United States Patent [19]

Driebel et al.

[11] **3,837,490**

[45] **Sept. 24, 1974**

[54] **ROTATABLE DRUM TYPE SCRUBBER FOR STONES, ROCKS, GRAVEL, AND THE LIKE**

[75] Inventors: **Carl D. Driebel,** Milwaukee; **Ronald B. Dediemar,** Brown Deer; **Leroy J. Schuman,** Milwaukee, all of Wis.

[73] Assignee: **Barber-Greene Company,** Aurora, Ill.

[22] Filed: **Dec. 3, 1973**

[21] Appl. No.: **421,407**

[52] **U.S. Cl.**..... **209/288,** 209/452, 209/363, 134/159, 241/178, 301/36 R

[51] **Int. Cl.**..... **B07b 1/24,** B03b 3/10

[58] **Field of Search** ..... 209/284, 288, 290, 294, 209/291, 297, 298, 299, 451, 452, 473, 94, 95, 363, 364; 241/178; 259/81, 89; 248/130; 134/159; 301/36 R; 74/2; 210/236

[56] **References Cited**

UNITED STATES PATENTS

2,080,875	7/1937	Moussette	241/178
2,296,851	9/1942	Henry	209/297 X
2,751,959	6/1956	Blomquist	301/5 X
2,964,185	12/1960	Katoh	209/288
3,014,315	12/1961	Cloyton	209/452 X
3,174,624	3/1965	Putnam	209/288 X
3,213,703	10/1965	Fitzgerald	74/230.3 X
3,708,001	1/1973	Koskinen	241/178 X

FOREIGN PATENTS OR APPLICATIONS

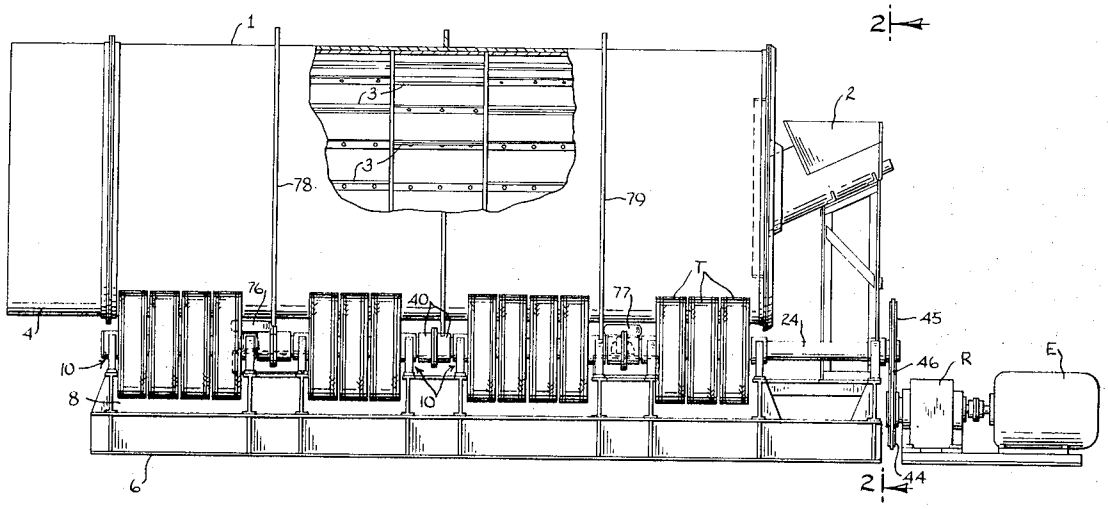
1,049,321	1/1959	Germany	209/452
1,222,234	1/1960	France	241/178

Primary Examiner—Robert Halper
Attorney, Agent, or Firm—James E. Nilles

[57] **ABSTRACT**

A rotary washer for crushed stone and the like and for scrubbing the stones to eliminate clay, dirt and soft stones and of the type having a hollow rotary drum which is rotated about a generally horizontal axis. The drum is rotatably supported by rubber tire wheel assemblies and in such a manner that the tires can be individually removed for repair, replacement or the like and without dismantling all of the other wheel assemblies or other parts of the rotary mounting means. The scrubber also includes double tapered roller antifriction bearing assemblies of the pre-seal type and which are used to rotatably support the shafts on which the rubber tire wheel assemblies are mounted.

