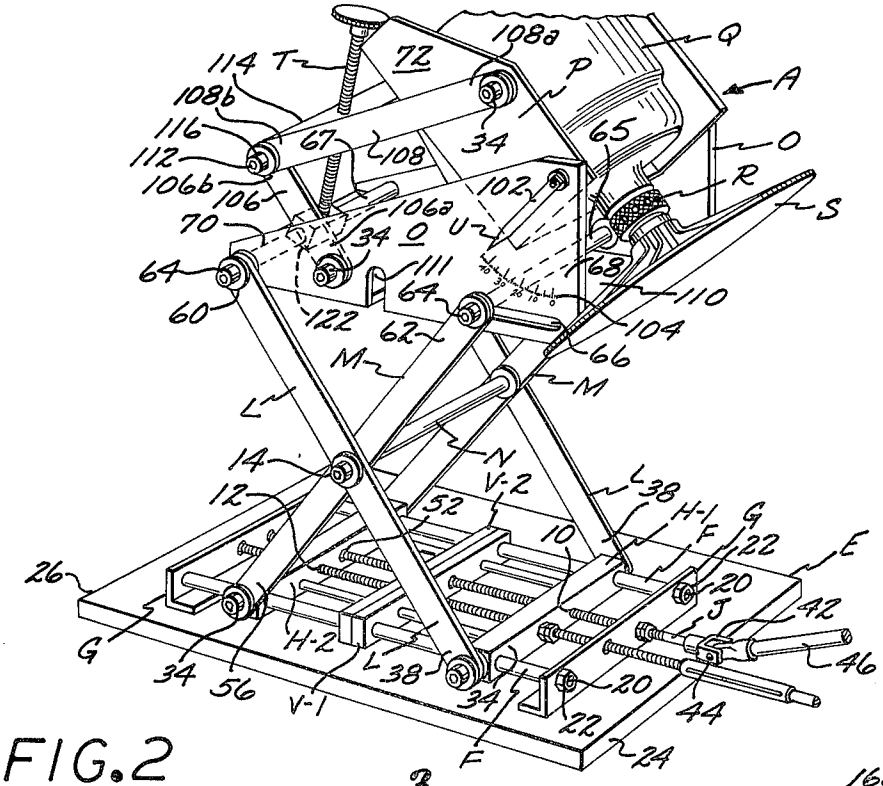


FIG. 1

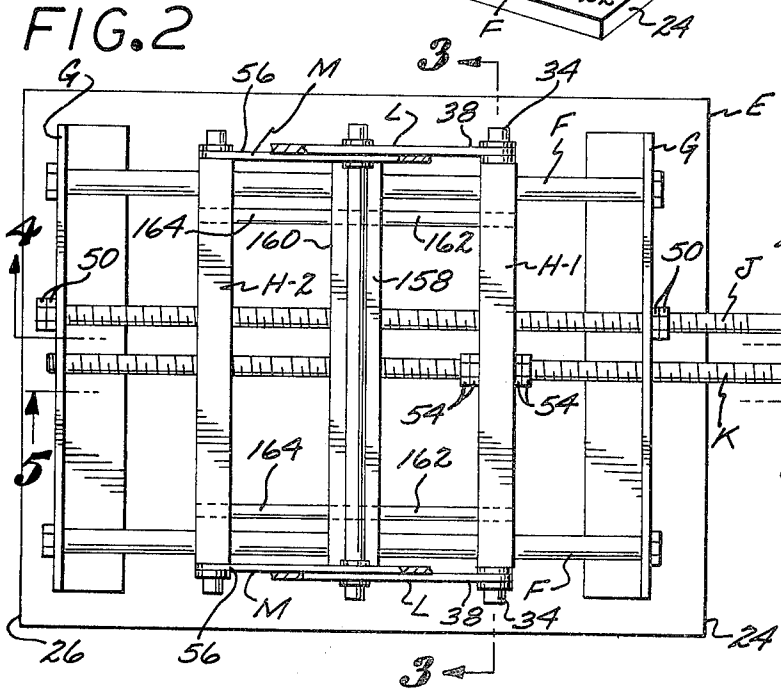


FIG. 2

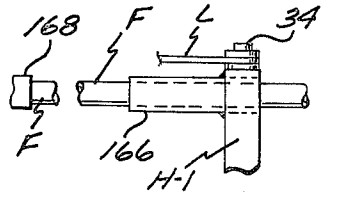


