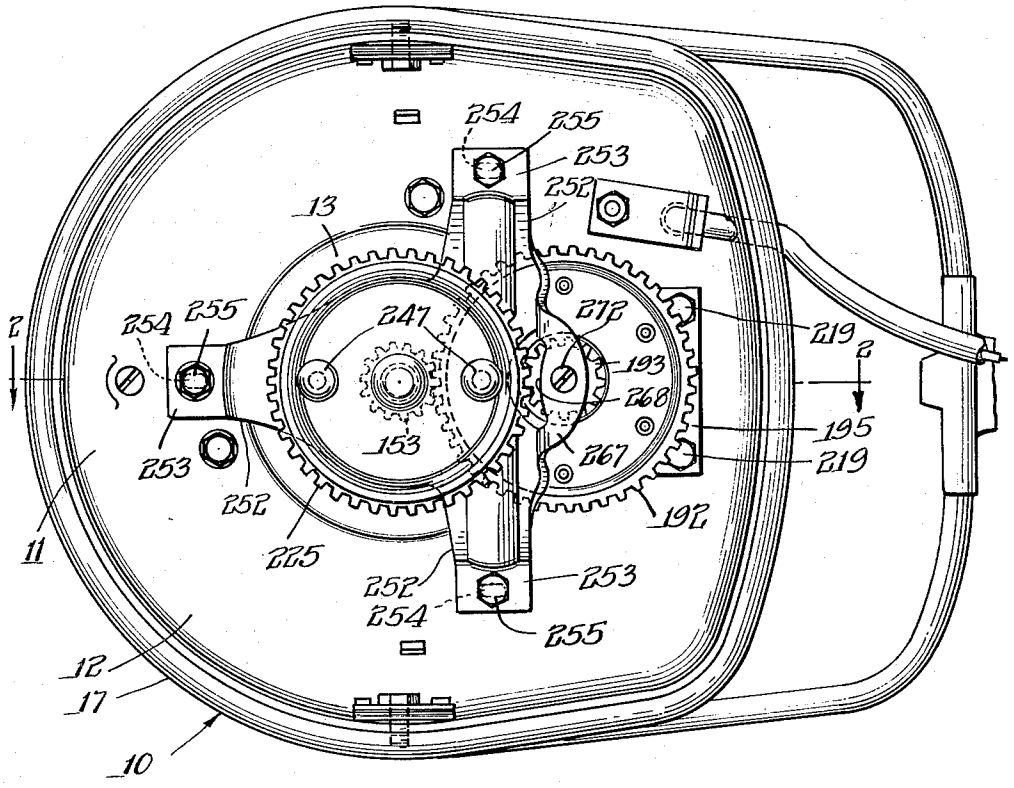
Aug. 21, 1956 W. H. KITTO 2,759,368

GEARING

Filed Nov. 27, 1950 3 Sheets-Sheet 1

Fig. 1.