4 Claims, 10 Drawing Figures



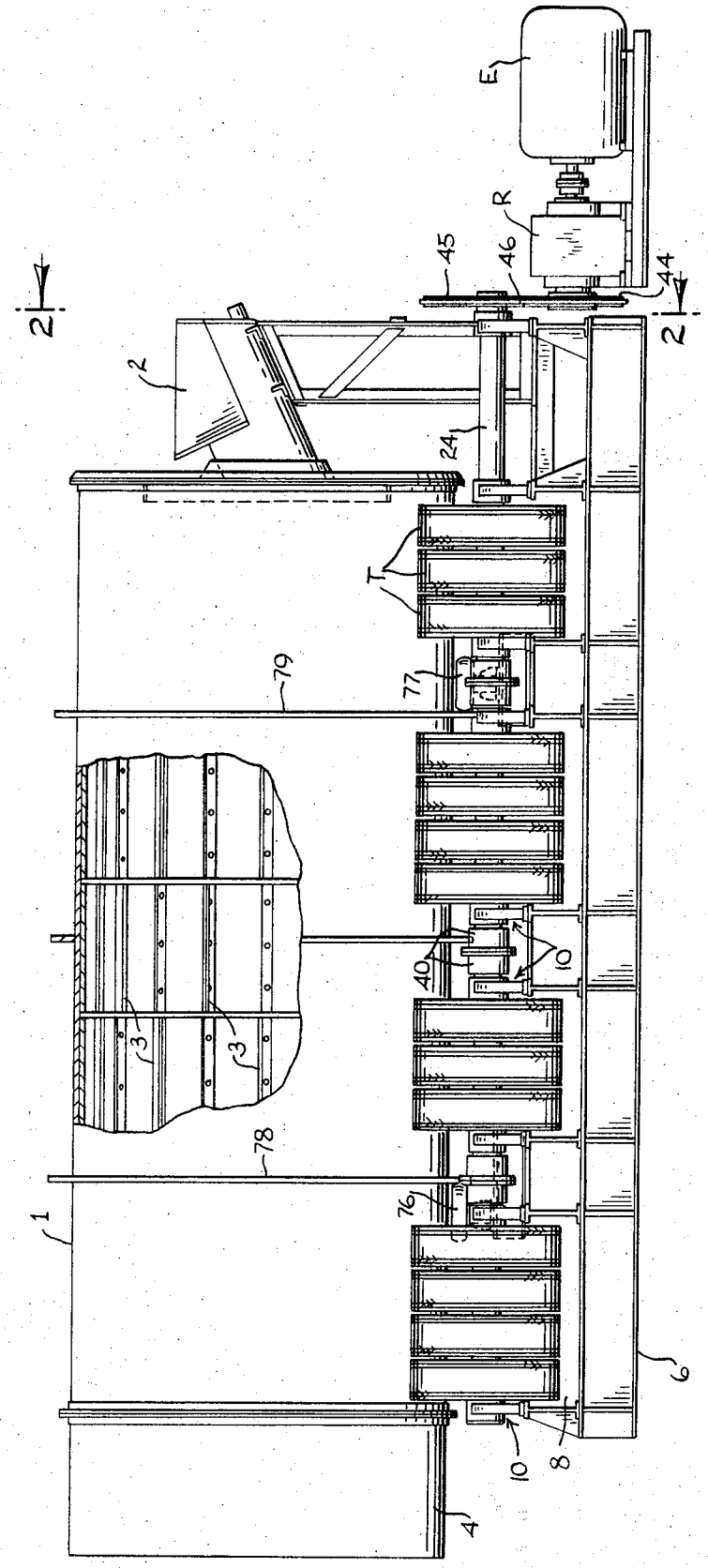


FIG. 1.

