

June 10, 1952

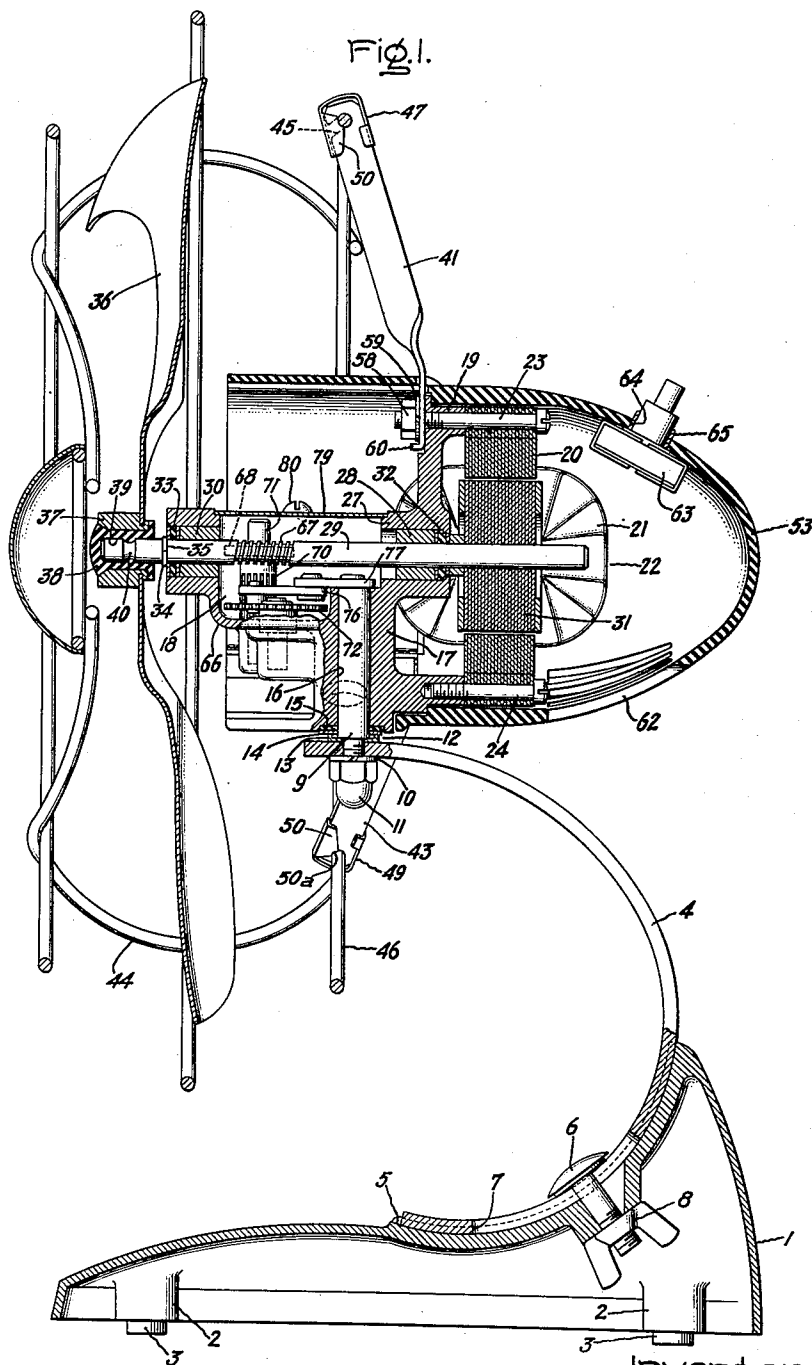
G. J. REISCH

2,600,325

ENCLOSED OSCILLATING FAN

Filed Nov. 13, 1948

2 SHEETS—SHEET 1



Inventor:
George J. Reisch,

by *Christina Reisch*
His Attorney.

