# United States Patent [19]

**Archer et al.**

[11] **3,774,858**

[45] **Nov. 27, 1973**


[54] **GYRATORY CRUSHER MAIN FRAME**


[75] Inventors: **Fred Curtis Archer,** Whitefish Bay; **Ronald B. Dediemar,** Brown Deer; **Edward H. Breiling,** West Allis, all of Wis.

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



[22] Filed: **Dec. 27, 1971**

[21] Appl. No.: **212,230**

[52] **U.S. Cl.** ..... **241/285 R**

[51] **Int. Cl.** ..... **B02c 2/00**

[58] **Field of Search** ..... 241/207, 208, 209, 241/214, 215, 216, 285 R



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*Primary Examiner*—Granville Y. Custer, Jr.

*Attorney*—James E. Nilles



[57] **ABSTRACT**

A gyratory crusher for crushing rock for example, and which has a generally conical crushing head rotatably mounted on an upright eccentric so that the head is gyrated upon rotation of the eccentric. The main frame of the crusher is fabricated from an inner portion comprising a central casting, and an outer portion fabricated from a steel wall and an upper, cast ring, the two portions being welded together.


**8 Claims, 9 Drawing Figures**

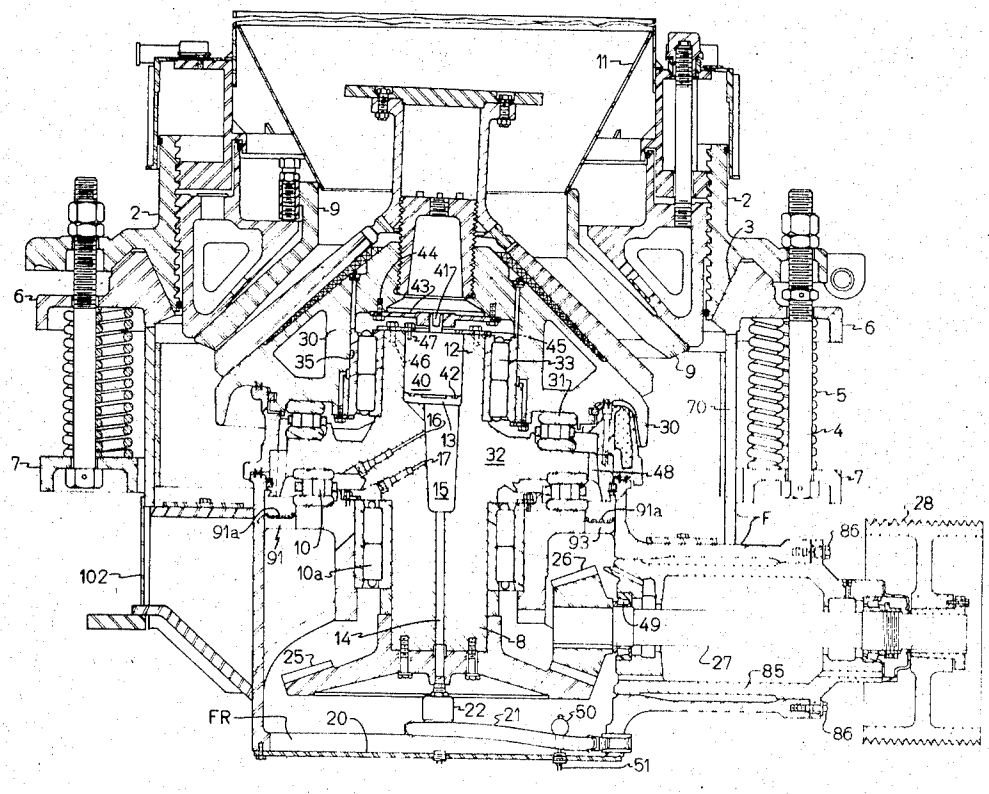

FIG.1

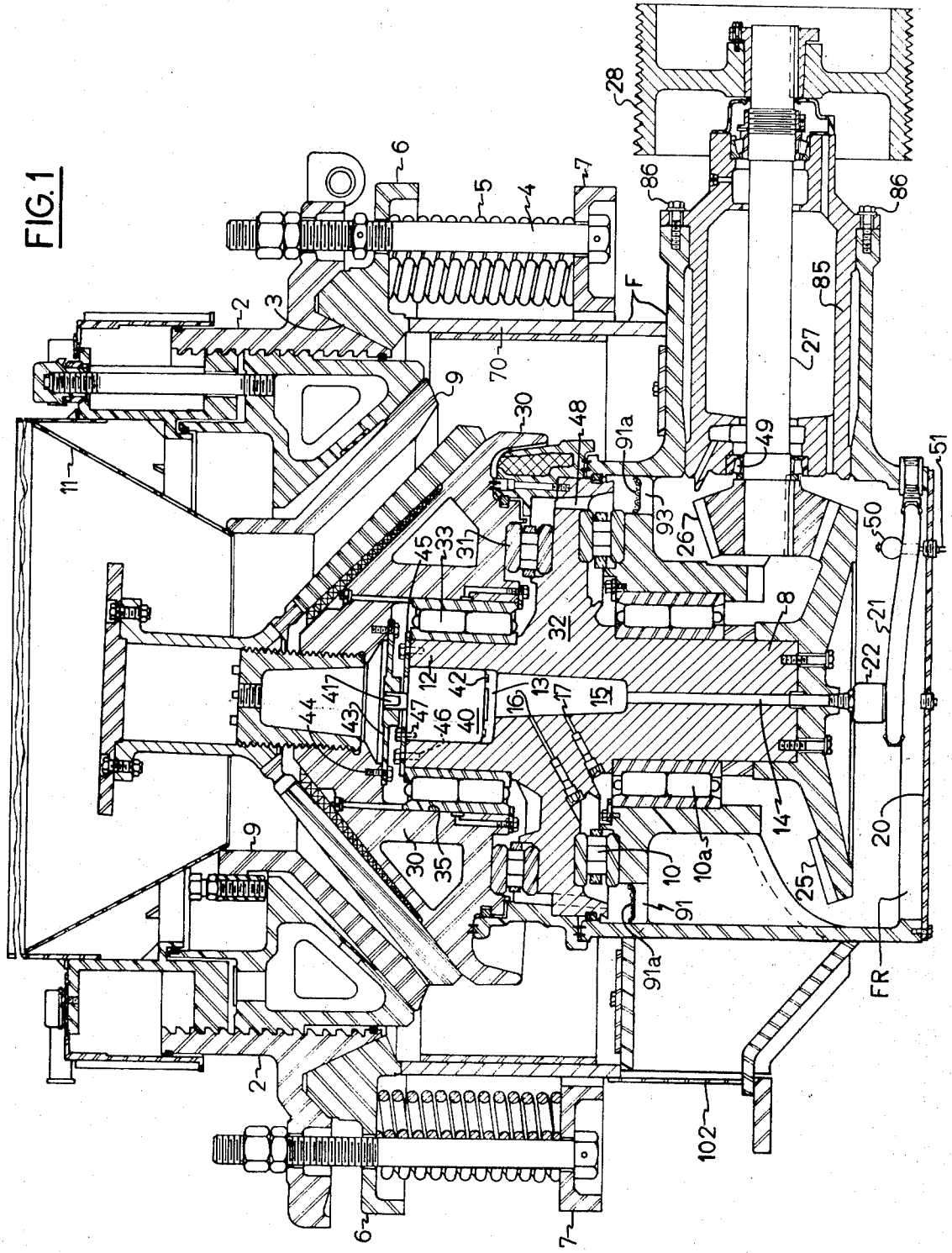
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FIG. 2