FIG. 2.

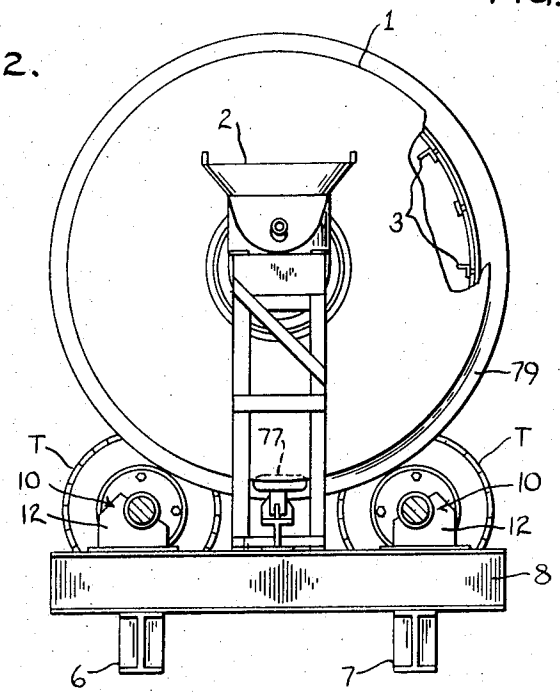


FIG. 3.

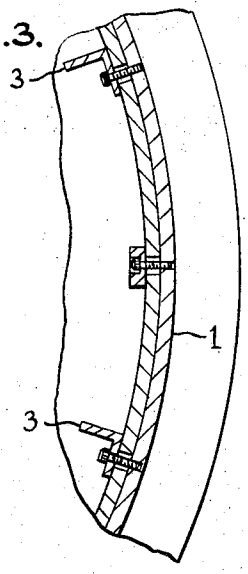
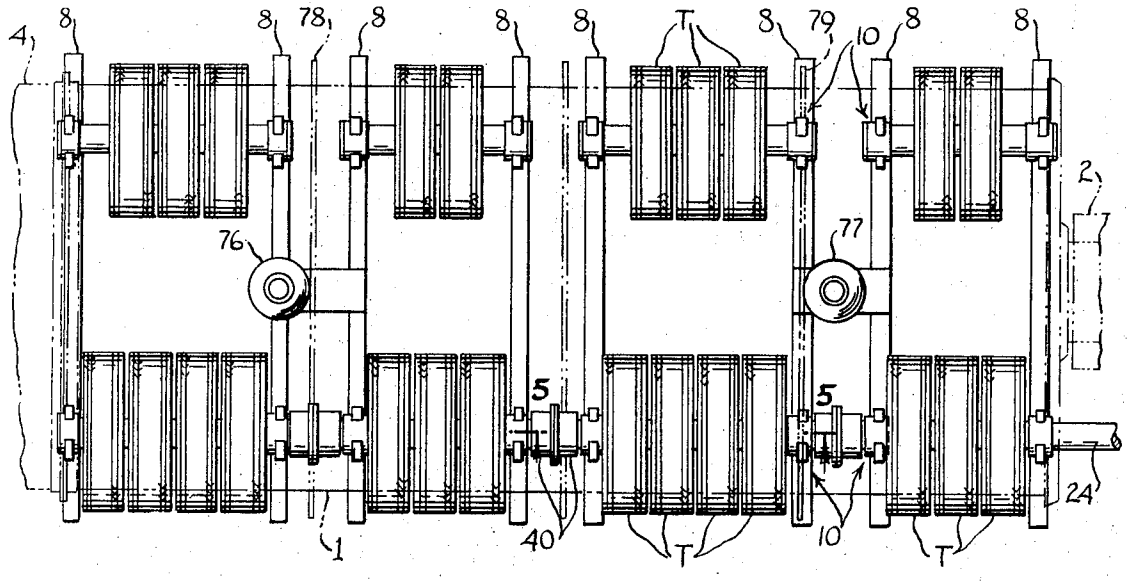


FIG. 4.