FIG. 9

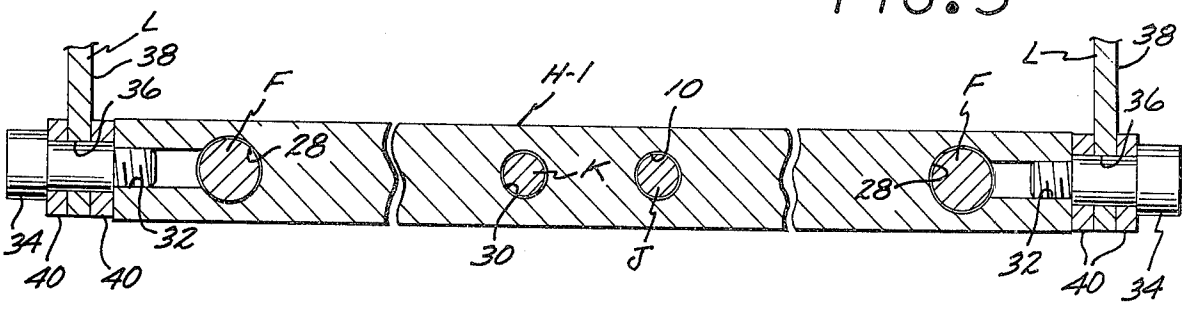


FIG. 3

FIG. 8

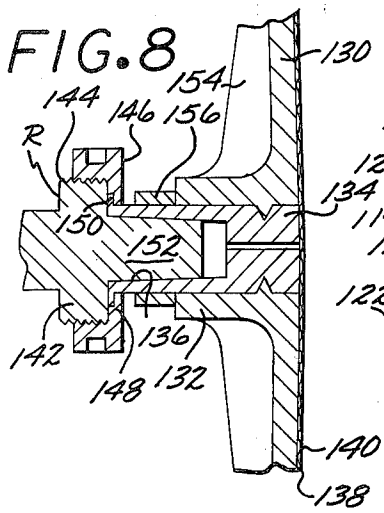
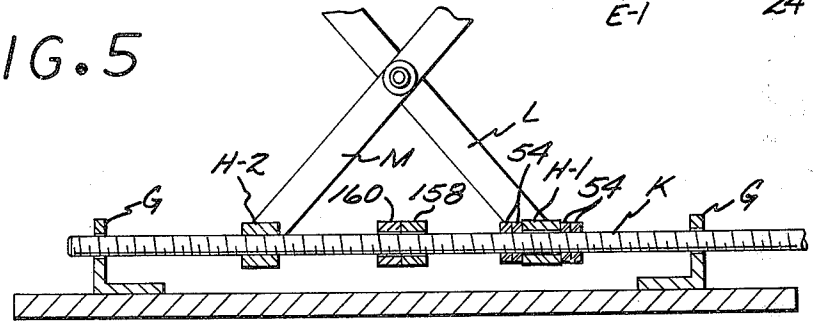