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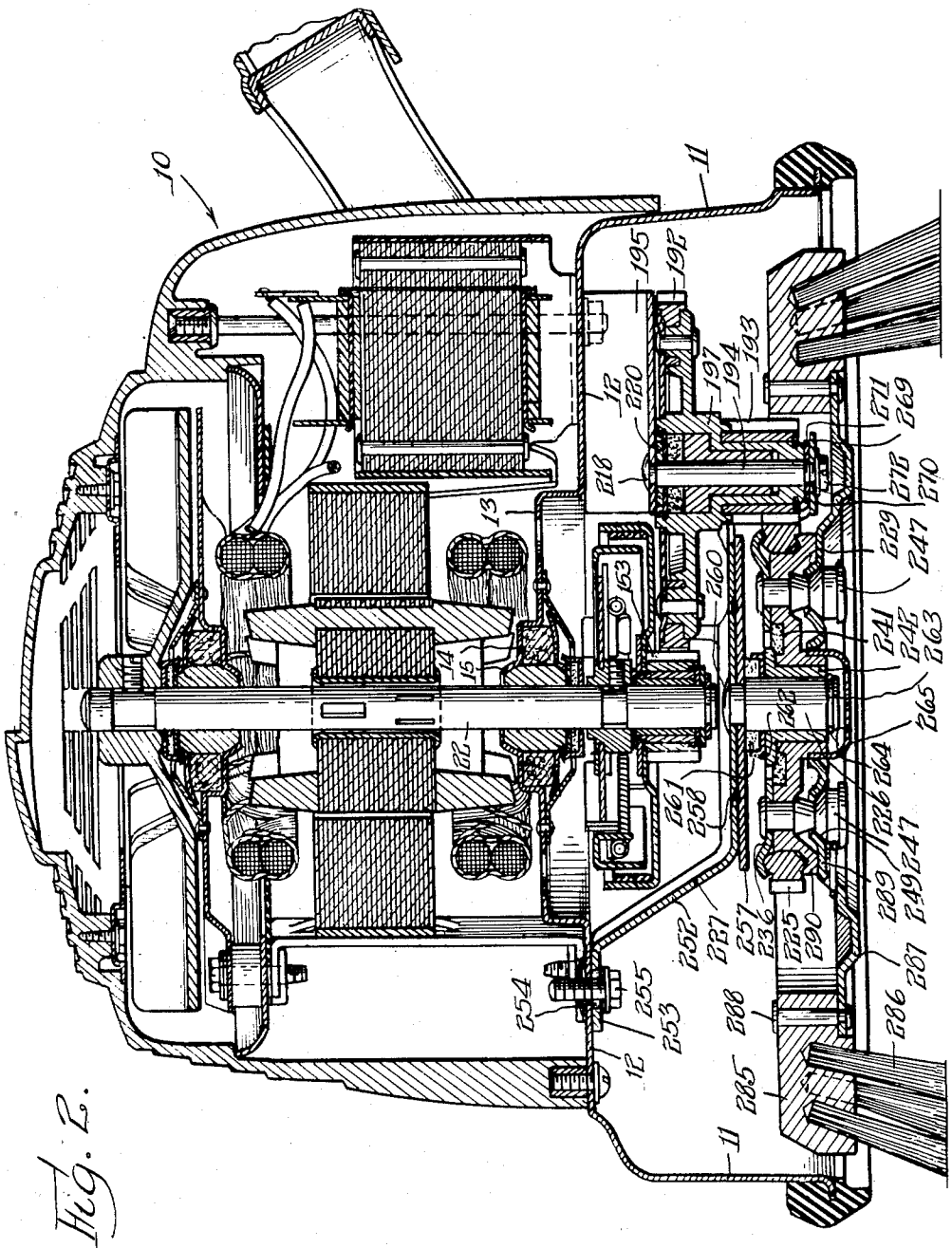


Fig. 2.

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Fig. 3.

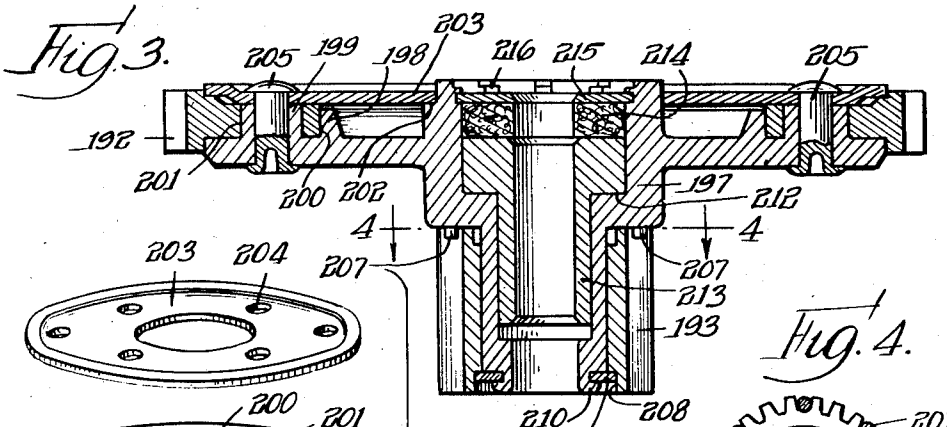


Fig. 4.