June 10, 1952

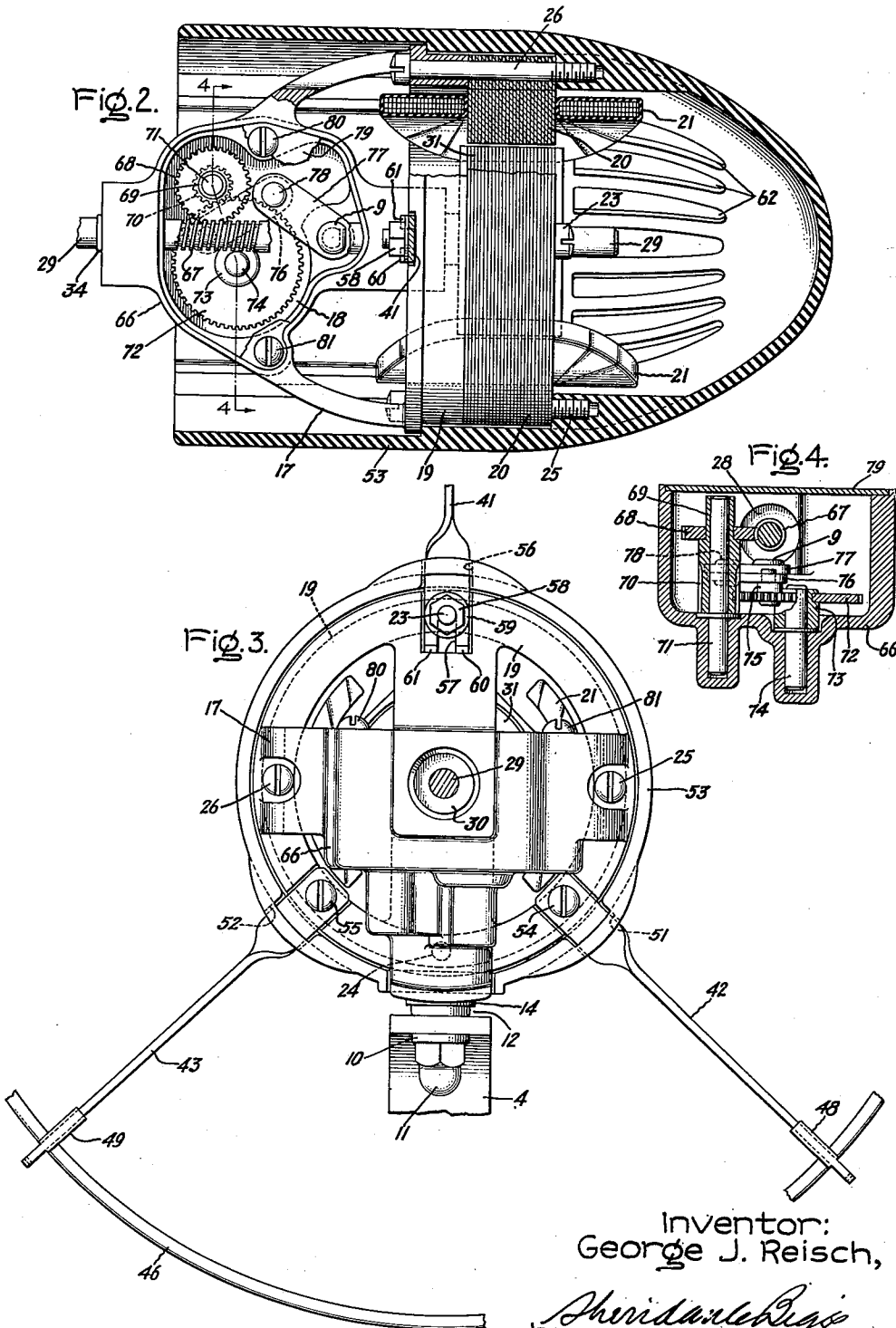
G. J. REISCH

2,600,325

ENCLOSED OSCILLATING FAN

Filed Nov. 13, 1948

2 SHEETS—SHEET 2



Inventor:
George J. Reisch,

by *Sheridan LeBorg*
His Attorney.

UNITED STATES PATENT OFFICE

2,600,325

ENCLOSED OSCILLATING FAN

George J. Reisch, Stratford, Conn., assignor to
General Electric Company, a corporation of
New York

Application November 13, 1948, Serial No. 59,847

9 Claims. (Cl. 230—256)

1

My invention relates to electric fans and it has for one of its objects to provide an improved means of automatically oscillating an electric fan about a vertically adjustable support.

