

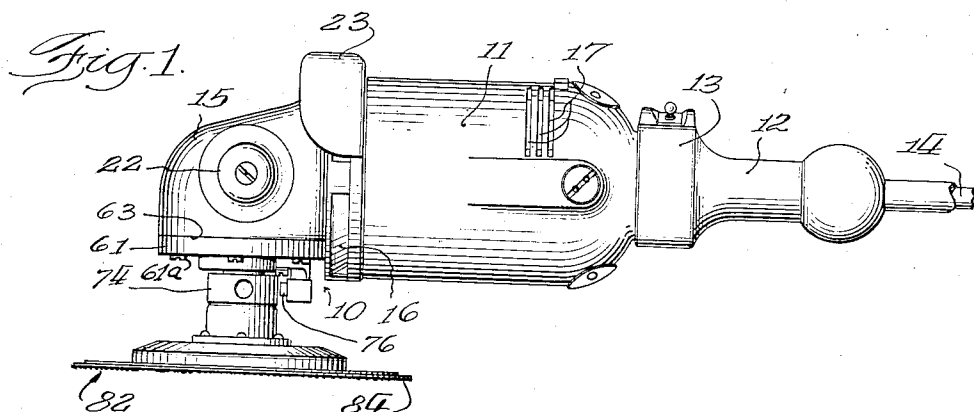
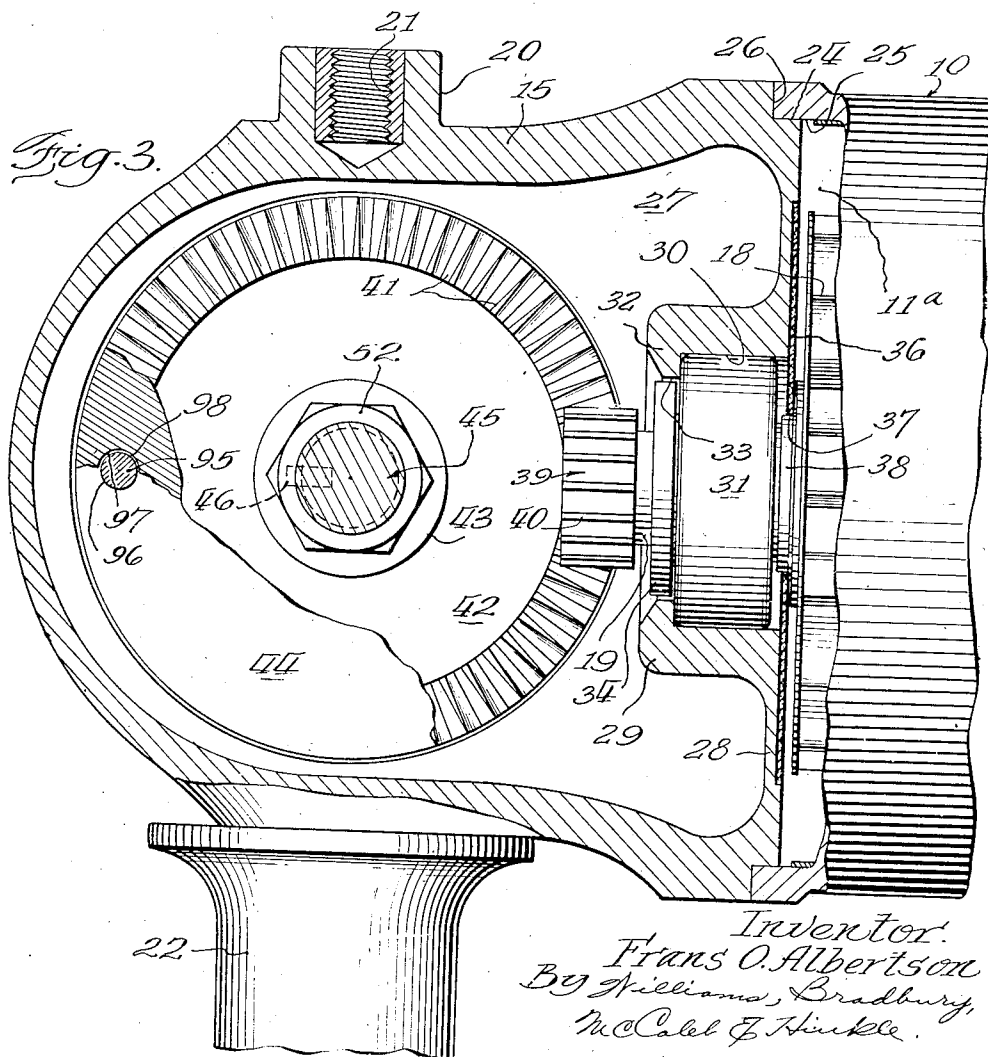
Dec. 30, 1941.