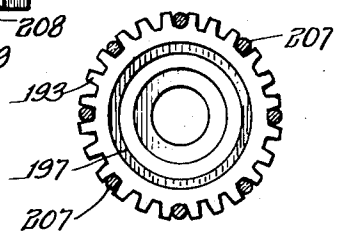
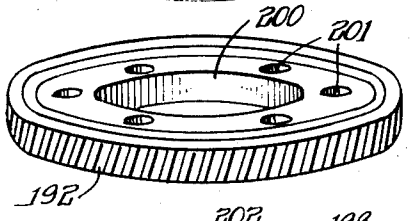


Fig. 5.



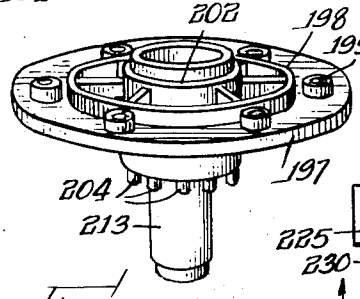


Fig. 6.

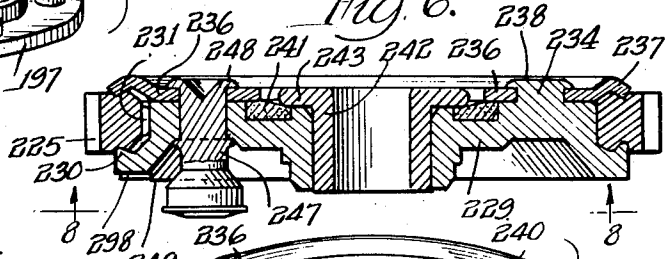
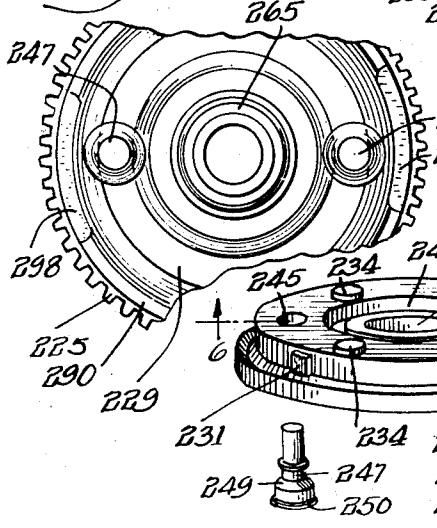


Fig. 8.



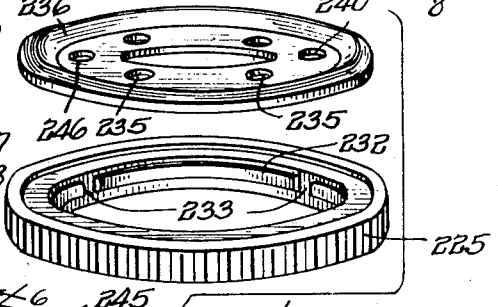


Fig. 7.

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United States Patent Office 2,759,368
Patented Aug. 21, 1956

2,759,368

GEARING

William H. Kitto, Evanston, Ill., assignor to G-M Laboratories, Inc., Chicago, Ill., a corporation of Illinois

Application November 27, 1950, Serial No. 197,721

6 Claims. (Cl. 74—446)

This invention relates to gearing which is particularly adaptable for use in an improved floor polishing and scrubbing machine having a single rotary flat brush which normally supports the weight of the machine.

The principal object of this invention is to provide an improved gearing construction for driving the rotary brush from the machine motor, wherein the gearing has long life under normal operating conditions, wherein gear noise is substantially eliminated, wherein porous bearings and plastic gears are utilized to eliminate the necessity for gear boxes, gaskets, seals and the like, and wherein the gearing may be accurately and inexpensively fabricated.

The improved floor polishing and scrubbing machine utilizing the gearing of this invention is fully illustrated and described in a co-pending application Serial #197,725, filed on November 27, 1950, by Archie J. McMaster, William H. Kitto, and Kurt Burian. The machine includes a base member which is preferably of an inverted cup shaped configuration. A substantially constant speed single phase induction motor is mounted on the upper side of the base member with the motor shaft extending downwardly through the base member. A phasing reactor is also mounted on the upper side of the base member. A cover is secured to the upper side of the base member and encloses the motor and phasing reactor. The lower end of the motor shaft operates a motor pinion meshing with a novel cluster gear carried by a bracket secured to the lower side of the base member. The cluster gear also meshes with a novel output gear carried by a bracket also secured to the lower side of the base member. Mounting means detachably secure a flat rotary brush to the output gear to be driven thereby. A centrifugal clutch is located between the motor shaft and the motor pinion.