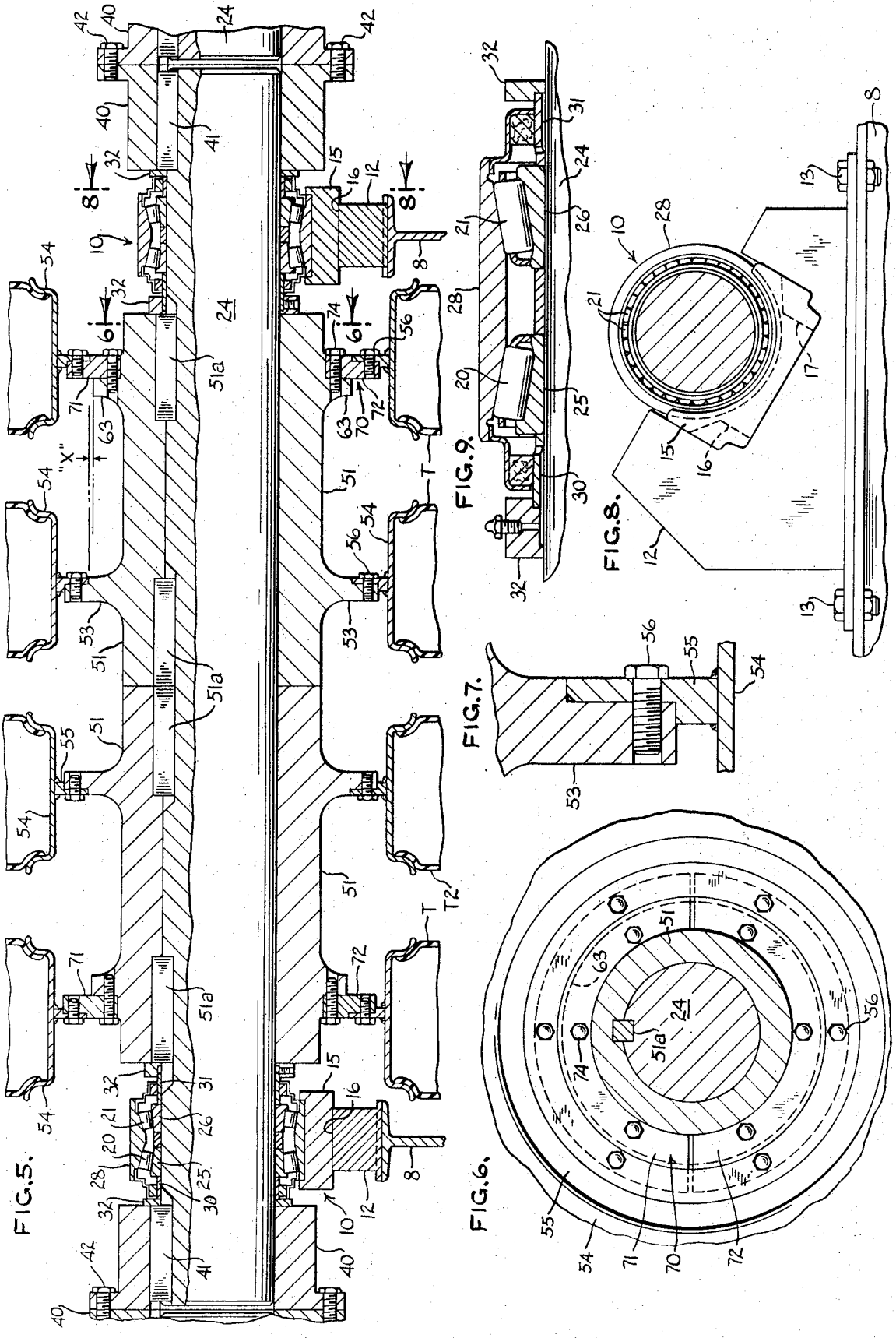


FIG.5.
FIG.6.
FIG.7.
FIG.8.
FIG.9.