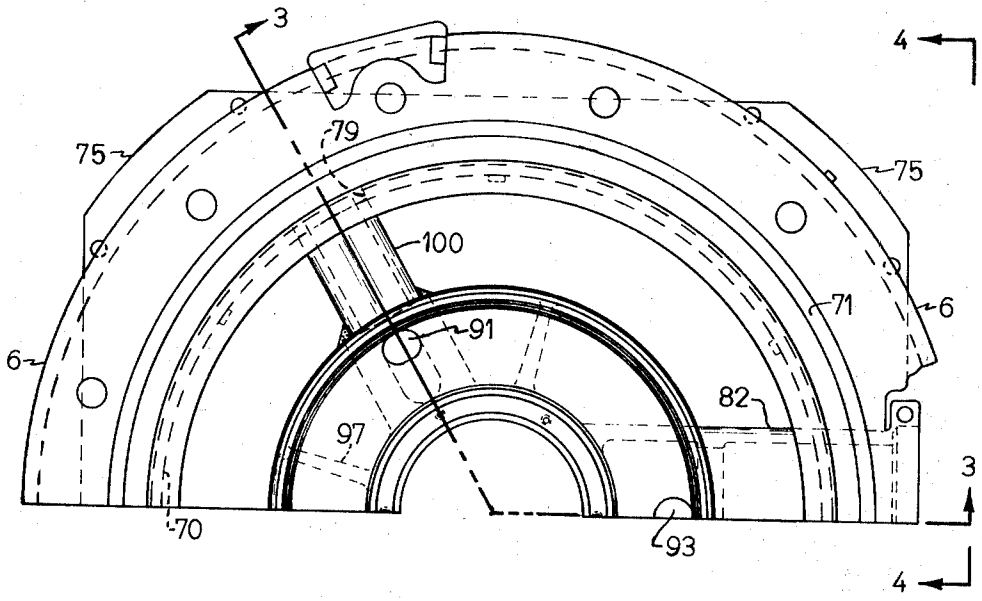
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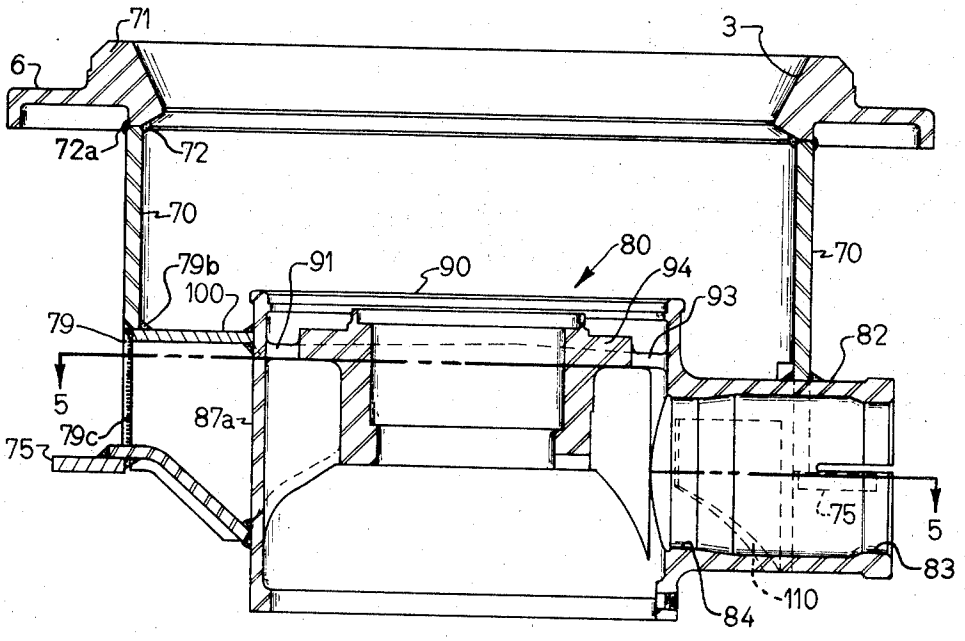
FIG. 3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72a
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79b
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FIG. 4