F. O. ALBERTSON
ELECTRIC SANDING MACHINE

2,267,781

Filed Nov. 9, 1939

2 Sheets-Sheet 1



Inventor:
Frans O. Albertson
By Williams, Bradbury,
McCaleb & Hinkle.
Attys.

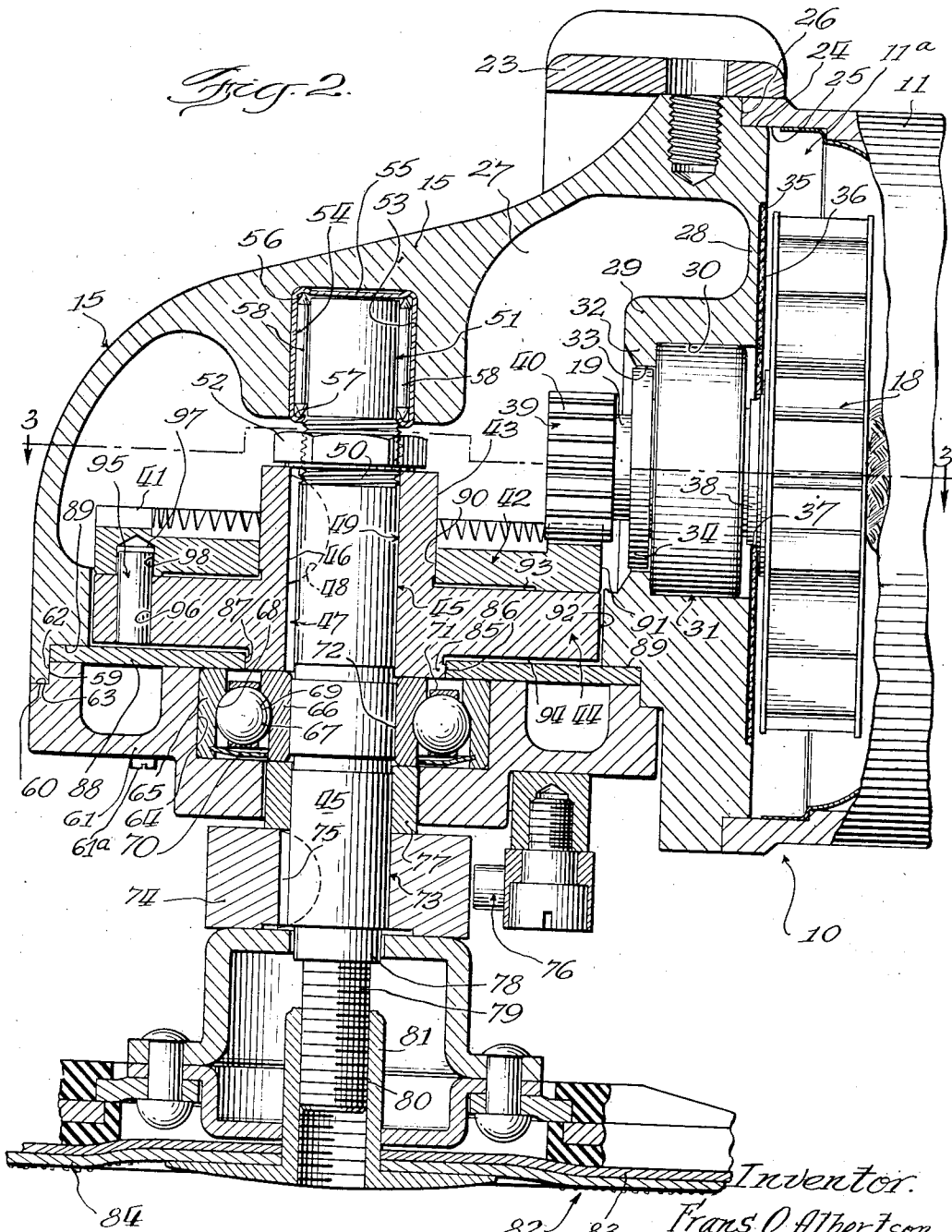
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Inventor.
Frans O. Albertson
By
Williams, Bradley,
McCaleb & Thibault