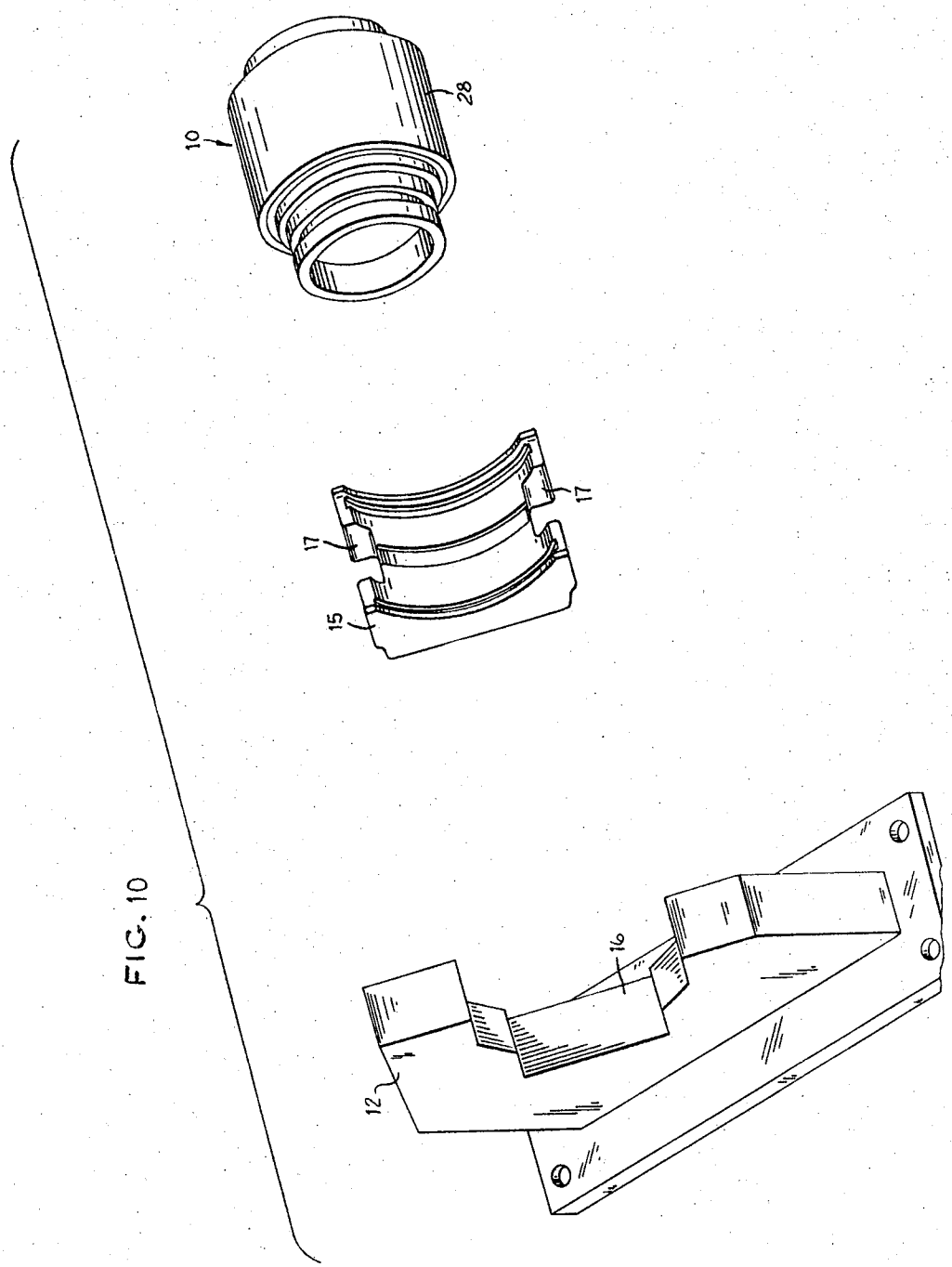


FIG. 10

ROTATABLE DRUM TYPE SCRUBBER FOR STONES, ROCKS, GRAVEL, AND THE LIKE

BACKGROUND OF THE INVENTION

Scrubber washers of the type to which the present invention pertain have heretofore usually employed a large gear around the periphery of the rotatable drum and which gear is driven by a drive shaft with a pinion which meshes with the gear. The drum has been usually supported on steel rollers which bear against large mating rollers located around the drum. These prior art devices were very costly to manufacture, subject to severe wear and were generally noisey in operation. Other prior art scrubbers of this type have attempted to employ rubber tire drive mounting means, but the means for rotatably supporting these rubber tire assemblies have not proved to be entirely satisfactory due to the tremendous wear and abuse to which they are subjected in operation; furthermore, it has been difficult to remove the individual rubber tire wheel assemblies for replacement or repair, resulting in much down-time in the scrubber washers.

SUMMARY OF THE INVENTION

The present invention provides a scrubber washer of the type having a hollow drum rotatable about a generally horizontal axis and which has a series of rubber tire wheel assemblies located along each of the lower sides of the drum and for rotatably supporting the latter. The rubber tire wheel assemblies located along one side of the drum are positively driven to impart the rotary drive to the drum itself. The invention contemplates the use of elongated hubs mounted on shafts and which hubs have radial flanges of different radial dimensions, those flanges which are of smaller radial dimension also utilize segmental hub rings to which the rubber tire wheel assemblies are mounted. In this manner, the wheel assemblies can be individually removed by only removing one other wheel assembly at most. The invention also contemplates the use of anti-friction bearing assemblies of the self-contained, pre-assembled and pre-lubricated type which can be applied to and removed from the axle without exposing the bearing elements or other parts. These anti-friction bearing assemblies can be easily removed from the main frame in which they are mounted.

