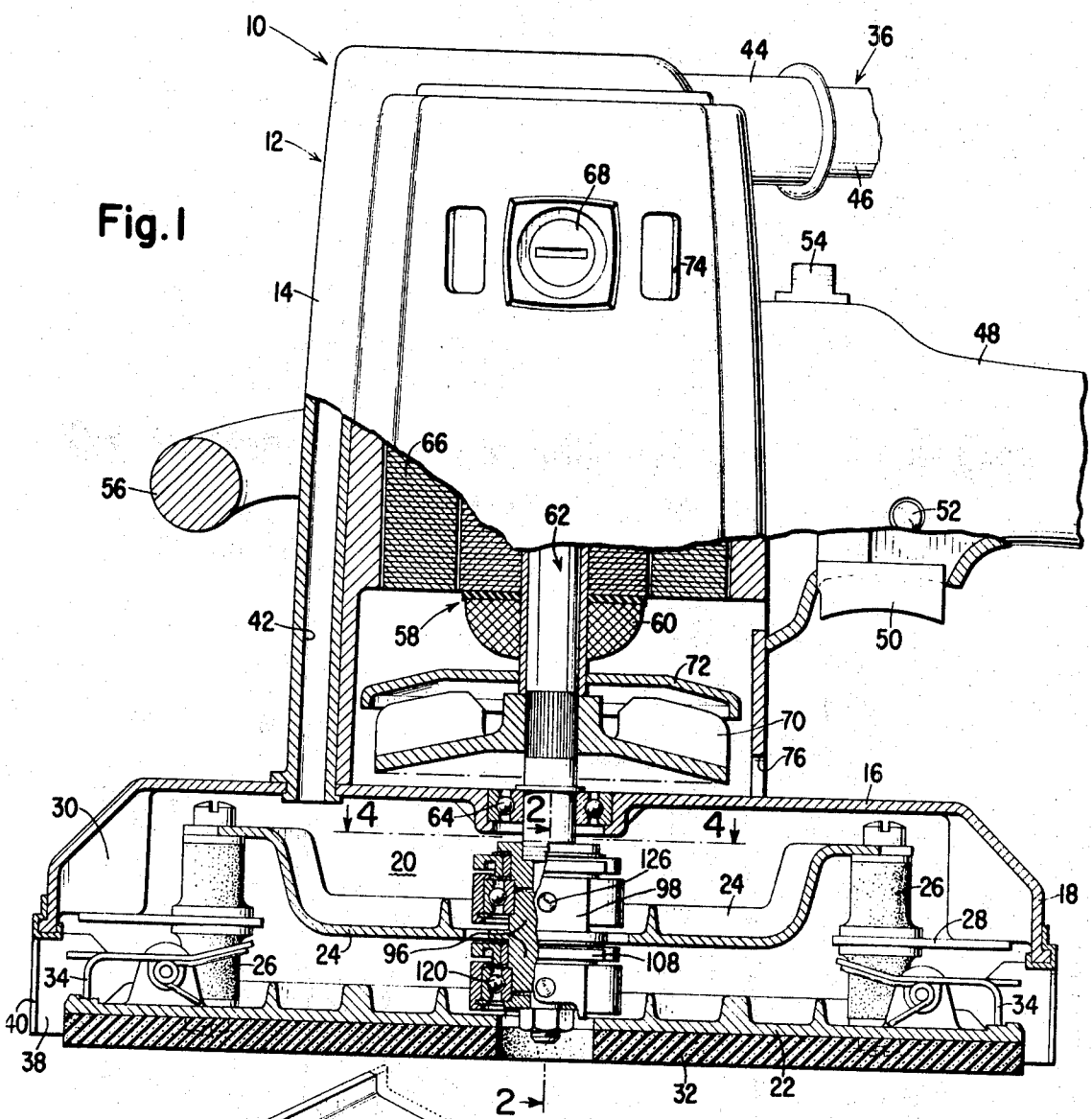
Oct. 13, 1970 E. C. DUDEK ET AL. 3,533,193