FIG. 4

FIG. 5



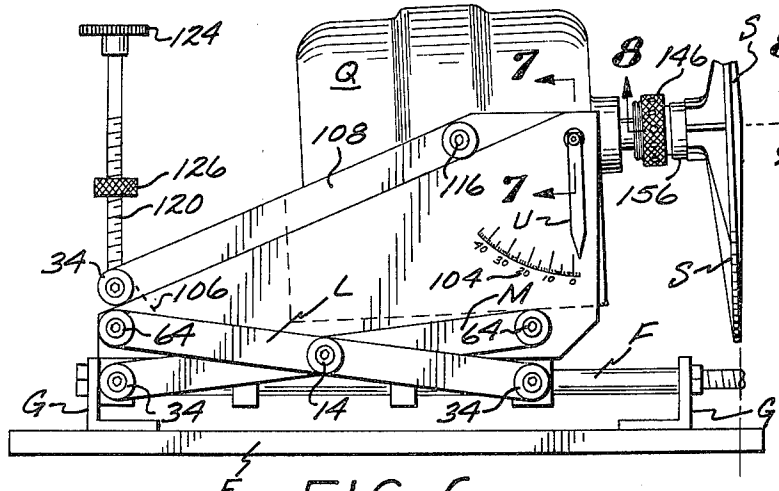


FIG. 6

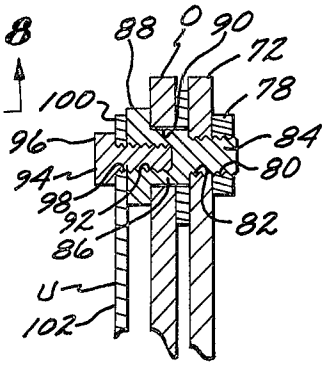


FIG. 7

THREE AXIS ADJUSTABLE DISC SANDER

BACKGROUND OF THE INVENTION

1. Field of the Invention

Three Axis Adjustable Disc Sander

2. Description of the Prior Art

In the use of a motor-driven sander disc, it is desirable that the disc be brought into rotatable contact laterally, vertically and angularly with the workpiece as the latter is manipulated to slide in a first direction on a horizontal support.

A primary object of the present invention is to supply a three axis manually adjustable disc sander that may be disposed in fixed position adjacent a surface on which a workpiece is supported for movement in a first direction, with the device by first, second and third manually operable means forming a part thereof being adjustable to move the sander disc laterally, vertically and angularly relative to the workpiece with a high degree of precision. After the workpiece has been angularly adjusted, it so remains until further adjustments are required in the positioning of the sander disc.

Another object of the invention is to provide a three axis adjustable disc sander of simple mechanical structure, one that can be fabricated from standard commerically available materials, is simple and easy to use, requires a minimum of maintenance attention, and can be retailed at a sufficiently low price as to encourage the widespread use thereof.

SUMMARY OF THE INVENTION

A three axis adjustable disc sander that is used in combination with a horizontal support of a desired elevation, which support includes an elongate guide, with the support allowing a workpiece that rests thereon, and is in abutting contact with the guide to be moved in a fixed direction to be contacted by the sander disc. The present invention is of articulated structure and so supports an electric motor that drives the sander disc that by use of first, second and third manually adjustable means the sander disc may be moved laterally, vertically and angularly relative to the workpiece.

The invention also includes a horizontal base disposed at a fixed position adjacent the support and to one side thereof. A pair of spaced, parallel rails are positioned above the base and normal relative to the guide on the support. First and second spaced parallel crosspieces are secured to the upper surface of the base and support the pair of rails therebetween.

First and second parallel cross members are slidably supported on the pair of rails. First means are provided that are manually operable for moving the first crosspiece on the rails, with the first means when not operated, holding the first cross member at a desired first position on the rails. Second means are also provided that are manually operable, and when operated, move the second cross member on the rails.

Two sets of first and second elongate members that extend upwardly from the base cooperatively define an "X", with each of the first and second members having first and second end portions, with the first end portions of the first members being pivotally connected to the first ends of the first cross members. The second end portions of the second members are pivotally connected to the second ends of the second cross members, with each set of first and second members having aligned, centrally disposed bores formed therein. Third means are provided that engage the aligned bores to pivotally connect the first and second members in each of the sets.