These and other objects and advantages of the present invention will appear hereinafter as this disclosure progresses, reference being had to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevational view of a rotary drum type scrubber made in accordance with the present invention, certain parts of the drum being broken away to show the interior thereof;

FIG. **2** is an end elevational view of the scrubber shown in FIG. **1** and taken generally along the line **2—2** in FIG. **1**, a certain portion of the drum being broken away to show the interior of the drum;

FIG. **3** is an enlarged, fragmentary view of a portion of the drum shown in FIG. **2**;

FIG. **4** is a plan view of the scrubber shown in FIG. **1**, the drum itself being shown in phantom lines for the sake of clarity;

FIG. **5** is a view taken generally along the line **5—5** in FIG. **4**, but on an enlarged scale, certain portions of this sectional view being shown as removed or broken away for the sake of clarity in the drawing;

FIG. **6** is a transverse, sectional view taken along the line **6—6** in FIG. **5**, and showing the segmental hub ring for mounting one of the rubber tire wheel assemblies;

FIG. **7** is an enlarged, fragmentary view of the flange connection between the tire rim and segmental flange shown in FIG. **5**;

FIG. **8** is a transverse sectional view taken along the line **7—7** in FIG. **5** and showing the means for mounting the anti-friction bearing assemblies for rotatably mounting the shaft on the main frame of the scrubber;

FIG. **9** is an enlarged, fragmentary view of the bearing assembly used with the present invention of the self-contained, pre-assembled and pre-lubricated bearing assembly; and

FIG. **10** is a perspective exploded view of the bearing mounting plate, the bearing adaptor, and the bearing assembly.