Atty 5.

UNITED STATES PATENT OFFICE

2,267,781

ELECTRIC SANDING MACHINE

Frans O. Albertson, Sioux City, Iowa, assignor to
Albertson & Company, Inc., Sioux City, Iowa, a
corporation of Iowa

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7 Claims. (Cl. 51—170)

The present invention relates to electric sanding machines, and is particularly concerned with electric sanding machines of the type having a motor, speed reducing gearing, and a driven shaft carrying a supporting pad and a sanding disc. In the sanding machines of the prior art, as exemplified in my prior patents, considerable trouble has been experienced with noisy gears, and there is considerable complaint from the users of such electric sanders on account of the unpleasant rattling or grinding noise of such sanding machines of the prior art, and the wear which takes place on the gears, due to the use to which the sanding machines are subjected.

In using such a sanding machine the sanding disc is applied to the work, and at such time a load is placed upon the motor, but the load is released at intervals, when the sanding machine is lifted from one point on the work to another, causing the pinion to slam back and forth against the teeth of the crown gear, and creating excessive rattle and noise.

It is found in devices of this type, which have been in use for some time, that there is just as much wear on the back of the teeth as there is on the load side. This shows the friction which is caused by abrupt changes in load, and such friction causes unnecessary heat, as well as noise, which are disadvantages in such a portable tool.

One of the objects of the invention is the provision of an improved electric sanding machine, having means for eliminating rigidity of contact or engagement between the driving and driven parts of the motor and sanding wheel, and eliminating noise and unnecessary wear on the gears.

Another object of the invention is the provision of an improved electric sanding machine which is adapted to operate with a substantial reduction in the amount of noise, and in which practically all of the undesirable rattling and grinding noises have been eliminated.

Another object of the invention is the provision of an improved electric sanding machine which is provided with an improved driving mechanism whereby the noise incident to its operation is transformed into a relatively smooth purr, as distinguished from the violent grinding, growling, or slapping back and forth of the gears, which was incident to the operation of the devices of the prior art.

Another object of the invention is the provision of an improved electric sanding machine

having a simple metallic structure for permitting a floating action of the crown gear and sanding wheel with respect to the driving pinion so as to eliminate wear on the back of the teeth of the gears and to eliminate grinding and growling noises of the gears, and to improve the operating characteristics of the sanding machine.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawings, in which similar characters of reference indicate similar parts throughout the several views.

Referring to the two sheets of drawings accompanying the specification,

Fig. 1 is a side elevational view of a sanding machine embodying the invention;

Fig. 2 is an enlarged fragmentary sectional view, drawn on a scale twice as large as one embodiment of the sanding machine, showing the structure of the mechanism;

Fig. 3 is a fragmentary sectional view, taken on the plane of the line 3—3 of Fig. 2, looking in the direction of the arrows.

Referring to Fig. 1, 10 indicates in its entirety an electric sanding machine, which is provided with an electric motor 11, having a handle 12, and controlled by an electric switch in a switch box 13.

The motor is energized through the rubber covered insulated conductors 14, passing through the handle 12 into the motor 11, and the motor 11 has a substantially cylindrical housing, which is joined at the opposite end to a gear housing 15. Suitable slots 16 are provided between the motor housing 11 and gear housing 15 for passage of the cooling and ventilating air, which is drawn in at the slots 17, and which is impelled by centrifugal impeller 18 carried by the motor shaft 19 (Fig. 3).

The gear housing 15 is provided with a pair of laterally projecting lugs 20, having threaded bores 21 for the reception of a threaded member carried by a suitable handle 22, which may be mounted on either side of the gear housing for convenience in manipulation of the sander.