The invention further includes a pair of spaced parallel side walls that have first and second end portions, with the first end portions having elongate longitudinally extending slots formed therein.

Fourth means are provided that slidably engage the slots and are pivotally connected to first end portions of the second members. Fifth means pivotally connect the second end portions of the first members to second end portions of the side walls. A pair of spaced horizontal transverse plates connect the longitudinal edges of the side walls most adjacent the base. Two transversely aligned slots extend upwardly from the lower longitudinal edges of the sidewalls. The slots are transversely aligned with the space between the two plates.

A cradle is provided that is pivotally supported between the side walls and above the pair of plates, with an electric motor being secured in a fixed position in the cradle, and the motor including a stub drive shaft. Sixth means removably secure a sander disc to the drive shaft.

Seventh means that are manually operable are provided for pivoting the cradle, motor and sander disc to a desired angular relationship relative to the pair of horizontal plates. Eighth means are supplied for visually indicating the vertical angle at which the sander disc has been adjusted by use of the seventh means.

The first and second cross members, the two sets of first and second members, the pair of side pieces, the plates, the cradle, and the motor and sander disc are moved as a unit laterally relative to the workpiece support when the first means is operated. The first and second members pivot relative to one another to raise or lower the sander disc relative to the workpiece support when the second means is operated. The motor supporting cradle is disposed at a maximum elevation relative to the base when the first and second stop are in abutting contact. Angular adjustment of the sander disc relative to the workpiece support is attained by use of the seventh means. The invention above described is capable of moving the sander disc laterally, vertically and angularly relative to the workpiece that rests on the support and is slidably movable in a first direction thereon.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the three axis adjustable disc sander;

FIG. 2 is a combined top plan view and longitudinal cross-sectional view of the device shown in FIG. 1;

FIG. 3 is a transverse cross-sectional view of a portion of the device, taken on the line 3—3 of FIG. 2;

FIG. 4 is a longitudinal cross-sectional view of the device, taken on the line 4—4 of FIG. 2;

FIG. 5 is a second longitudinal cross-sectional view of the device, taken on the line 5—5 of FIG. 2;

FIG. 6 is the same view as shown in FIG. 4, but with the device having been adjusted to a second lowered position;

FIG. 7 is a fragmentary transverse cross-sectional view of a portion of the device, taken on the line 7—7 of FIG. 6;

FIG. 8 is another fragmentary cross-sectional view of the device, taken on the line 8—8 of FIG. 6; and

FIG. 9 is a perspective view of an alternate form of stop structure.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The three axis adjustable disc sander invention A as may best be seen in FIG. 4 is positioned adjacent a horizontal support B that includes an elongate guide C. When a workpiece D rests on support B and abuts against guide C, a user (not shown) may slide the workpiece in a first direction on the support. The invention A permits a power driven sander disc S to be selectively adjusted laterally, vertically and angularly relative to the workpiece D when the latter rests in a slidable position on support B.

Invention A includes a rigid rectangular base E that is horizontally positioned, and held at a fixed position adjacent support B by conventional means E-1. The invention A includes a pair of spaced parallel rails F as shown in FIG. 1 that are normal to the guide C. The pair of rails F are held in a fixed elevated position above the base E by a pair of cross pieces G. The cross pieces G have the ends of the pair of rails F secured thereto. Cross-pieces G are illustrated in FIG. 1 as being defined of angle iron. However, the crosspieces G, if desired, may be formed from elongate rigid members of other transverse cross section.

The pair of rails F serve to slidably support first and second cross members H-1 and H-2. A first manually rotatable, threaded rod J is supported from the cross piece G, as is a second threaded rod K. First threaded rod J is in engagement with a tapped bore **10** formed in first cross member H-1, and the first rod when manually rotated moving the first cross member to a desired longitudinal position on the pair of rails F. The second threaded rod K engages a tapped bore **12** formed in second cross member H-2. When second rod K is rotated by means that will later be described, the second cross member is moved longitudinally on the pair of rails F relative to the first cross member H-1.