DESCRIPTION OF A PREFERRED EMBODIMENT

The scrubber provided by the present invention is of the type which is used to process rock, gravel or stone, that is to say, such material is "washed" as it moves from one end of the horizontally disposed drum **1** to the other. More specifically, an inlet hopper **2** is located at one end of the drum and through which the material to be processed passes into the interior of the drum. As the drum rotates, the lifters **3** which are circumferentially spaced around the interior of the drum act to create a vigorous churning action to the material as the material passes from one end of the drum to the other in the known manner. Thus, the material is subjected to high speed cascading and ball mill action as it travels through the drum. Ultimately, the material passes out the discharge end **4** of the drum and through the outer dewatering trommel of the perforated screen type (not shown) located at the discharge end of the drum. Generally, the operation on the material passing through the drum is conventional and it is believed sufficient to say that the drum is subjected to extremely heavy loads, and the loads imposed on the rotary means for mounting on the drum are severe, periodically requiring replacement or repair.

The main frame for the scrubber includes two longitudinally disposed and spaced apart steel members **6** and **7** (FIGS. **1** and **2**) to which are welded the transversely disposed steel beams **8.**

Anti-friction bearing assemblies **10** (FIG. **8**) are mounted on the transverse beams **8** by heavy mounting plates **12** secured thereto by the bolt means **13.** The plates **12** have a generally upwardly facing recess **16** which receives the generally semi-circular bearing adaptors **15** which are slipped into the complementary recess **16** in the bearing mounting plates **12.** Thus, the bearing assemblies **10** simply set in the adaptors **15** and are held therein by the slots **17** of the adaptor which embrace the plate **12** and also by the adaptor being inclined at about 30° from the horizontal. Assemblies **10** are mounted by the bolt means **13** (FIG. **8**) to the steel beams **8** and as the mounting for the bearing units **10** are similar, only one has been shown in detail in FIG. **8.**

The bearing assemblies themselves include a series of opposed tapered roller bearings **20, 21** which are mounted on a rotatable shaft **24** by means of their inner races **25, 26,** respectively. An outer, common race **28** embraces the outer periphery of the circumferentially spaced roller bearings **20** and **21.** Spacers **30, 31** and end rings **32** hold the bearing in clamped, assembled relationship.

The shaft **24** is made in segments and as shown in FIG. **5,** the segments **24** each have a coupling member **40** secured to their ends by the keys **41** and the couplings **40** are held together by the bolt means **42.** In this manner, if need be, one segment **24** of the shaft can be removed without disturbing the others.

As shown in FIGS. **1** and **4,** one of the shafts located at one side of the drum is driven by an electric motor E through the gear reducer R, sprockets **44, 45** and chain **46** which drive the shaft at one side of the drum. It will also be noted from FIG. **4** that this drive shaft **24** at the "up running" side of the drum has more rubber tires T mounted thereon than the total of the other individual shafts **48** which are located at the opposite side of the drum.

The means for mounting the rubber tires T to their shaft will now be described. In using rubber tires to rotatably support the drum, the inflatable tire must occasionally be replaced or repaired, and heretofore it has been a difficult problem to do so without removing numerous other tires.

As shown clearly in FIGS. **5** and **7,** a pair of double tire hubs **51** are fixed to the shaft **24** by their respective keys **51a.** As these hubs are generally similar in construction, only one will be described. The hub **51** for example, has a first radially extending, shouldered flange **53** which is formed integrally with the main hub portion and the tire rim **54** has a flange **55** which is detachably secured by bolt means **56** to the shouldered flange **53.** The hub **51** also has a second integrally formed shouldered flange **63** which is of a smaller circumference, that is to say, which is of a radially smaller dimension than the flange **53.** A segmental hub ring **70** is formed as two pieces **71** and **72** (FIG. **6**) and is detachably secured by bolt means **74** to the radially shorter second flange **63.** The outer diameter of the hub ring **70** is the same as the outer diameter of the first flange **53** so that the rubber tire wheel assemblies including the tire T and its radial flange **55** can be interchanged in any of the positions along the length of the shaft. That is to say, as shown in FIG. **5,** the flange **55** may be secured by the bolt means **56** to the hub ring **70.**