Another object is to completely enclose and submerge in grease the oscillating mechanism and journals of all moving parts of a fan within a gear case which is an integral part of a fan frame.

Another object is to arrange the component parts of a fan in such a manner as to obtain a proper weight distribution throughout the fan, thereby reducing vibration and minimizing the friction between a swivel bearing and a swivel stud around which the fan oscillates.

A further object is to provide a new and improved fan construction having a unitary gear case and frame, which may be fabricated easily by such means as die-casting. This gear case and frame supports all of the operating parts of the fan so that a motor casing may be provided which is one complete shell made from one piece of material and which can be easily removed without interfering with the operation of the fan; thereby permitting the observation of the fan motor while it is in operation and facilitating adjustment and repair.

Other objects and advantages of my improved electric fan will become apparent as I describe my invention in greater detail.

In a preferred embodiment of my invention, I provide a gear case having bearings at its front and rear ends and attached to its rear end are arms which support a motor frame in the form of a ring to which the stator of the fan motor is fastened. Mounted in the bearings is a shaft which projects beyond the bearings at each end of the casing, the fan blade assembly being mounted on the end of the shaft which projects from the front end of the gear casing and the rotor of the fan motor being mounted on the end of the shaft which projects from the rear end of the gear case. Gearing for an oscillating mechanism for the fan is mounted in the gear case. An enclosing casing for the gear case and motor may be attached to the motor frame.

For a more complete understanding of my invention, reference should be made to the accompanying drawings in which Fig. 1 is a vertical sectional view of an entire fan embodying my invention, Fig. 2 is a sectional view of the motor and gear assembly of the fan shown in Fig. 1, Fig. 3 is a view in elevation of the front of the fan with the fan proper removed, Fig. 4 is a sectional view of the gear case of the fan taken along line 4—4 in Fig. 2.

2

Referring to Fig. 1, I have shown my invention in one form as applied to an electric fan having a base 1 provided with extending foot supports 2 and resilient feet 3 and splined to an arcuate support 4 by a flat channel 5 in which the support 4 is slidably fitted. The support 4 controls the angle of elevation of the fan by being adjustably secured in channel 5 by a carriage bolt 6 inserted through an elongated slot 7 in support 4 and a hole in base 1 and locked in place by wing nut 8. Inserted through a suitable aperture in the upper end of support 4 and keyed to stop rotation is a swivel stud 9 which is locked in place by lock washer 10 and an acorn nut 11. Encircling swivel stud 9 and resting on support 4 is a thrust bearing assembly 12 which I have shown as comprising a cup washer 13 making contact with washers 14 and 15 acting as a grease seal. The swivel stud 9 fits into a cylindrical hole 16 in the approximate center of a combined gear case and fan frame 17 which acts as a bearing for the swivel stud 9 permitting the combined gear case and fan frame to pivot around this swivel stud 9 on thrust bearing assembly 12.

The gear case and fan frame 17 has a generally cup-shaped portion which defines the gear case 18 and an integral rearwardly extending cylindrical portion 19 which serves to support the laminations 20 and coil assembly 21 which form the stator of a fan motor 22. The laminations of the stator 20 are secured in place by screws 23 and 24 shown in Fig. 1 and screws 25 and 26 shown in Fig. 2. At the rear end of gear case 18 is a rearwardly extending hub 27 which accommodates a rear bearing 28 for a drive shaft 29. The front end of gear case 18 is similarly formed to support a front bearing 30 for the drive shaft 29. At its rear end shaft 29 projects beyond bearing 28 and mounted on such projecting end is the usual rotor assembly 31 of the fan motor 22. Both the front and the rear bearings for the drive shaft 29 are located on the forward side of fan motor 22. A thrust washer 32 encircling shaft 29 is inserted between rotor 31 and rear bearing 28. Another thrust washer 33 is similarly positioned at the outer end of front bearing 30 and is secured in place by a snap ring 34 which fits into an annular groove 35 formed in shaft 29. These thrust washers 32, 33 reduce the friction between the moving parts as the motor rotates. The snap ring 34 acts not only as a thrust shoulder to hold the rotor in place but also allows a measure of adjustment of the rotor end play without the necessity of disassembling the motor.