Two sets of first and second elongate rigid members L and M arranged in the form of an "X" are disposed on opposite ends of the first and second cross members H-1 and H-2 and pivotally connected thereto as shown in FIG. 1. The two sets of first and second rigid members L and M have centrally disposed, aligned bores (not shown) formed in the central portions thereof through which the shouldered ends **14** of a transverse shaft N extend. The shouldered ends **14** serve to pivotally connect the first and second members L and M of each set.

Invention A includes a pair of spaced parallel side walls O. The lower longitudinal edges of side walls O have horizontal plates **110** extending therebetween. A cradle P is pivotally supported between the side walls O and above plates **110** by means that will later be described in detail. An electric motor Q is mounted in a fixed position in cradle P. A stub drive shaft **18** is by connecting means R shown in FIG. 8 removably connected to the sander disc S. The manual adjustment T shown in FIGS. 1 and 4 permits the cradle P and motor Q to be pivoted relative to the pair of side walls O to dispose the sander disc S at a desired vertical angle relative to horizontal support B and the work piece D resting thereon. By manual rotation of the first threaded rod J, the sander disc S may be moved laterally relative to guide C and the workpiece D in abutting contact with the latter.

Rotation of second threaded rod K results in the sets of first and second members L and M concurrently pivoting to raise or lower the sander disc S relative to guide C and work piece D. Visual means U are provided as shown in FIG. 1 for indicating the vertical angle at which the sander disc S is positioned. First and second stops V-1 and V-2 are secured to first and second cross members H-1 and H-2 as shown in FIG. 1 to limit the pivotal movement of the sets of first and second elongate members L and M towards one another, and in so doing limiting the elevation to which the motor Q and sander disc S may be raised above base E. Motor Q and sander disc S are at their minimum elevation above base E when first and second cross members H-1 and H-2 are in contact with the cross pieces G.

The detailed structure of the invention A is as follows: The pair of rails F are illustrated as of transverse circular cross section, and have shouldered threaded end portions **20** that extend through aligned openings (not shown) in cross pieces G to be engaged by nuts **22.** Base E has a first end **24** and second end **26,** with the first end adjacently disposed to guide C on support B as shown in FIG. **4.**

First cross member H-1 has two spaced openings **28** therein as shown in FIG. 3 that slidably engage the pair of rails F. The first bore **10** in first cross member H-1 is tapped and engages first threaded member J. A second bore **30** in first cross member H-1 slidably engages second threaded rod K. First cross member H-1 has tapped bores **32** in the ends thereof that are engaged by bolts **34** that extend through openings **36** formed in first end portions **38** of first elongate members L. A pair of washers **40** are mounted on each of the bolts **34** on opposite sides of the first end portion **38.** First threaded rod J is illustrated in FIG. 2 as having a bifurcated end **42** that by a transverse pin **44** is pivotally connected to a manually rotatable extension **46.** Extension **46** may be rotated by a handle **48** that is preferably located on the side of support B most distant from the invention A. Two pairs of nuts **50** are in locked engagement on first rod J as shown in FIG. 2 to prevent the rod moving longitudinally relative to the pair of cross pieces G as the rod is rotated.

The second cross member H-2 has the same structure as first cross member H-2 with the exception that a bore **52** therein that is in alignment with bore **10** is smooth. The tapped bore **12** in second cross member H-2 is in alignment with bore **30** in first cross member H-1. Two pairs of nuts **54** are in locked engagement on second threaded rod K on opposite sides of first cross piece H-1 to cause second cross piece H-2 to move concurrently with the first cross piece on rails F. Bolts **34** on the ends of second cross piece H-2 pivotally engage second end portions **56** of second members M by extending through openings (not shown) in the latter.