All of the component parts of the machine are carried by the single base member so that they may all be accurately positioned with respect to each other with a minimum of effort, thereby greatly reducing manufacturing and assembly costs. Further, when the brush and cover are removed, the various parts are exposed for ready inspection, cleaning and repair, if necessary.

In assembling the gearing, the cluster gear is brought into proper meshing relation with the motor pinion and then its supporting bracket is securely fastened in place on the base member. Then the output gear is brought into proper meshing relation with the cluster gear and its supporting bracket is tightly secured to the base member. In this way correct meshing of the gearing is assured and the maintenance of close tolerances in the parts is not required. This further decreases the costs of manufacture of the machine.

The engaging teeth of the motor pinion and cluster gear are helically formed to provide a downward thrust on the motor shaft and an upward thrust on the cluster gear during operation for the purpose of eliminating intermittent thrust motion of the motor shaft and cluster gear and noise which would result therefrom. Suitable thrust bearings are provided for the motor pinion and

cluster gear. The engaging teeth of the cluster gear and output gear are regularly formed and since the output gear, which carries the brush, supports the weight of the machine, it is also provided with a thrust bearing.

The gears are all rotatably journaled by means of porous bearings supplied with suitable lubricant and the gears are formed of suitable plastic, such as nylon, for oilless and noiseless operation. As a result the necessity for gear boxes, seals, gaskets and the like is eliminated. The gears are unique in construction in that they include metal body portions, plastic tires having the gear teeth formed therein and novel means for securing the plastic tires to the body portions. The tires in blank form are secured to the body portions and then the gear teeth are hobbed in the plastic tires. This provides fast cutting of accurate gear teeth and eliminates the necessity of maintaining close tolerances in the parts.

The output gear is provided with an annular boss and with pins having conical heads for securing the brush to the output gear. The brush is drawn against the annular boss of the output gear and since the brush forms the sole support for the machine, the drawing of the brush against the annular boss of the output gear squares up the machine and prevents wobbling of the machine.

Further objects of this invention reside in the details of construction of the gearing, the cooperative relationship between the component parts thereof and the features of the gearing which particularly adopt the gearing for use in the improved floor polishing and scrubbing machine.

Other objects and advantages of this invention will become apparent to those skilled in the art upon reference to the accompanying specification, claims and drawings, in which:

Fig. 1 is a bottom plan view of a floor polishing or scrubbing machine with the brush removed and utilizing the novel gearing of this invention;

Fig. 2 is an enlarged vertical sectional view taken through line 2—2 in Fig. 1 and showing the brush assembled;

Fig. 3 is an enlarged sectional view of the cluster gear;

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 3;

Fig. 5 is an exploded perspective view of the cluster gear;

Fig. 6 is a vertical sectional view through the output gear;

Fig. 7 is an exploded perspective view of the parts forming the output gear; and

Fig. 8 is a partial bottom view of the output gear.

Referring first to Figs. 1 and 2, the floor polishing and scrubbing machine utilizing the gearing of this invention is generally designated at **10** and includes an inverted cup-shaped base member formed from sheet steel having a side wall **11** and a top wall **12**. The top wall **12** is recessed at **13** and is formed with a central bearing seat **14** having a spherical bearing supporting surface **15**.

Mounted on the upper side of the base member is an electric motor, which motor may be of the type described in the above mentioned co-pending application Serial #197,725. The lower end of the motor shaft **22** carries within the base member **11**, a centrifugal clutch and motor pinion assembly, which is fully shown and described in said co-pending application.

The motor pinion **153** meshes with a large diameter gear **192** of a cluster gear also having a gear of smaller diameter **193**. This cluster gear is rotatably carried on a shaft **194** which in turn is secured to a cluster gear bracket **195**, the bracket being adjustably secured to the lower side of the upper wall **12** of the base member.

The cluster gear is illustrated in more detail in Figs.