DUAL MOTION PAD SANDERS

Filed Nov. 25, 1968

2 Sheets-Sheet 1

Fig. 1



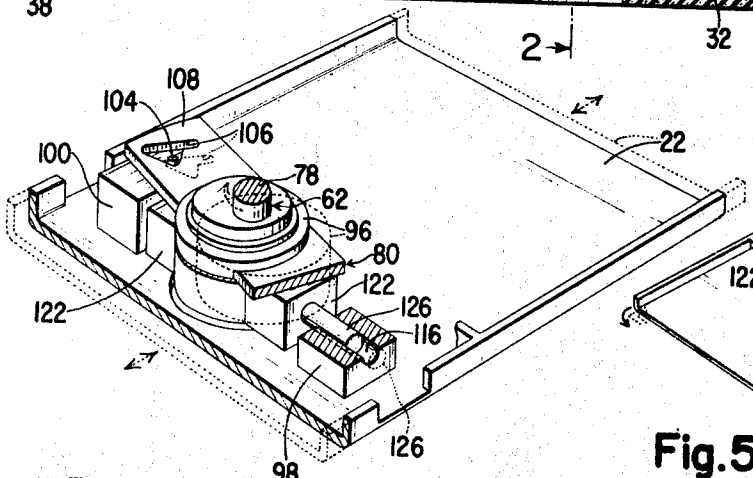


Fig. 6

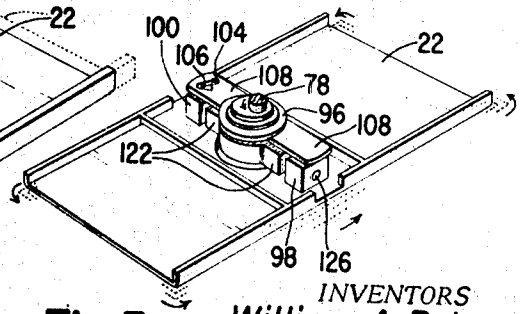


Fig. 5

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2 Sheets-Sheet 2

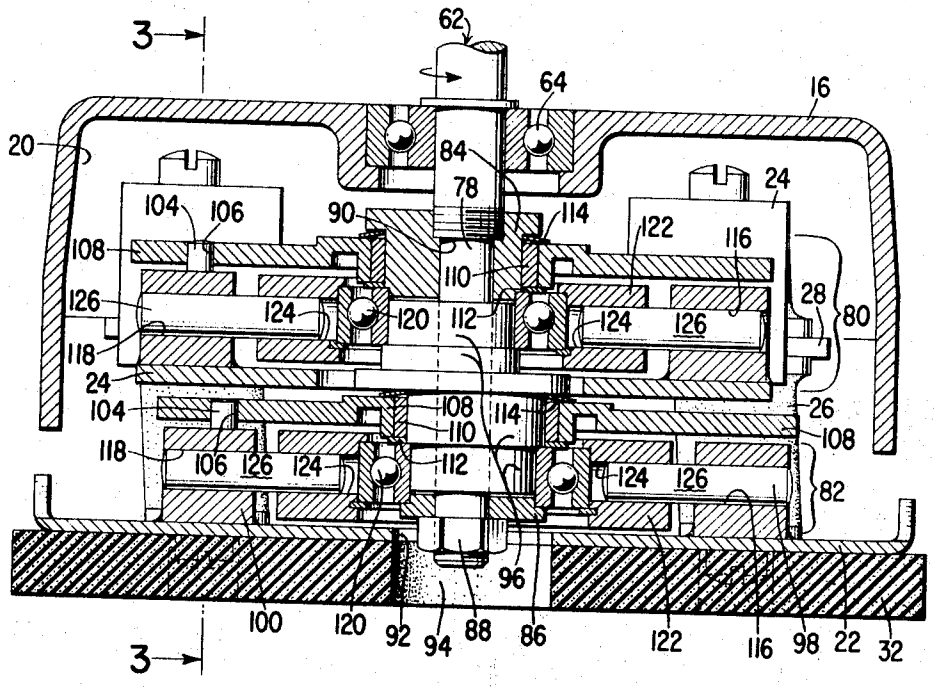


Fig. 2

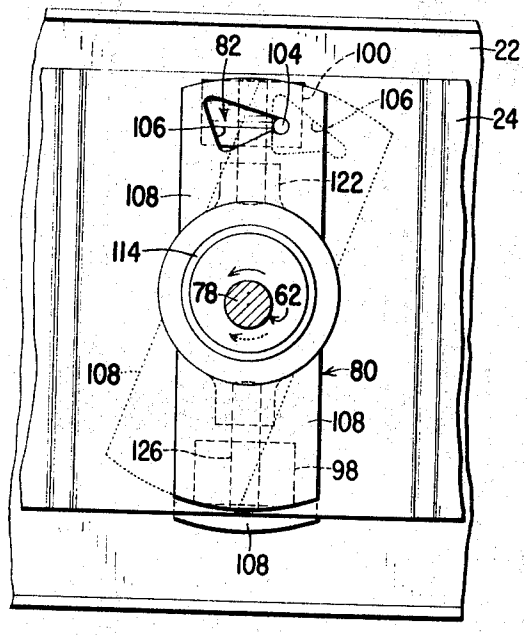


Fig. 4

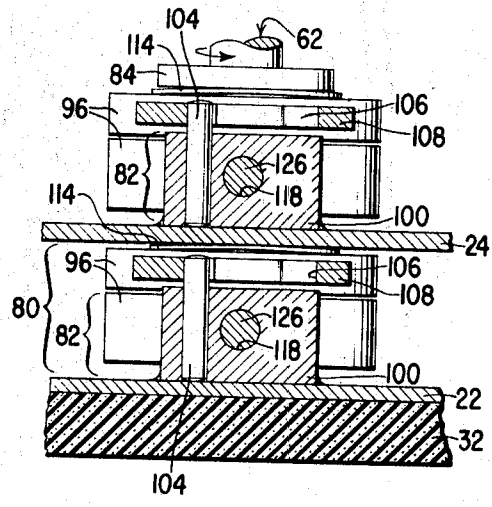


Fig. 3

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3,533,193

DUAL MOTION PAD SANDERS

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Int. Cl. B24b 23/00
U.S. Cl. 51—170 12 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure relates to a dual motion pad sander capable of performing the sanding operation upon a work surface by selectively prescribing either orbital or reciprocatory movement thereon. The pad sander preferably has a direct drive reversible electric motor which drives counter-balanced platens connected through an eccentric and motion changing mechanism whereby in one direction of rotation the platen reciprocates, while in the other direction of rotation the platen is locked to the eccentric to follow an orbital path.

BACKGROUND OF THE INVENTION

Heretofore, pad sanders having dual motion required manual manipulation of the motion changing mechanism in order to select one of the two desired motions orbital or reciprocal, the platen would partake of. One type of dual motion pad sander is illustrated in U.S. Pat. No. 2,817,192, granted Dec. 24, 1957. The prior art had several disadvantages in that the motion selector lever was difficult to operate, was located in a place of limited access, or required modifying the housing adjacent the platen to permit access to the motion selector lever.

SUMMARY OF THE INVENTION