Second end portions **60** of first members L and first end portions **62** of second members M have bolt assemblies **64** mounted thereon as shown in FIG. **1.** The bolt assemblies **64** on first end portions **62** slidably engage elongate longitudinally extending slots **66** formed in first end portions **68** of side walls O. The bolt assemblies **64** on second end portion **60** of second members L pivotally connect the second end portions to second end portions **70** of side walls O as shown in FIG. **1.** The two pairs of bolt assemblies **64** engage longitudinal tapped recesses formed in the ends of two transverse shafts **65** and **67.**

Cradle P is defined by two parallel laterally spaced side walls **72** that on their lower edges are connected by

a web 74 to which a base 76 of motor Q is connected by conventional means. Cradle P has two opposed tapped bores 82 formed therein, one of which is shown in FIG. 7. Tapped bores 82 are aligned with bores formed in side walls O. Two shouldered bolts 84 engage the bores 90 as shown in FIG. 7, and occupy non-rotatable positions relative to side walls 72. Bolts 84 include portions 86 adjacent the heads 88 thereof that are journalled in a pair of transversely aligned openings 90 formed in the pair of side walls O.

One of the bolts 84 has a tapped bore 92 extending therein from the head 88 thereof, and this tapped bore being engaged by a screw 94 that has a head 96. Screw 94 extends through an opening 98 formed in a first end portion 100 of a pointer 102. The pointer 102 when cradle P is pivoted moves over gradations 104 on one of the side walls O to visually indicate the vertical angle at which sander disc S is disposed. The pointer 102 and gradations 104 cooperate to provide the visual angle indicating means U.

Manual adjustment T that controls the angle of sander S includes two pairs of first and second links 106 and 108, which links have first and second end portions 106*a*, 106*b* and 108*a* and 108*b* as shown in FIG. 1. First end portions 106*a* and 108*a* of each pair of links are pivotally connected to a side wall 72 and side wall O. Sidewalls O have a pair of spaced plates 110 extending between the lower edges thereof. A pair of slots 111 extend upwardly from the lower longitudinal edges of side walls O and are transversely aligned with the space between the pair of plates 110. Second end portions 106*b* and 108*b* of each pair of links overlap and have aligned openings (not shown) therein through which the threaded ends 112 of a shouldered cross bar 114 extend to be engaged by nuts 116.

Cross bar 114 has a tapped bore 118 therein that is engaged by a threaded rod 120. Rod 120 has the lower end thereof rotatably secured to a member 122 pivotally supported in a fixed position relative to plate 110. Rod 120 has a handle 124 on the upper end thereof. A lock nut 126 is mounted on the rod 120. When rod 120 is rotated, cradle P, motor Q and sander disc S may be pivoted as a unit relative to sidewalls O to dispose the sander disc at a desired vertical angle.

The sander disc S includes a circular member 130 that has a centrally disposed tubular boss 132 that non-rotatably engages a cylindrical hub 134 having a tapered bore 136 therein. Member 130 tapers radially to a slight degree on the forward surface thereof and has a circular sheet 138 covered with abrasive material 140 secured thereto. Connecting means R includes a collar 142 that is mounted on or formed as a part of drive shaft 18. Collar 142 has threads 144 on the exterior thereof that are engaged by an internally threaded connector 146 that has an inwardly extending ring-shaped flange 148 that engages a circular rib 150 on hub 134. A tapered shaft projection 152 projects outwardly from collar 142 and engages tapered bore 136. When connector 146 is tightened the hub 134 is moved longitudinally on shaft extension 152 to frictionally engage the same and be non-rotatable relative thereto. Circumferentially spaced, radially extending ribs 154 project rearwardly from member 130 as shown in FIG. 8. A ring 156 is mounted with a light press fit on hub 134.

The stops V-1 and V-2 are illustrated in FIG. 1 as being defined by rigid members 158 and 160 that slidably engage the pair of rails F. Member 158 is connected to first cross piece H-1 by a pair of longitudinally disposed rigid bars 162. Member 160 is connected to second cross piece H-2 by a pair of longitudinally positioned bars 164.