3 to 5 and includes a body portion **197** which may be formed of die cast zinc. The upper surface of the body portion **197** is provided with an annular boss **198** and also with a plurality of circumferentially spaced circular bosses **199**. The gear **192** is formed on a tire made of suitable plastic material such as nylon, the tire being provided with a central opening **200** and a plurality of holes **201**. The tire is placed on the upper surface of the body portion **197** with the central opening **200** engaging the annular boss **198** and with the holes **201** receiving the bosses **199**. In this way a driving relationship is established between the tire and the body portion. A plate **203** having a central opening and holes **304** is provided for clamping the tire in place on the body portion. In this respect rivets **205** extend through the holes **204** and through holes in the bosses **199**. The inner part of the plate **203** rests on an annular shoulder **202** formed on the upper side of the body portion **197**.

The body portion **197** has an extension or shank of reduced diameter upon which is mounted the gear **193**, the gear being made of suitable plastic such as nylon. The body portion **197** is provided with a plurality of projections **207** extending between the gear teeth on the gear **193**. These projections **207** provide a driving connection between the body portion **197** and the gear **193**. The gear **193** is provided with an internal recess **208** for receiving a washer **209** which in turn is held in place by peening over at **210** the lower extremity of the body portion **197**. In this way the gear **193** is locked in place on the body portion **197**.

A sintered porous bronze bearing **213** is secured within the body portion **197** and it seats against an internal shoulder **212**. An absorbent washer **214** rests against the upper surface of the porous bearing **213** and the absorbent washer is held in place by a metal washer **215**, the metal washer in turn being staked in place as illustrated at **216**. The absorbent washer is impregnated with a suitable lubricant for supplying lubricant to the porous bearing **213** for lubricating the running fit between the porous bearing and the cluster gear shaft **194**. The washer **215** in addition to encasing the absorbent washer **214** also acts as a thrust washer for the cluster gear.

In forming the cluster gear the smaller diameter plastic gear **193** has its teeth molded or otherwise formed thereon before the gear is applied to the body portion. However, in the case of the larger diameter gear **192**, the plastic tire in blank form is first secured to the body portion and then the gear teeth are suitably hobbed or cut after assembly about a center corresponding to the axis of the porous bearing. This assures an accurate relation between the central axis of the cluster gear and the teeth of the larger gear **192**. The gear teeth may thus be accurately and rapidly formed with small expense in this manner.

The cluster gear is rotatably mounted on the shaft **194** which in turn is provided at its upper end with a shoulder engaging the bracket **195**, the shaft being held in place on the bracket **195** by peening over the upper end thereof as at **218**. A resilient thrust washer **220** preferably made of impregnated cork is located between the bracket **195** and the washer **215**. There is thus provided a resilient thrust bearing for the cluster gear. The bracket **195** is adjustably secured to the base member by screws **219**.

Preferably the gear teeth of the motor pinion **153** and the gear teeth of the gear **192** of the cluster gear are helically formed for the purpose of maintaining substantially constant thrust on the motor shaft and on the cluster gear. The direction of the helices is such that upon operation of the machine a downward thrust is provided on the motor shaft and an upward thrust on the cluster gear. This upward thrust is absorbed by the resilient upper thrust bearing of the cluster gear.

The smaller gear **193** of the cluster gear meshes with an output gear **225** which is rotatably mounted on a shaft **226**, the shaft being carried by a bracket **227** adjustably secured to the lower side of the upper wall **12** of the base member.