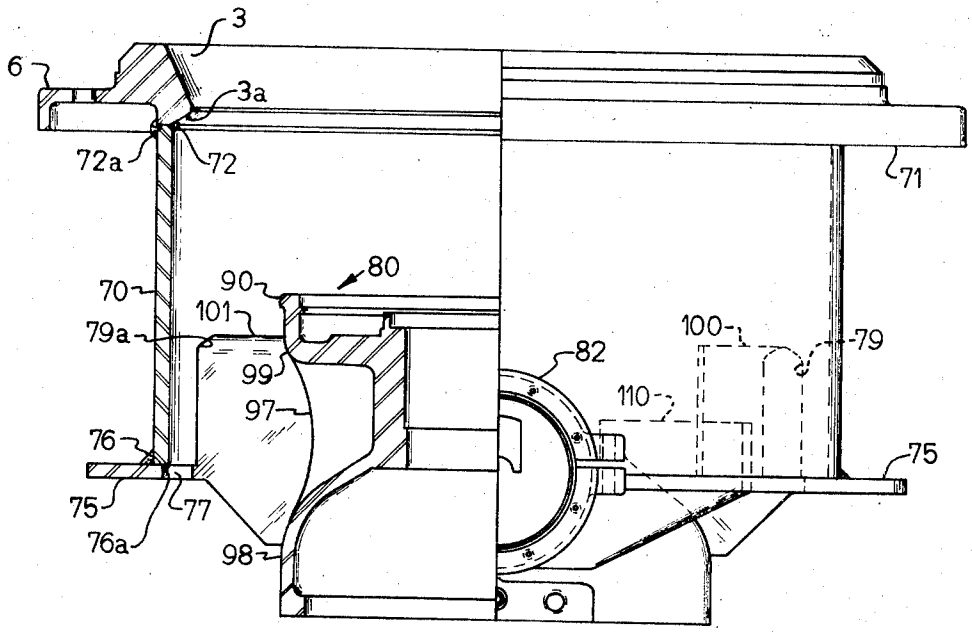
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FIG. 5

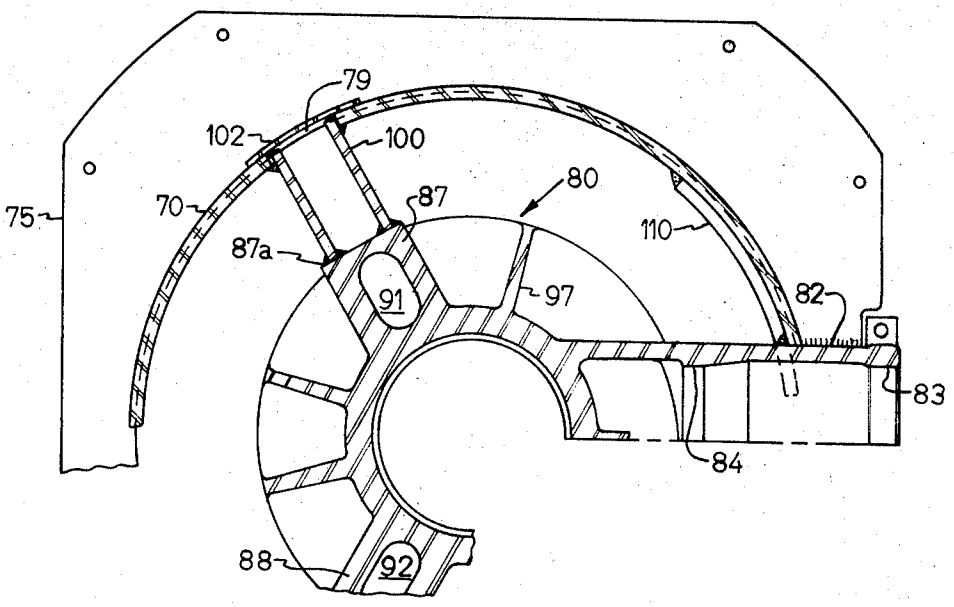
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FIG. 6