With the above construction, if it is necessary to repair or replace the tire T2 (FIG. **5**), the adjacent tire T would first be removed from the flange **70.** Then the segmental hub ring **70** can be removed in halves from the radially shorter flange **63** by removal of the bolt **74.** The tire T2 can then be removed by removing the bolts **56** from the radially larger flange **53** and the tire T2 can then be removed axially over the shorter flange **63,** due to the fact that the radial dimension of the flange **63** is less than the internal radial dimension of the flange **55** of tire assembly T2. This difference in radial dimension is indicated by the letter *x* in FIG. **5.**

The above arrangement as shown in FIG. **5** is utilized when four tire assemblies are used adjacent to one another as shown in the lower portion of FIG. **4.** When a double tire arrangement is used as shown in the upper portion of FIG. **4,** the different flanges on the tire hub are not required. As also shown in FIG. **4,** when three tire assemblies are used adjacent one another, it is only necessary to utilize the segmental hub ring construction on either one of the outermost of the tire assemblies.

To prevent axial shifting of the drum, a pair of tire guide wheels **76** and **77** (FIGS. **1, 2** and **4**) are provided which bear against the radially extending flanges **78** and **79** fixed around the periphery of the drum.

With the above construction, the shaft itself can be readily replaced or removed from the main frame of the machine by the mounting of the anti-friction bearing assemblies as shown in FIG. **7.** Furthermore, the bearing assemblies **10** act to absorb axial thrust in either direction and are completely sealed and lubricated and need infrequent attention and are capable of accommodating the extremely heavy loads to which they are subjected.

In addition, the present invention provides a relatively easy means for replacing any one of the rubber tire assemblies.

We claim:

1. A scrubber for washing gravel, rock or the like and comprising, a rotary, general horizontal drum through which the material is passed from one end to the other while being processed, a rubber tire drive assembly for rotatably mounting said drum and comprising a shaft rotatably mounted along said drum and in parallelism therewith, an elongated tire hub fixed to said shaft for rotation therewith, said hub having a radially extending first flange formed integrally therewith, a first rubber tire wheel assembly detachably mounted on said first flange, said hub also having an integral second flange and axially spaced from said first flange, said second flange being of shorter radial dimension than said first flange, and a segmental hub ring detachably secured to said second flange, and a second rubber tire wheel assembly detachably secured to said hub ring, the outermost radial dimension of said second flange being less than the internal radial dimension of said first rubber tire wheel assembly whereby when said segmental hub ring is removed from said second flange, said first tire wheel assembly can be moved axially over said second flange for removal from said shaft.

2. The scrubber set forth in claim **1** including a rigid base frame, and a self-contained, pre-assembled, preset and pre-lubricated sealed anti-friction bearing assembly of the double roller type for rotatably mounting said shaft, and mounting plates for removably mounting said bearing assembly on said base frame.

3. The scrubber set forth in claim **2** further characterized in that said mounting plates include a plate having a generally upwardly facing recess, and a generally semi-circular bearing adaptor mounted in said recess for receiving said anti-friction bearing assembly.

4. The scrubber set forth in claim **2** further characterized in that said bearing assembly includes a pair of opposed tapered roller assemblies each having an inner cage mounted around said shaft and a common outer race embracing said pair of opposed roller assemblies, a wear ring located at each of opposite ends of said outer race for abutting thereagainst, and an end cap located at the outer end of said rings for holding said bearing assembly in assembled relationship.

* * * * *