The output gear **225** is illustrated in more detail in Figs. 6 to 8. The output gear includes a tire formed of suitable plastic material such as nylon in which the gear teeth are formed. It also includes a body portion **229** for carrying the tire. The body portion **229** may be formed of die cast zinc and is provided with an external shoulder **230** received in a groove formed in the lower side of the tire. The tire is provided with an internal surface 232 engaging the exterior of the body portion **229** and the body portion is provided with a plurality of lugs **231** received in notches **233** in the tire. In this way a driving connection is provided between the tire and the body portion. The top of the body portion **229** is provided with a plurality of circular bosses **234** which are received in holes **235** in a clamping disc **236**. The outer edge of the clamping disc **236** is provided with a downwardly extending flange **237** received in a suitable groove in the tire. The disc **236** is fastened to the body portion **229** by peening over the bosses **234** as indicated at **238** and also securely clamps the tire in place on the body portion. The upper surface of the body portion is provided with an annular groove **240** in which is received an absorbent washer **241** impregnated with suitable lubricant. The disc **236** partially overlies the absorbent washer for retaining the same in the annular groove. A sintered porous bronze bearing **242** is carried by the body portion **229** and it is provided with an annular flange **243** which also partially overlies the absorbent washer **241**. The absorbent washer **241** supplies lubricant to the porous bearing **242** for lubricating the running fit between the bearing and the shaft **226**. The flange **243** on the upper end of the bearing **242** also serves as a thrust surface for the output gear and the thrust surface must be normal to the axis of rotation of the output gear. To obtain the desired accuracy a shouldered punch is pressed into the bore of the bearing **213** with an interference fit until the shoulder strikes the flange for sizing the bore and squaring the flange. Then the bearing and punch are pressed into place with an interference fit for accurately locating the bearing in the body portion. Then the punch is removed from the bearing.

The body portion **229** is provided with a pair of holes **245** and likewise the disc **236** is provided with a pair of holes **246**, these holes receiving a pair of downwardly projecting pins **247** which are riveted in place as indicated at **248**. These downwardly extending pins **247** are provided with enlarged heads having a conical surface **249** and a bead **250**. These pins provide means for removably securing a brush to the output gear and also provide additional means for fastening the disc **236** to the body portion **229** for clamping the tire in place.

The bracket **227** is illustrated in Figs. 1 and 2. It includes a plurality of legs **252** terminating in attaching ears **253** having slots **254**. The bracket is secured to the base member by screws **255** and nuts **256**, the screws **255** passing through the slots **254** and suitable holes in the base member. The lower surface of the bracket **227** has a plate **257** secured or welded thereto as indicated at **258**. The shaft **226** is provided with a shoulder resting against the plate **257** and is held in place on the bracket by peening over the upper end of the shaft as indicated at **260**. A thrust washer assembly is interposed between the disc **257** and the output gear bearing flange **243**. This thrust bearing assembly includes a metal cup-shaped member **262** having a running engagement with the porous bearing flange **243** and a resilient washer **261** carried within the cup-shaped member **262**. The resilient washer forms a resilient thrust bearing for the output gear. The lower end of the shaft **226** is provided with an annular groove **263** for receiving a split washer **264** for holding the output gear in place on the shaft **226**. The lower side of the output gear is provided with a cover **265** for enclosing the output gear

bearing **242** and the shaft **226** to prevent dirt and foreign material from going into the bearing.

The plate **257** overlies the disc **236** and is spaced a slight distance therefrom. The plate **257** acts as a stop for the output gear to prevent undue tilting of the output gear with respect to the machine. The spacing between the plate **257** and the output gear disc **236** is such that the parts are not strained or stressed beyond their elastic limits when and if tilting should occur.

The output gear bracket **227** is provided with an extension **267** terminating in an ear **269** provided with a hole **270**. An opening **268** is also provided in the extension **267**. The extension **267** and ear **269** form an outboard support for the cluster gear shaft **194**. In this respect a thrust washer **271** of fiber or other suitable material is interposed between the cluster gear and the ear **269**. I screw **272** is received in the lower end of the cluster gear shaft **194** for anchoring the same to ear **269** of the bracket **227**. The opening **268** in the extension **267** is for accommodating the gears **193** and **225** so that these gears may mesh through that opening.

The gear teeth of the gears **193** and **225** are conventional in form and preferably the gear teeth of the gear **225** are also cut or hubbed in the plastic tire after the tire has been secured in place on the body portion **229**. This provides for accurate and inexpensive formation of the gear.

In assembling the gearing enclosed within the inverted cup-shaped base member **11**, the gear **192** is first brought into proper meshing relation with the motor pinion **153** and then the supporting bracket **195** is securely fastened in place on the base member. Then the output gear **225** is brought into proper meshing relation with the cluster gear **193** and the supporting bracket **227** is then tightly secured to the base member. In this way correct meshing of the gearing is assured and the maintenance of close tolerance in the parts is not required.