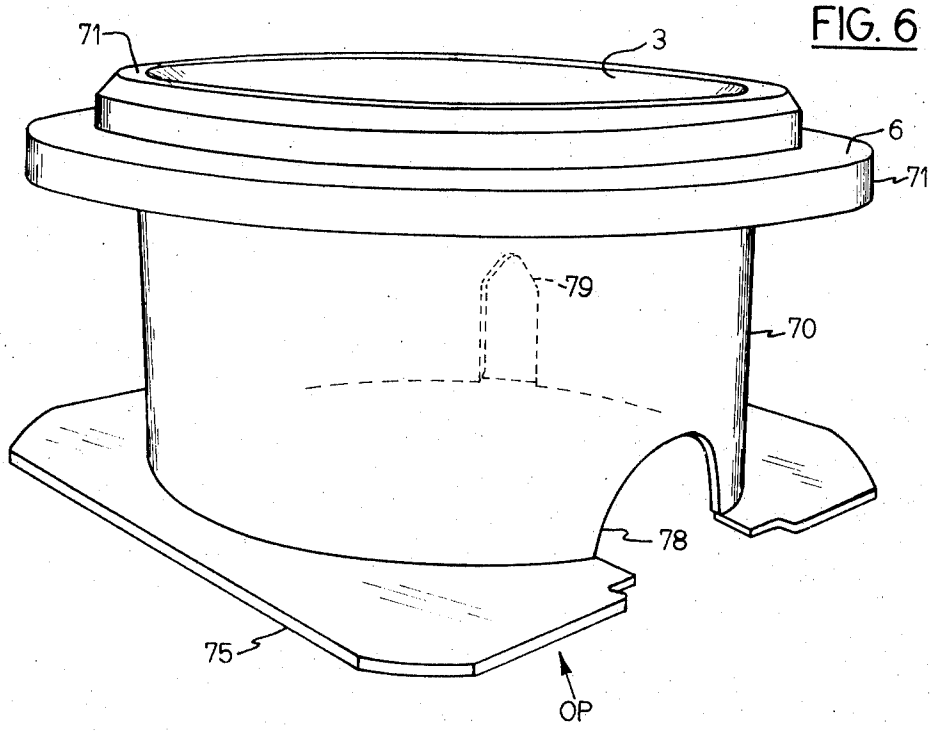



FIG. 7

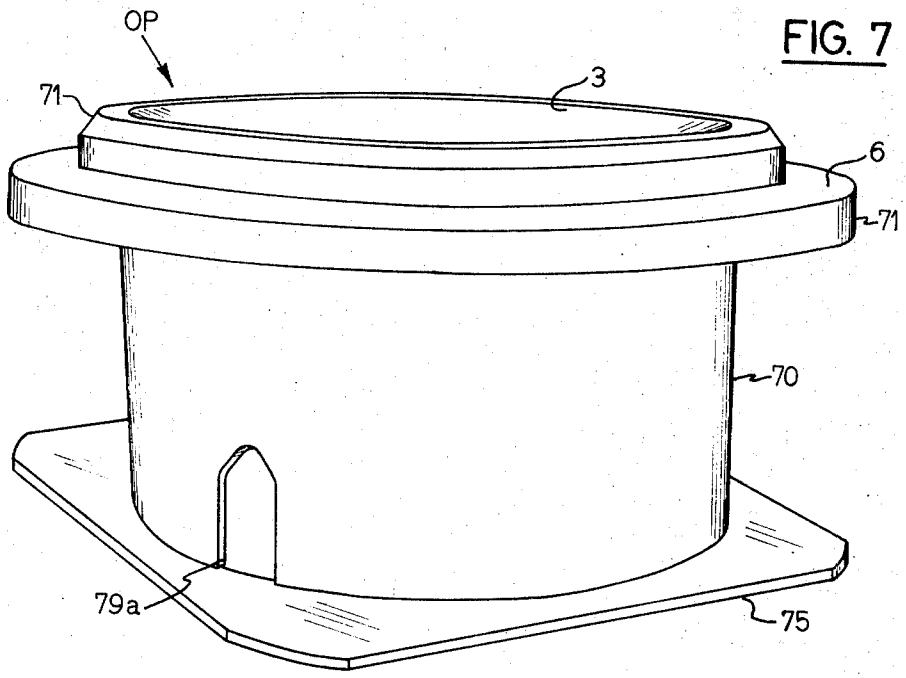