In accordance with the present invention, the novel dual motion pad sander is provided with a reversible motor mounted in a housing to drive an eccentric which is connected to a platen means through a motion changing mechanism in which for one direction of motor rotation orbital motion is transmitted to the platen, and in the reverse direction of motor rotation reciproctatory motion is transmitted to the platen.

It is therefore an object of the present invention to provide an improved dual motion pad sander which overcomes the prior art deficiencies; which is simple, economical and reliable; which automatically changes the motion of the platen from orbital to reciprocatory, or vice versa upon reversal of the direction of motor drive; which uses a transverse shifting means mounted to the eccentric drive means and adapted to be selectively locked responsive the direction of drive; which is counterbalanced; which uses a frictionally carried lock means connected to the eccentric to selectively lock the motion changing mechanism; and, which uses a slide bearing mechanism to internally absorb motion in one plane during reciprocation of said sander.

Other objects and advantages will be apparent from the following description of one embodiment of the invention and the novel features will be particularly pointed out hereinafter in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

This invention is illustrated in the accompanying drawings in which:

FIG. 1 is a side elevation, partly in section, of a pad sander embodying the present invention,

FIG. 2 is a view taken along line 2—2 of FIG. 1,

FIG. 3 is a view taken along line 3—3 of FIG. 2,

FIG. 4 is a view taken along line 4—4 of FIG. 1,

FIG. 5 is a schematic view representation of the novel dual motion pad sander being driven into a counterclockwise direction to produce orbital motion,

FIG. 6 is an enlarged schematic representation, partly in section, of the present invention in which the drive means is rotated clockwise to produce reciprocatory motion.