The output gear detachably carries a rotatable brush. This brush includes a brush backing **285** carrying a plurality of rows of brush bristles **286**. The brush backing **285** of annular form is secured to a sheet metal disc **287** by means of rivets **288**. The disc **287** has an annular surface **289** for engaging an annular shoulder **290** on the output gear. The disc is connected with the output gear by means of pins **247** in the manner fully described in the above mentioned co-pending application Serial #197,725.

From the above description, it is seen that the present invention has provided a novel gearing fully capable of accomplishing the objects heretofore set forth. More specifically, it is seen the the present invention has provided a novel gearing which is of relatively simple construction and may be inexpensively manufactured and assembled. Furthermore, it is seen that the gearing of the present invention eliminates the necessity for gear boxes, gaskets, seals and the like. In addition, by reason of the novel construction of the gearing of this invention, increased operating life is obtained, and gear noises are substantially eliminated.

While for the purposes of illustration one form of this invention has been disclosed, other forms thereof may become apparent to those skilled in the art upon reference to this disclosure and, therefore, this invention is to be limited only by the scope of the appended claims.

I claim as my invention:

1. A cluster gear comprising a metal body portion having a shank, a central bore and an annular seating surface, a bearing in the central bore for rotatably mounting the cluster gear, an absorbent washer for containing lubricant and contacting the bearing for supplying lubricant to the bearing, a gear carried by the shank of the body portion, interlocking means on the gear and the body portion for establishing a driving connection between the gear and the body portion, means for securing the gear in place on the shank of the body portion, a tire having gear teeth seating on the annular seating surface of the body portion, interlocking means on the tire and the body portion for establishing a driving connection between the tire and the body portion, and means for securing the tire in place on the body portion.

2. A gear comprising, a gear body having a central bore provided with an internal shoulder, a bearing member having an external shoulder located in the central bore with the shoulders in engagement, an absorbent washer for containing lubricant located in the central bore and engaging the end of the bearing member for supplying lubricant to the bearing member, and a metal washer secured to the gear body for retaining the absorbent washer in place and for taking end thrust of the gear body.

3. A gear comprising, a gear body having a central bore, an annular groove about the central bore and an annular seating surface, a porous bearing member located in the central bore and having a flange partially overlying the annular groove and forming an end thrust member for the gear body, an absorbent washer for containing lubricant located in the annular groove and engaging the flange for supplying lubricant to the porous bearing member and its flange, a tire have gear teeth and seating on the annular seating surface of the gear body, and an annular disc carried by the gear body for securing the tire in place on the gear body and also partially overlying the annular groove for maintaining the absorbent washer in place therein.

4. A gear comprising, a body portion having a central bore and an annular seating surface, a bearing member in the central bore for rotatably mounting the gear, an absorbent washer for containing lubricant and contacting the bearing for supplying lubricant to the bearing, a tire seating on the annular seating surface and having gear teeth, interlocking means on the tire and body portion for establishing a driving connection between the tire and the body portion, and means for clamping the tire in place on the body portion.

5. A gear comprising, a gear body having a central bore, an annular groove about the central bore and an annular seating surface, a porous bearing member having a bored sleeve portion and a flange at one end, said bearing member being accurately disposed within the central bore of the gear body, with the sleeve portion having an interference fit with the central bore of the gear body and with the flange squared with respect to the bore of the fitted sleeve portion and engaging the gear body and partially overlying the annular groove, said bored sleeve portion of the bearing member forming a rotating bearing for the gear body and said flange forming a thrust bearing for the gear body, an absorbent washer containing lubricant located in the annular groove and engaging the flange for supplying lubricant to the porous bearing member and its flange, a tire having gear teeth and seating on the annular seating surface of the gear body, and an annular disc carried by the gear body for securing the tire in place on the gear body and also partially overlying the annular groove for maintaining the absorbent washer in place therein.

6. A cluster gear, comprising a body portion having a shank, a central bore in said shank, and an annular seating surface, a gear carried by the shank of said body portion, means extending from said body portion between the teeth of said gear for establishing a driving connection between the gear and the body portion, and a tire having gear teeth seating on the annular seating surface of the body portion.

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