The gear housing 15 is also provided with a suitable supporting skid member 23, mounted on the side opposite from the sanding wheel for supporting the device when it is not in use.

Referring to Figs. 2 and 3, the gear housing 15 is preferably provided with a substantially cylindrical formation 24 adapted to be received in a complementary cylindrical chamber or opening 25 at the end of the motor housing 11.

The gear housing 15 also has an annular

shoulder 26, which fits against the end of the motor housing 11, and the gear housing 15 may be secured in place by a plurality of through screw bolts (not shown), which extend through the motor housing 11, and are threaded into the gear housing 15.

The gear housing 15 is provided with an inner chamber 27, which is adapted to receive lubricant, so that the gears may be surrounded by a bath of suitable semi-solid lubricant.

Chamber 27 is separated from the interior of the motor by an end partition 28, which may be provided with an inwardly extending socket formation 29, having the socket 30 for receiving the anti-friction bearing 31, supporting the motor shaft 19.

The bearing socket 30 has an end wall 32, which terminates in a cylindrical opening 33, having a very limited clearance between the opening 33 and a steel baffle disc 34 carried by the motor shaft 19. The close relation between the cylindrical periphery of the baffle disc 34 and the aperture 33 practically prevents the egress of the fiber lubricant from the gear chamber 27 into the socket 30 and into the blower chamber 11a. At the other side of the socket 31, the partition 28 may be recessed at 35 to receive an oil sealing plate 36 of leather or other suitable flexible material, having a cylindrical aperture 37, engaging a complementary cylindrical formation 38 on the shaft 19.

Thus the anti-friction bearing 31 may be provided with suitable lubricant of a different character from that in the gear chamber 27; but in any event, lubricant is prevented from leaking into the motor 11 by the oil seal 36.

The motor shaft 19 carries a pinion 39, having teeth 40, which are adapted to mesh with the teeth 41 of a crown gear 42. Crown gear 42 is mounted for free rotation on the hub 43 of a metal disc or fly-wheel 44, which is carried by the driven shaft 45 and secured thereto by means of a key 46 and key-way 47, and recess 48.

The driven shaft 45 has a central cylindrical portion 49 and a reduced threaded portion 50, and a reduced cylindrical portion 51 at its upper end (Fig. 2). The nut 52 on the reduced threaded portion 50 engages the end of the hub 43 of the flywheel 44.

The gear housing 15 is formed with a suitably located cylindrical socket 53, having secured therein, by a pressed frictional fit, a sheet metal cage 54 of substantially cylindrical form. The cage 54 may have its closed end 55 pressed inward, forming an annular guide groove 56 at that end, and the opposite end may be turned over at 57 to form a second annular guide groove. A plurality of small roller bearings 58, provided with conical points at each end, have their pointed ends mounted in the guide grooves 56 and 57, to form a needle bearing.

The reduced cylindrical end 51 of the shaft 45 is rotatably mounted inside the rollers 58, which it is adapted to engage.

The gear housing 15 is provided at one side with an opening bound by an inner cylindrical wall 59, terminated at an annular shoulder 60. The annular shoulder 60, surrounding the opening 59, is in a plane at right angles to the partition 28. This opening 59 is closed by a cover plate 61, having an outer cylindrical formation 62, fitting in the opening 59, and having an annular shoulder 63 engaging the annular shoulder 60.

The cover plate 61 is provided with a centrally

located cylindrical socket 64 for receiving the outer race 65 of an anti-friction bearing, which also includes the inner race 66 and a multiplicity of balls 67 mounted in the grooves 68, 69.

The anti-friction bearing is preferably of the thrust type, as shown, each of the grooves 68 and 69 being so arranged that they are adapted to hold the driven shaft 45 in its place, as well as to rotatably support the shaft.

The outer race 65 may support an oil seal plate 70 of metal, which has a very small clearance adjacent the inner race 66, and practically prevents the egress of fiber lubricant of the type used in the gear housing 27.

Balls 67 may be held in proper place by a suitable cage 71. The inner race 66 may engage a cylindrical formation 72 on the shaft 45, which is of larger size at this point. The shaft 45 has a reduced cylindrical portion 73, which carries a thrust member 74 that is secured to the shaft 45 by a key 75.