DESCRIPTION OF THE INVENTION

The present invention is embodied in a pad sander **10**, as shown in FIG. 1.

The pad sander **10**, illustrated in FIGS. 1 and 2, has a main frame or housing **12**, which includes a motor housing **14** mounted atop a base **16**, the vertical walls **18** of which define a hollow chamber **20** in which a pair of counterbalanced platens **22** and **24**, respectively, are mounted to resilient posts **26** which carry an attachment plate **28** affixed to a support partition **30** of the walls **18**. The platen **22** is the lower of the two and carries a resilient pad **32** on the bottom surface thereof. A pair of clamps **34** located at either end of the platen **22** releasably hold a sheet of sand paper (not shown) against the pad **32** for the subsequent sanding operation. The upper platen **24** serves to counterbalance the lower platen **22**, and therefore, is offset from the lower platen **22** but otherwise will partake of the same motion, be driven by the same means and have substantially the same mass as the lower platen **22**.

The pad sander **10** includes an optional dust pickup system **36** which operates to remove the dust created by the sanding operation by drawing the dust from an annular passage **38** formed between the platen **22** and a skirt **40**, into the chamber **20** to be delivered through an integrally formed conduit **42** to a blower (not shown) for discharge from an outlet **44** to the connected collection bag **46** of the dust pickup system **36**.

A main handle **48** is connected to the rear of the motor housing **14** and has mounted therein an "on-off" trigger switch **50** lockable in the "on" position by a releasable detent pin **52**. A reversing switch **54** is mounted on the upper side of the handle **48** adjacent the motor housing **14**. A second handle **56** is connected to the front end of the motor housing **14** and permits the operator to firmly grasp the frame **12** of the pad sander **10** both for and aft during the operation and manipulation thereof.

A reversible motor **58** is mounted in the motor housing **14**, and connected in circuit with the switches **50** and **54** to a suitable source of electric potential for operation thereof. The motor has an armature **60** and a commutator (not shown) carried by an armature shaft **62** journaled in the housing **12**, as by a ball bearing **64**. A field **66** is disposed about the armature **60**. The commutator is mounted at the upper end of the armature shaft **62** and is operatively engaged by a brush assembly **68**. A fan **70** covered by a fan shroud **72** draws air into an inlet **74** to pass in heat exchange relationship to the motor **58** and cools the components thereof prior to being discharged from an outlet **76**.

The motor **58** may be of any conventional design, and will be actuated by operation of the switch **50** to turn the shaft **52** clockwise or counterclockwise depending upon which one of two positions the reversing switch **54** has been placed into, whereby on changing the position of the switch **54** the motor and armature shaft thereof will turn in the opposite direction. The lower free end **78** of the armature shaft **62** is of reduced diameter and extends downwardly into the chamber **20** wherein the shaft end connects to a motion changing mechanism **80** which includes a transverse shifting mechanism or slide assembly **82**. The motion changing mechanism **80** is clamped to the shaft end **78** between two oppositely disposed eccentric caps **84** and **86**, respectively. The

upper cap **84** has a counterbore, the upper section of which is threaded upon the shaft immediately above shaft end **78** to seat against a shoulder **90** formed by the diameter reduction of shaft **62**. After the remainder of the motion changing mechanism **80** is assembled a nut **88** is threaded upon the shaft end **78** to abut cap **86**. Access to the nut **88** is provided by enlarged central apertures **92** and **94**, respectively, formed in the platen **22** and the pad **32** so as to permit relative motion of the platen **22** and shaft **62** without interfering contact occurring between the shaft end **78** and nut **88**, and the platen **22** and pad **32**.

A separate motion changing mechanism **80** is provided for each of the platens **22** and **24**, and except for the eccentric caps **84** and **86** which are positioned 180° out of phase so as to effect the counterbalancing for said platens **22** and **24**, and some other minor structural modifications, due mainly to the differences in the platens each of the motion changing mechanisms **80** are identical and therefore, like character references will be used for each of the mechanisms **80**, without a distinction being made for the mechanisms **80** associated with either platen **22** or platen **24**.