An alternate form of stop construction is shown in FIG. 9 in which the stops are tubular bearings 166 and 168 that are slidably mounted on rails F and secured to first and second cross members H-1 and H-2. The bearings 166 and 168 extend towards one another, and are in contact when motor Q is at a maximum elevation. The second threaded rod K has a transverse pin 170 on the right hand end thereof as viewed in FIG. 2, which pin slidably engages a pair of longitudinal slots 172 in a tubular member 174 that may be manually rotated by a rod extension 176 that is rotated by a crank 48 of the type as secured to rod extension 46.

It will be particularly noted that due to the taper of the forward surface of member 130 and the sheet 138 mounted thereon, the abrasive material 140 on sheet 138 has line contact with workpiece D as sander disc S rotates and the workpiece is slid on surface B relative thereto. Due to such line contact no striations or marks are left on workpiece D by the sander disc S, and the sander disc S provides a finish on workpiece D that is final and complete.

The stops V-1 and V-2 not only serve that function but due to being connected rigidly to the first and second cross members H-1 and H-2 by rods 162 and 164 serve as stabilizers to prevent first and second cross members becoming angularly disposed relative to the pair of rails F and binding thereon.

The use and operation of the invention has been described previously in detail and need not be repeated.

I claim:

1. In combination with a horizontal support of a desired elevation on which a workpiece may rest to slide in a first direction thereon when in contact with an elongate guide that occupies a fixed position relative to said support, a device that permits a power-driven sander disc to be adjusted laterally, vertically and angularly relative to said guide to contact said workpiece as the latter is moved in said first direction, said device including:

a. a horizontal base disposed at a fixed position adjacent said support;

b. a pair of spaced parallel rails disposed above said base and normal relative to said guide;

c. first and second spaced crosspieces secured to said base and supporting said pair of rails therebetween;

d. first and second parallel cross members slidably supported on said rails;

e. first means that are manually operated for moving said first cross member on said rails, with said first means when not operated holding said first cross member at a desired fixed position on said rails;

f. second means that are manually operated for moving said second cross member on said rails;

g. two sets of first and second elongate members that extend upwardly from said base to define an "X", each of said first and second members having first and second end portions, with said first end portions of said first members being connected to opposite ends of said first cross member, and said second end portions of said second members being pivotally connected to opposite ends of said second cross member, with each of said sets of said first and second members having aligned centrally dis-

posed bores formed therein;

h. third means that engage said aligned bores for pivotally connecting said first and second members in each of said sets;

i. a pair of spaced parallel side walls that have first and second end portions, with said first end portion having elongate horizontal slots formed therein;

j. fourth means slidable in said slots and pivotally connected to said first end portions of said second members;

k. fifth means that pivotally connect said second end portions of said side walls;

l. at least one horizontal plate that connects the longitudinal edges of said side walls most adjacent said base;

m. a cradle pivotally supported between said side walls and above said plate;

n. an electric motor supported in a fixed position in said cradle, said motor including a stub drive shaft;

o. sixth means for removably securing said sander disc to said drive shaft;

p. seventh means that are manually operated for pivoting said crable, motor and sander disc to a desired angular relationship relative to said horizontal plate;

q. eighth means for visually indicating the vertical angle of said sander disc; and

r. first and second stops that extend towards one another from said first and second cross members, with said first and second cross members, said two sets of first and second members, said side pieces, said plate, said cradle, and said motor and sander disc being moved as a unit laterally on said pair of rails when said first means is operated, and said first and second members pivoting relative to one another to raise or lower said sander disc when said second means is operated, and with said motor-supporting cradle being at a maximum elevation relative to said base when said first and second stops are in abutting contact.