Ring 74 is used with a pivoted latch member 76 to hold the shaft 45 in fixed position, while a sanding pad is attached to the shaft. A spacer collar 77 is interposed between the ring 74 and the race 66.

The shaft 45 is also provided with a still smaller cylindrical portion 78 and a still smaller threaded portion 79, which is adapted to be received in the complementary threaded bore 80, located in the nut 81 of a disc-supporting pad, indicated in its entirety by 82.

The disc-supporting pad may be of the type disclosed in my prior Patent No. 2,132,917 for Abrasive devices, issued October 11, 1938, and it may carry suitable flexible discs 83 and a sanding disc 84.

The fly-wheel hub 43 has an extension 85 on the lower side of the hub in Fig. 2, which is provided with a cylindrical periphery 86, having a very small clearance with respect to a cylindrical bore 87 in a steel plate 88.

The plate 88 is secured between the cover 61 and an annular shoulder 89, and the cover 61 and plate 88 are secured in place by a plurality of screw bolts 61a, passing through the cover 61 and threaded into the gear housing 15.

One of the most important features of the invention is the structure of the crown gear 42 and the fly-wheel 44. The crown gear 42 may comprise a disc-like metal member made of suitable hardened steel, having a cylindrical bore 90 and having the laterally projecting teeth 41 arranged adjacent the cylindrical periphery 91.

The bore 90 slidably receives the hub 43 so that the crown gear 42 is slidably mounted on the hub 43, but is restrained by the fact that its teeth 41 engage the teeth 40 of pinion 39. This prevents anything except a very limited amount of longitudinal motion of the crown gear 42 on the hub 43.

A small amount of motion is permitted, to allow adjustment between the teeth 40 and 41, to find the best driving relation. The fly-wheel 44 comprises a thick steel disc, having a substantially cylindrical periphery 92, and having flat sides 93 and 94. The fly-wheel 44 is provided with a laterally projecting pin 95 of cylindrical shape, which has one end fixedly secured by a close frictional fit in a bore 96 in the disc 44. The other end projects from the disc 44 and extends into an enlarged cylindrical aperture 97 in the back side of the crown gear 42.

Referring to Fig. 3, it will be seen that there

is a clearance 98 between the pin 95 and the bore 97.

The operation of the sanding machine, from the point of view of the sanding disc 84, is as follows: The motor, by means of its shaft 19, drives the pinion 39, which engages the crown gear 42 so that the crown gear 42 is driven at a reduced speed. The crown gear 42, through the pin 95 and socket 97, drives the disc 44, which drives the driven shaft 45 and the sanding disc 84.

The operation of the sanding machine, from the point of view of reduction in noise and wear on the teeth, is something for which it is difficult to find a logical explanation, but the applicant's explanation of this phenomenon is as follows: It is a fact that this structure results in reduced wear on the gear teeth, particularly on the back side of the gears, and there is a marked difference in the characteristics of operation of the sanding machine. This difference is particularly noted in the reduction of noise, as the slapping and grinding of gears and the rattling of gears have been practically eliminated, and the grinding machine operates under load and without load with a sound which may be described as a purring action.

As all of the elements used in the drive are of metallic nature and may be made of steel, the present device is more durable than devices which I have heretofore employed for the purpose of reduction of noise and strain on the gears, and the present device may be operated for long periods of time without necessity for repair. I explain the operation of the mechanism as follows, but the present explanation is not necessarily the only one, and it may be found that there is some better explanation of the action of the mechanism.

The crown gear has the capability of moving a slight amount in an angular manner in either direction relative to the fly-wheel or disc 44. This permits the crown gear to have a floating action in between the driven shaft 45 and the driving pinion 39. There is necessarily a certain amount of slack between the driving of the motor and the driven shaft 45 of the sanding machine under all conditions because there is a necessary manufacturing clearance between the teeth of the two gears.

The distinct slap or growl which is caused by the back sides of the teeth running into each other in the devices of the prior art, may be analogous to the noise which occurs on a railway train with loose couplings, which jerk violently on starting or stopping of the train.