FIG. 8

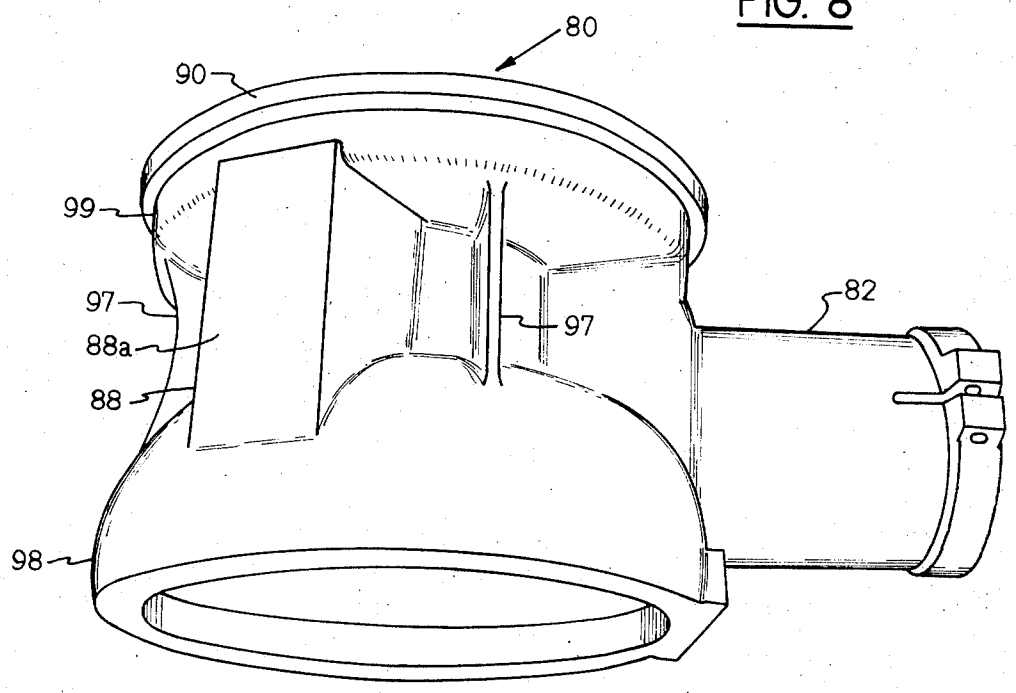
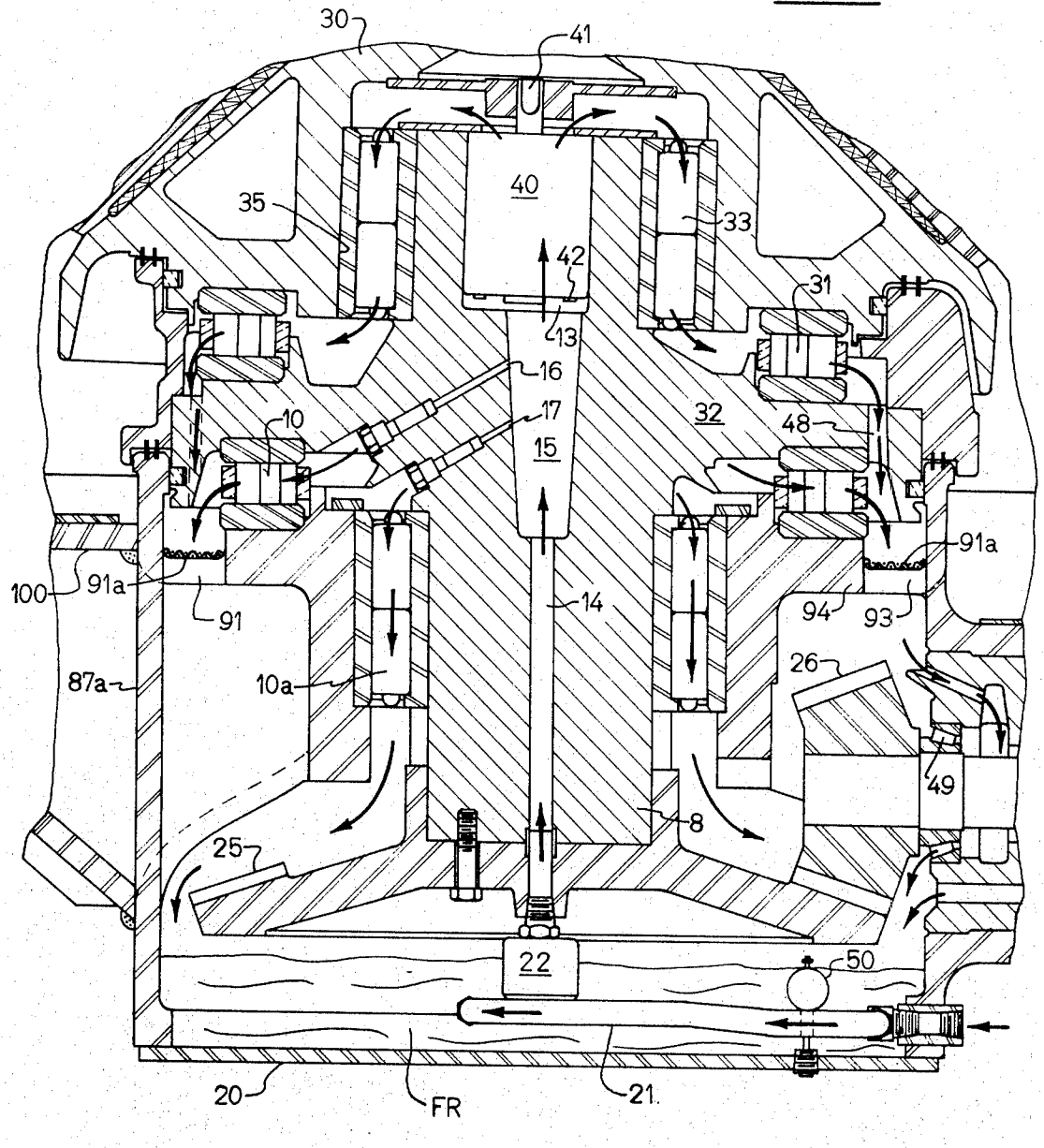