A fan blade assembly 36 is attached to a cir-

cular sleeve 37 which is fixed on the forward end of drive shaft 29 as by a bushing 38, cylindrical in shape to fit contiguously against the inner circumference of sleeve 37. Bushing 38 has an axially extending cylindrical aperture 39 which permits it to fit tightly around the drive shaft 29. An annular groove 40 is milled or otherwise formed around the forward end of drive shaft 29. The bushing 38 is forced into said annular groove and locks the parts together.

Attached to the gear case and frame 17 by three supporting arms 41, 42 and 43, best seen in Fig. 3, is the usual fan guard 44. Each supporting arm has an elongated slot extending angularly from its outer end, designated in supporting arm 41 in Fig. 1 by the numeral 45. A rear fan guard wire 46 is inserted in these slots and locked in place by suitable metallic clips 47, 48 and 49. One side 50 of each metallic clip is triangular in shape and has an arcuate notch 50a at its apex which is folded to snap under the guard wire 46 and lock said guard wire within the slotted grooves of the supporting arms. The inner ends of supporting arms 42 and 43, best seen in Fig. 3, are inserted through suitable apertures 51 and 52 in a motor casing 53 and are attached to gear case and frame 17 by screws 54 and 55. The inner end of supporting arm 41 is also inserted through a suitable aperture 56 in motor casing 53, but has a slotted aperture 57 extending upward from its inner edge which slides over the screw 23 and is adjustably secured in place by nut 58 and lock washer 59. This allows a small measure of adjustment of the vertical pitch of the fan guard 44. Extending, however, from the inner edge of supporting arm 41 on either side of slotted aperture 57 is a pair of small projecting flanges 60 and 61, which determine the extent of adjustability in one direction as well as prevent the supporting arm 41 from completely sliding off screw 23.

Motor casing 53 is fabricated from one piece of material to assume a general cup shape. It completely encloses the fan motor 22 and is attached to the gear case and fan frame 17 by screws 25 and 26. This motor casing may be die cast or otherwise fashioned from a suitable plastic or metallic material and contains the usual plurality of ventilating apertures 62 in the under rearward portion. An off-on switch 63, inserted through a circular aperture 64 in motor casing 53 and attached thereto by such means as a speed clip 65, is the only part of the fan supported by the motor casing 53. Therefore, since no operational parts of the fan are attached to the motor casing 53, it may be easily removed without interfering with the operation of the fan. Control wires (not shown) leading to the switch from a power source, and from the switch to the motor, are provided in conventional fashion.

Gear case 18 has a cup-shaped portion 66 which serves as an enclosure for the oscillating drive or gearing. A worm thread 67 formed in the drive shaft 29 near the forward end of gear case 18 drives a worm gear 68, best seen in Figs. 2 and 4. This worm gear 68 is attached by means such as a press fit, to a hub 69 which has a pinion 70 formed in its lower portion and is journaled on a bearing pin 71. Pin 71 is securely assembled into gear case 18 by a press fit or other suitable means. Pinion 70, in turn, drives another larger spur gear 72 similarly attached to a hub 73 and journaled on a bearing pin 74 which is also secured to gear case 18 in any suitable

manner similar to bearing pin 71. A shouldered pin 75 is riveted or otherwise attached to gear 72 close to its outer edge and serves to pivotally connect a crank arm 76 to the gear 72. The other end of crank arm 76 is attached to a rigid arm 77 by such pivotal means as a shouldered rivet 78, which also acts as a bearing and pivot point for said crank arm 76. The rigid arm 77 is keyed, swaged or otherwise securely attached to swivel stud 9. This entire oscillating drive or gearing assembly is completely submerged in grease or other lubricant and enclosed by a gear case cover 79 secured in place by such means as screws 80 and 81.

Because the drive shaft bearings and the swivel stud bearing communicate with the interior of the gear case enclosure, lubricant in the gear case will serve not only for the oscillating gearing, but also for the drive shaft and stud bearings.