In the present invention, when the load on the sanding wheel is released, the crown gear does not immediately slap back against the teeth of the pinion with a sudden jar, but it comes up against the back side of the teeth with a floating action that permits the crown gear and pinion to come together and find their own point of contact without noise such as is caused in the devices of the prior art.

This may be partly due to the fly-wheel action of the disc 44, which tends to keep the drive shaft running at a constant rate of speed, instead of permitting the sanding wheel to run ahead of the motor and cause engagement of the back of the pinion teeth by the crown gear teeth when the load is released. It is a fact that the structure shown reduces and practically eliminates the slap and grind and growl of the gears under these conditions, and results in the smooth

purring operation of the electric sanding machine.

While I have illustrated a preferred embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. In an electric sanding machine, the combination of a driving motor having a shaft provided with a pinion, a driven shaft for supporting a rotatable sanding member, said driven shaft being provided with a crown gear engaging said pinion, and a metallic drive between said driven shaft and said crown gear, having a predetermined amount of clearance to permit a floating action of the crown gear when the load is removed from the sanding member, and a rotating inertia member carried by the shaft and tending to maintain the rotative speed of the crown gear to prevent back slap of the crown gear against its pinion.

2. In an electric sanding machine, a driving mechanism comprising a pinion carried by the motor shaft, a driven shaft for supporting a sanding member, bearings for supporting said driven shaft, a crown gear carried by said driven shaft, and having a limited rotation on said driven shaft, and interengaging means between said crown gear and driven shaft, and having a predetermined range of movement whereby the crown gear is permitted to have a floating action when the load changes on the driven shaft, said inter-connecting means including a metallic disc-like rotatable member having a predetermined inertia tendency to maintain the rotation of the driven shaft.

3. In an electric sanding machine, the combination of a driving motor having a motor shaft provided with a pinion, a driven shaft for supporting a rotatable sanding member, bearing means carried by said machine for said driven shaft, said driven shaft being provided with a driven gear engaging said pinion, and said gear being mounted for rotation on said driven shaft, a fly wheel member fixedly secured to said driven shaft and having a laterally projecting pin engaging in an aperture in said gear, said pin and aperture having a predetermined amount of clearance to permit a floating action of the gear when the load is removed from the sanding member.

4. In an electric sanding machine, the combination of a driving motor having a shaft provided with a pinion, a driven shaft for supporting a rotatable sanding member, said driven shaft being provided with a crown gear engaging said pinion, a flywheel carried by said driven shaft, a gear rotatably mounted concentrically with said flywheel, and metallic drive means interconnecting said flywheel and said gear with a predetermined clearance to permit floating driving action by said gear when the load is removed from the sanding member.

5. In an electric sanding machine, the combination of a driving motor having a shaft provided with a pinion, a driven shaft for supporting a rotatable sanding member, said driven shaft being provided with a crown gear engaging said pinion, a metallic drive between said driven shaft and said crown gear, said metallic drive being spaced

outwardly from said driven shaft and having a predetermined amount of clearance to permit a floating action of the crown gear when the load is removed from the sanding member, and a rotating inertia member carried by the shaft and tending to maintain the rotative speed of the crown gear to prevent back slap of the crown gear against its pinion.

6. In an electric sanding machine, a driving mechanism comprising a pinion carried by the motor shaft, a driven shaft for supporting a sanding member, bearings for supporting said driven shaft, a crown gear carried by said driven shaft, interengaging means between said crown gear and said driven shaft, said interengaging means including an inertia member mounted concentrically with the driven shaft to be directly driven

by said shaft and having predetermined limited rotative movement with said crown gear, whereby the crown gear is permitted to have a floating action when the load changes on the driven shaft.

5 7. In an electric sanding machine, a driving mechanism comprising a pinion carried by the motor shaft, a driven shaft for supporting a sanding member, bearings for supporting said driven shaft, a metallic disc-like member having a predetermined inertia tendency carried by said driven shaft to maintain the rotation thereof, a crown gear carried by said driven shaft and having limited rotation on said driven shaft, the rotation thereof being limited by interengaging means mounted between said crown gear and
10
15 said driven shaft.

FRANS O. ALBERTSON.