The caps **84** and **86**, respectively, each have pairs of aligned eccentrics **96**, all of which are fixedly connected to rotate in the same direction as the rotational direction of the shaft **62**, with a counterclockwise direction of rotation being illustrated for FIGS. 1, 2 and 3.

A pair of slide bearings **98** and **100** are fixedly connected to the platens **22** and **24**. The bearings **98** and **100** may be formed integrally with the platens **22** and **24**, or as is shown in FIGS. 2 and 3 connected by brazing or in any other suitable manner. A lock pin **104** is force fitted to the slide bearing **100** to extend above the upper surface thereof to be normally disposed in a wedge shaped aperture **106** formed in superposition thereto in a lock plate or lever **108** connected through a sleeve bearing **110** to rotatably engage either eccentric **84** or **96**, respectively. The lock plate **108** and the sleeve bearing **110** seat upon a wear washer **112**, while the upper surface of the lock plate **108** is engaged by a wavy washer **114** suitably mounted in the eccentric **84** or **96**, respectively, to act as a loading spring and provide a sufficient frictional engagement between said eccentric and lock plate so as to cause the turning of the lock plate **108** responsive to the direction of rotation of the armature shaft **62**.

The lock pin **104** limits the turning of the lock plate **108**, as illustrated in FIG. 4 between the apex and base of the aperture **106**. Counterclockwise rotation of the armature shaft **62** is represented by the full line arrow and will cause the lock plate **108** to turn counterclockwise, thus forcing the lock pin **104** into the apex of the aperture **106** as is represented by the full line drawing of the aperture **106** and the lock plate **108**. A clockwise direction of rotation is also illustrated in FIG. 4 by the dotted arrow and dotted representation of the aperture **106** and lock plate **108** for which the lock pin **104** acts to limit the clockwise turning of said plate upon abutting the substantially flat base of the wedge shaped aperture **108**. The purpose of providing a turnable lockplate **108** will be set forth hereinafter.

The slide bearings **98** and **100** have central apertures **116** and **118**, respectively, formed perpendicular to the longitudinal axis of the shaft **62** and its end **78**, while the longitudinal axis of said apertures extends parallel to and transversely of the platens **22** and **24**. Below the wear washer **112** and a ball bearing **120** is seated at its inner race upon one of the eccentrics **96** to be clamped between said eccentric and one of the end caps **84** or **86**. The outer race of the bearing **120** seats upon the inner periphery of a bearing collar **122** which has diametrically opposed transverse projections formed at either end thereof. Each of the projections formed has an aperture **124** the axis of which is in line with the axis of the respective apertures **116** and **118**. A slide pin **126** is fixedly connected in the aperture **124** to extend radially outwardly therefrom to be slidingly engaged within the respective apertures **116** and **118**.

When the armature shaft **62** is rotated counterclockwise the spring loaded wavy washer **114** will frictionally engage the lockplate **108** causing it to turn counterclockwise whereby the lock pin **104** will abut the apex of the wedge shaped aperture **106** for the dual purpose of limiting the counterclockwise turning of the lock plate **108**, and preventing transverse motion of the slide pin **126** in the respective slide bearings **98** and **100**. So long as the lock pin **104** is retained in the apex of the aperture **106** no transverse motion of the slide pin **126** is possible. However, the slide pin **126** is always transmitting longitudinal motion and therefore aids the turning momentum of the lock plate **108** in retaining the lock pin **104** in the apex of the aperture **106**. Thus, as seen in FIGS. 2, 3, 4 and 5, the counterclockwise rotation of the armature shaft **62** results in the motion changing mechanism **80** partaking of the orbital motion of the armature shaft **62** as transmitted by the eccentrics thereof, as is illustrated in FIG. 5.