When electric power is applied to the fan motor, through operation of the switch 63, the worm thread 67 in drive shaft 29 rotates the gear train comprising worm gear 68, pinion 70 and gear 72. As gear 72 rotates, crank arm 76 being pivotally attached thereto, pulls against rigid arm 77 but cannot move it since said rigid arm 77 is secured to swivel stud 9 which in turn is fixed to the support 4. Therefore, since the entire gear case and frame 17 is pivotally journaled on swivel stud 9, the torque of crank arm 76 as gear 72 rotates is imparted through bearing pin 74 to the gear case and frame 17 causing it to oscillate on swivel stud 9. The linkage of the above oscillating mechanism is designed to bisect the angle of oscillation so that there is an equal amount of oscillation on either side of the centerline of the fan.

As can be seen from the foregoing detailed description of the fan, I have completely enclosed the oscillating mechanism within the motor casing so that there are no projecting arms or levers. The combined gear case and frame is of simple construction yet serves a multiplicity of purposes. It supports the fan motor, the front and rear bearings, the fan guard supports, and the bearing pins for the gear train. It also acts as an enclosing case for the oscillating mechanism and as a bearing close to center of gravity of the assembled fan for the main oscillating swivel stud. The gear case constitutes a lubricant reservoir for all moving parts. Furthermore, by attaching all the operating parts of the fan to the gear case and frame alone, I permit the use of a single plastic or metallic shell as a motor casing which may be easily removed and yet leave the fan completely operable. This feature makes it relatively easy both to assemble and adjust the fan and to make any necessary repairs. Unless a contrary meaning is obvious from the context, the words "gear" or "gearing" are used in their broadest sense here, as designating a train or series of parts by which motion is transmitted in machinery. This includes parts such as worm gear, pinion, spur gear, crank arm, rigid arm, etc. in the description of the oscillating drive. Use of the term "gear case" does not imply that gears alone are used in the drive, or even that gear wheels must be contained in the case. Obviously, gear wheels, arms, cams or other elements might be used in the gearing. Obviously, also, part of the oscillating drive might be placed outside of the gear case if desired, but naturally this part of the drive would then require separate

5

lubrication and would retain only the advantage of being supported by the unitary fan frame and gear case.

While I have shown a particular embodiment of my invention, it will be understood that I do not wish to be limited to that particular embodiment since many modifications may be made, and I therefore, contemplate by the appended claims to cover such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electric fan comprising, a stationary support, a swivel stud secured to said support, a gear case pivotally mounted on said swivel stud, said case including a pair of spaced bearings, a driving rotor having a drive shaft journaled in said bearings, said rotor being located on one side of said bearings, a stator co-operating with said rotor supported by said gear case, a fan blade mounted on said shaft at a point thereon located on the other side of said bearings, a gear train located within said case and arranged to be driven by said shaft, said train including gears journaled on bearings in said case between said spaced bearings, a crank arm located within said case and having one end pivotally attached to said train, and a rigid arm pivotally attached to the other end of said crank arm, said rigid arm being fixed to said swivel stud within said gear case to form a stationary element about which said crank arm oscillates said gear case, said motor and said fan blade.

2. In an electric fan, a support, a vertical swivel stud secured to such support, a gear case and frame journaled around said swivel stud having a pair of spaced bearings, a drive shaft journaled in said bearings, a motor operating said drive shaft located on one side of said bearings, said gear case being located between said bearings, and an oscillating mechanism sealed within said gear case comprising a gear train driven by said drive shaft, a crank arm pivotally attached at one end to said gear train, and a rigid arm pivotally attached to the other end of said crank arm and securely mounted on the upper end of said swivel stud which projects into said gear case.

3. In an electric fan, a base, an angularly adjustable support attached thereto, a vertical swivel stud secured to said support, a thrust bearing surrounding the lower end of said swivel stud, a gear case and frame having a cylindrical aperture forming a bearing for said swivel stud, said gear case and frame being supported by said thrust bearing and including a portion forming a sealed gear case, a motor, an oscillating mechanism positioned within said gear case comprising a drive shaft rotated by said motor, said drive shaft having a worm groove formed thereon, a pair of hubs journaled in said gear case, one of said hubs having a worm gear attached thereto and having a pinion formed in its lower portion, the other of said hubs having a second gear connected thereto arranged to be driven by said pinion, a crank arm having one end pivotally attached to said second gear and a rigid arm pivotally attached to the other end of said crank arm, said rigid arm being securely mounted on said swivel stud and providing a stationary element cooperating with said crank arm to compel oscillating motion.