2. A device as defined in claim **1** in which said first means includes:

q. a first threaded rod rotatably supported by said cross pieces, and extending therebetween normal to said guide, with said threaded rod engaging a tapped bore in said first cross member;

r. a pair of first longitudinally spaced stops on said first threaded rod that are in abutting contact with said pair of cross pieces for preventing said first threaded rod moving longitudinally relative to said pair of cross pieces as said first threaded rod is rotated; and

s. a first crank secured to said first threaded rod for manually rotating the latter.

3. A device as defined in claim **2** in which said second means includes:

t. a second threaded rod rotatably supported by said cross pieces and extending therebetween parallel to said first threaded rod and laterally spaced therefrom said second threaded rod extending through an opening in said first cross member and engaging a tapped bore in said second cross member;

u. a pair of longitudinally spaced stops mounted on said second rod on opposite sides of said first cross member and in abutting contact with the latter; and

v. a second crank secured to said second threaded rod for manually rotating the latter to move said second cross member relative to said first cross member.

4. A device as defined in claim **1** in which said third means includes:

q. a transverse shaft that extends between said two sets of first and second members, said transverse shaft having two tapped longitudinal recesses in opposite ends thereof that are aligned with said centrally disposed bores in said first and second members; and

r. two bolts that extend through said centrally disposed bores in said first and second members and engages said tapped recesses.

5. A device as defined in claim **1** in which said fourth means includes:

q. a transverse shaft that extends between said pair of sidewalls, said transverse shaft having two tapped longitudinal recesses in opposite ends thereof that are aligned with said slots, with said recesses normal to said side walls; and

r. two bolts that extend through said slots and engage said tapped recesses.

6. A device as defined in claim **1** in which said fifth means includes:

q. a first transverse shaft that extends between said pair of side walls, said first transverse shaft having two tapped longitudinal recesses in opposite ends thereof that are aligned with transverse bores in said pair of side walls; and

r. two bolts that extend through said transverse bores and engage said tapped recesses.

7. A device as defined in claim **1** in which said shaft includes an externally threaded collar that has a tapered shaft extension projecting therefrom, with said sander disc including a circular member having a first, radially tapering abrasive covered first surface and a second surface, a centrally disposed hub that projects from said second surface, said hub having a tapered recess extending longitudinally therein from the free end thereof, and a circular rib projecting from said free end of said hub, and said sixth means being:

q. an internally threaded ring shaped connector that includes an inwardly extending flange, said connector encircling said hub and when rotated relative to and in engagement with said externally threaded collar removably securing said sander disc to said tapered shaft extension and in non-rotatable frictional engagement therewith.

8. A device as defined in claim **4** in which two of said plates are secured to said pair of side walls, and a pair of slots that extend upwardly in said pair of side walls from said lower longitudinal edges thereof, said slots transversely aligned with a space between said pair of plates, and said pair of slots having said transverse shaft at least partially situated therein when said pair of plates are lowered to their lowermost position relative to said base.

9. A device as defined in claim **6** in which said first transverse shaft has a bore extending therethrough and said seventh means includes:

s. two pairs of first and second links disposed adjacent said side walls and opposite sides of said cradle, with said first and second links each including first and second end portions, and said second end portions of each of said sets overlapping and having aligned openings therein;

t. eighth means that pivotally connect said first end portions of said first links to said side walls;

u. ninth means that pivotally connect said first end portions of said second links to said cradle;

v. a second transverse shaft that has tapped longitudinal recesses in the ends thereof that are aligned with said aligned openings, said second transverse shaft has a tapped bore extending therethrough;

w. a pair of bolts that extend through said aligned openings and engage said tapped recesses in said second transverse shaft to pivotally connect said two pairs of first and second links;

x. a third threaded rod having first and second end portions, said third threaded rod engaging said tapped bore in said second transverse shaft, and said first end portion journalled in said bore in said first transverse shaft; and

y. a handle secured to said second end portion of said third threaded rod to rotate the latter and pivot said cradle relative to said pair of side walls.

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