Assuming an initial counterclockwise direction of rotation actuation of the reversing switch **54** will cause the motor **58** to rotate the armature shaft **62** in a clockwise direction resulting in the motion changing mechanism **80** transforming the rotary motion of the shaft **62** into reciprocatory motion at the respective platens **22** and **24**. Upon clockwise rotation of the armature shaft **62** the lock plate **108** represented in FIG. 4 by the dotted linear lines will be turned clockwise through the frictional urgings of the wavy washer **114**, thus freeing said plate from the lock pin **104** which still acts to limiting the turning of the lock plate **108** by abutting the base of the wedge shaped aperture **106**. Said base has a transverse dimension substantially twice that of the eccentricity of the eccentrics **96** so as not to interfere with the relative motion of the pin **104** and the lock plate **108**. The rotary motion transmitted from the armature shaft **62** to the respective platens **22** and **24** may be characterized by a longitudinal component lying in the direction of reciprocation and a transverse component lying perpendicular to the direction of reciprocation. As the shaft **62** rotates there is nothing to interfere with or absorb the longitudinal component of the motion thereof, and this component is transmitted directly through the eccentrics **96** to the bearing collar **122**, slide pin **126**, slide bearings **98** and **100** to cause the respective platens **22** and **24** to reciprocate as indicated by the dotted arrows and in phantom representation of said platen shown in FIG. 6. However, this is not the case for the transverse component of the motion, which component is absorbed in the transverse shifting mechanism or slide assembly **82** of the motion changing mechanism **80**. In FIG. 6 the full line representation of the motion changing mechanism **80** depicts the transverse component of the motion at leftward extreme of its travel, that being the leftward most travel, with the rightward extreme of said travel indicated by the dotted representation of the aperture **106**, the eccentric **96** and the slide pin **126**.

As the eccentric rotates any transverse component of motion is transferred through the bearing collar **122** to the slide pin **126** which slidingly engages the slide bearings **98** and **100**, respectively, so that no transverse component of the motion is transmitted to the platens **22** and **24**. In other words, as the eccentric **96** is rotated by the armature shaft **62** the pins **126** are alternately shifted from right to left to slide within the apertures of the slide bearings **98** and **100** while pushing said slide bearings and the connected respective platens **22** and **24** back and forth to accomplish the reciprocatory motion thereof. During clockwise rotation of the armature shaft **62** the lock pin **104** remains free within the aperture **106**,

the base of which slides transversely along the pin **104**, so that the transverse shifting mechanism **82** of the motion changing mechanism **80** remains in an unlocked position and is free to absorb the transverse component of the rotary motion of the eccentrics **96**.

The motion changing mechanism **80** may be generally described as including all of the components connected to the armature shaft **62** and shaft end **78**, except for possibly the platens **22** and **24**. The transverse shifting mechanism **82** of the motion changing mechanism **80** relates to the components which absorb the transverse motion of the eccentric **96**, and therefore, may be said to exclude the lock plate **108**.

In summary, the operator desiring orbital motion will position the switch **54** to obtain counterclockwise rotation of the armature shaft **62** of the motor **58**, which rotation will act to lock the transverse shifting mechanism **82** to the lock plate **108** whereby the rotary motion of the eccentrics **96** will be transmitted to said members directly to the platens **22** and **24** for counterbalanced orbital motion thereof. Reciprocatory motion will be obtained by the operator changing the position of the reverse switch **54** to cause clockwise rotation of the armature shaft **52**, thus turning the lock plate to a second or unlocked position whereby the transverse shifting mechanism **82** is free to absorb the transverse component of the motion and to transmit the longitudinal component of the motion so as to cause the platens **22** and **24** to reciprocate in a counterbalanced fashion, and thus produce a straight line motion thereof. Accordingly, by merely actuating the reversing switch **54** the operator will obtain either orbital motion or reciprocatory motion for the platens of the pad sander **10**.

It will be understood that various changes in the details, materials, arrangements of parts and operating conditions which have been herein described and illustrated in order to explain the nature of the invention may be made by those skilled in the art within the principle and scope of the invention as expressed in the claims.

Having thus set forth the nature of the invention, what is claimed herein is:

1. In a counterbalanced pad sander adapted to prescribe orbital motion or reciprocal motion upon a flat work surface, the combination of:

(a) a hoursing,

(b) a reversible motor mounted in the housing,

(c) an eccentric drive means rotatably driven by the motor along an axis perpendicular to the work surface,

(d) a platen means supported in the housing to be driven by the eccentric drive means to prescribe translatory movement upon said work surface in an orbital or reciprocal path,

(e) a motion changing mechanism connected between the eccentric drive means and the platen means,

(f) the motion changing mechanism including, a transverse shifting means, and a locking means interconnected thereto, and

(g) the transverse shifting means to remain unlocked in one direction of rotation of said drive means to transmit the reciprocal motion thereof to the platen while internally absorbing motion perpendicular to the direction of reciprocation, and in the other direction of rotation of said drive means to be locked thereto by the locking means to transmit the orbital motion thereof to the platen.