4. In an electric fan, a gear case having a bearing at its front end and a bearing at its rear end, a motor shaft journaled in said bear-

6

ings, the ends of the shaft projecting beyond the bearings, a ring at the rear end of the gear case, arms connecting the ring to the gear case, said ring having a flat rearwardly facing end surface, a motor stator attached against said surface to the ring, a motor rotor carried by the projecting shaft end at the rear end of the gear case, a fan blade structure carried by the projecting shaft end at the front end of the gear case, reduction gearing in the gear case driven by the shaft, a support for the gear case, and means connecting the reduction gearing to the support for oscillating the gear case on its support.

5. In an electric fan, a gear case having a bearing at its front end and a bearing at its rear end, a motor shaft journaled in said bearings, the ends of the shaft projecting beyond the bearings, a fan blade structure mounted on the projecting shaft end at the front end of the gear case, a motor rotor mounted on the projecting shaft end at the rear end of the gear case, a motor stator attached to the rear end of the gear case in operative relation to said rotor, reduction gearing in the gear case driven by said shaft, a support for the gear case, and means connecting the reduction gearing to the support for oscillating the gear case on its support.

6. In an electric fan, a gear case having a bearing at its front end and a bearing at its rear end, a motor shaft journaled in said bearings, the ends of the shaft projecting beyond the bearings, a fan blade structure mounted on the projecting shaft end at the front end of said gear case, a motor rotor mounted on the projecting shaft end at the rear end of said gear case, a motor stator attached to the rear end of the gear case in operative relation to said rotor, reduction gearing in the gear case driven by said shaft, a support for the gear case comprising a swivel stud, the free end of which terminates within the gear case, and means connecting the reduction gearing to the inner end of said stud for oscillating the gear case on the stud.

7. In an electric fan, a gear case having a bearing at its front end and a bearing at its rear end, a motor shaft journaled in said bearings, the ends of the shaft projecting beyond the bearings, a ring at the rear end of the gear case, arms connecting the ring to the gear case, a motor stator attached to the ring, a motor rotor carried by the projecting shaft end at the rear end of said gear case, a fan blade structure carried by the projecting shaft end at the front end of said gear case, reduction gearing in the gear case driven by the shaft, a support for the gear case, means connecting the reduction gearing to said support for oscillating the gear case on its support, and an outer casing for the motor and gear case attached to and carried by said ring.

8. In an electric fan, a gear case having a bearing at its front end and a bearing at its rear end, a motor shaft journaled in said bearings, the ends of the shaft projecting beyond the bearings, a fan blade structure mounted outside the gear case on the front end of said shaft, a motor rotor mounted outside the gear case on the rear end of said shaft, a motor stator attached to the rear end of the gear case in operative relation to said rotor, reduction gearing in the gear case driven by said shaft, a support for the gear case, and means connecting the reduction gearing to the support for oscillating the gear case on said support, said gear case having an open top through which the gearing in the

gear case is accessible, and a cover for sealing said opening.

9. In an electric fan, a gear case having an open top, a bearing at its front end and a bearing at its rear end, a motor shaft journaled in said bearings, the ends of the shaft projecting beyond the bearings, a fan blade structure mounted outside the gear case on the front end of said shaft, a motor rotor mounted outside the gear case on the rear end of said shaft, a motor stator attached to the rear end of the gear case in operative relation to said rotor, stub shafts fixed to and projecting upwardly from the bottom wall of the gear case, reduction gearing on the stub shafts driven by said shaft, a support for the gear case comprising a swivel stud, the free end of which terminates within the gear case, means connecting the reduction gearing to inner end of the swivel stud for oscillating the

gear case on said swivel stud, and a cover plate for the open top of the gear case.

GEORGE J. REISCH.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
999,890	Shedd	Aug. 8, 1911
1,088,687	Dodds	Mar. 3, 1914
1,189,273	McEwen	July 4, 1916
1,219,562	Kouyoumjian	Mar. 20, 1917
1,253,199	Zabriskie	Jan. 8, 1918
1,261,753	Anderson	Apr. 9, 1918
2,112,766	Feltner	Mar. 29, 1938
2,152,112	Tornberg	Mar. 28, 1939
2,357,053	Moeller	Aug. 29, 1944