2. The combination claimed in claim **1** wherein:

(a) an upper transverse shifting means, locking means and platen means carried by the eccentric drive means, and

(b) a lower transverse shifting means, locking means and platen means carried by the eccentric drive means 180° out of phase with said upper unit to counterbalance the motion of the pad sander and reduce vibration.

3. The combination claimed in claim **1** wherein:

(a) the eccentric drive means including a shaft and a connected eccentric means.

4. The combination claimed in claim **3** wherein:

(a) the shaft is directly driven by the motor.

5. The combination claimed in claim **4** wherein:

(a) the locking means frictionally carried by the eccentric means, and

(b) means formed on the locking means, to limit the turning motion thereof between two positions in one position of which permits the transverse shifting means to move perpendicular to the direction of reciprocation, and in another position of which the transverse shifting means is locked through the locking means for direct connection with the eccentric means to transmit the orbital motion thereof, and

(c) the transverse shifting means partaking of motion perpendicular to the direction of reciprocation defined as transverse shifting.

6. The combination claimed in claim **5** wherein:

(a) the transverse shifting means including a slide pin portion slidably received in a bearing portion thereof,

(b) the slide pin portion rotatably mounted onto the eccentric means,

(c) the bearing portion affixed to the platen means and carrying a lock pin,

(d) the locking means having a wedge shaped aperture formed to have the lock pin extend therein,

(e) the lock pin in one direction of rotation of said drive means positioned in the wide end of the aperture to permit transverse shifting of the transverse pin portion within the bearing portion of the transverse shifting means to produce reciprocal motion at the platen, and upon reversal of said direction of rotation the aperture to shift with the locking means to lock the pin in the narrow edge thereof to prevent transverse shifting and to cause orbial motion to be transmitted by the transverse shifting means to said platen.

7. In a direct drive pad sander, the combination of:

(a) a housing,

(b) a reversible motor mounted in the housing,

(c) an eccentric drive means operatively driven by the motor,

(d) a motion changing mechanism, in one direction of drive to transmit orbital motion and in the reverse direction of drive to transmit reciprocatory motion,

(e) a platen means mounted onto the motion changing mechanism to prescribe a path of motion responsive to the position of said mechanism.

8. The combination claimed in claim **7** wherein the pad sander is counterbalanced and includes:

(a) an upper motion changing mechanism and connected platen and

(b) a lower motion changing mechanism and connected platen substantially 180° out of phase with the upper of said phase mechanisms.

9. The combination claimed in claim **8** wherein each of the motion changing mechanisms includes:

(a) a slide assembly rotatably mounted to the drive means and fixedly connected to said platen, the slide assembly to transmit motion in the direction of reciprocatory motion and independently move in a plane parallel to the work surface perpendicularly to the line of reciprocation,

(b) locking means frictionally connected to the eccentric drive means and interconnected to the slide assembly, in one direction of rotation to lock said slide assembly from independent motion to produce orbital motion at the platen, and upon reversal of the direction of rotation to unlock said slide assembly to permit said independent motion to produce reciprocal motion at the platen.

10. The combination claimed in claim **9** wherein:

(a) the locking means including a plate having a wedge shaped substantially longitudinal slot formed adjacent one end thereof,

(b) a pin connected to the slide assembly extending into said slot, and

(c) the pin limiting the turning movement of the plate and in one direction of rotation freely movable in said slot, and in the reverse direction of rotation non-movably held in the slot to cause the slide assembly to be locked to the eccentric drive means.

11. The combination claimed in claim **1** wherein:

(a) the platen is resiliently supported by the housing.

12. The combination claimed in claim **8** wherein:

(a) each of the platens is resiliently supported by the housing.

References Cited

UNITED STATES PATENTS

2,893,177	7/1959	Bruck	51—170.5
3,136,099	6/1964	Tully et al.	51—170.5
3,375,616	4/1968	Scott et al.	51—170.3

WILLIAM R. ARMSTRONG, Primary Examiner