FIG. 9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# GYRATORY CRUSHER MAIN FRAME

## BACKGROUND OF THE INVENTION

Gyratory crushers of the type to which the invention pertains are extremely large and heavy and to assemble the parts and weld them together has been a difficult task. Furthermore, these crushers must have their bearings sufficiently lubricated so as to maintain them in proper working order.

An example of a crusher of the type to which the invention pertains is shown in U.S. Pat. No. 2,634,061 issued Apr. 7, 1953, to Rumpel and entitled "Gyratory Crusher,"
and this patent has been assigned to an assignee common with the present application.

Another example of a prior art structure is shown in the U.S. Pat. No. 2,860,837, issued Nov. 18, 1958 and entitled "Crusher Main Frame."

## SUMMARY OF THE INVENTION

The present invention provides a main frame for a gyratory crusher which has a cast inner, center portion having radially extending integral portions that each terminate in a flat surface and to which surface steel plate arms may be readily aligned and welded, and by means of which arms the center portion is connected with an outer, circular, vertical wall. The crusher frame provided by the present invention also provides for several circumferentially spaced oil drain passages which insure quick and complete return of the lubricating oil that has passed through the various bearings of the crusher. The arrangement of the oil draining passages is such that overall height of the crusher can be reduced as compared to prior art devices that depended on gravity to drain the returning oil over circumferentially inclined surfaces to an oil discharge passage.

Generally, the invention provides a crusher main frame of the above type which has parts which are relatively easy to fabricate and assemble relative to one another for being welded into an integral frame.

The invention provides an improved lubricating arrangement for a main frame of a gyratory crusher.

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 vertical, cross sectional view through a gyratory crusher embodying the present invention;

FIG. 2 is a plan view of one-half of the gyratory crusher main frame shown in FIG. 1;

FIG. 3 is a sectional view taken along line 3—3 in FIG. 2;

FIG. 4 is a side elevational view, partially in section, of the frame shown in FIG. 1;

FIG. 5 is a sectional view of one-half of the crusher main frame, the view being taken generally along the line 5—5 in FIG. 3;

FIG. 6 is a perspective view of the outer portion of the main frame;

FIG. 7 is another perspective view of the main frame, but taken generally from another side thereof;

FIG. 8 is a perspective view of the inner portion of the main frame; and

FIG. 9 is a vertical cross sectional view through the crusher made in accordance with the present invention



and showing a portion of the crusher as disclosed in FIG. 1, certain parts being shown as broken away for the sake of clarity.

## DESCRIPTION OF A PREFERRED EMBODIMENT

By way of general background organization, a crusher embodying the present invention includes a main frame F which is rigidly and stationarily mounted to any suitable supporting structure (not shown). The main frame has an annular, upwardly diverging surface 3 for supporting an annular concave support ring 2. The ring 2 is resiliently held in a downward position on the surface 3 by means of the series of tension bolts 4 and compression springs 5, which springs act against the flange 6 of the main frame and against the lower spring retaining ring 7 located on the lower end of the bolts 4. This spring loading permits the upper ring to rise slightly when excessive loads are encountered by the crushing members to be described.

The above general arrangement is shown and described, for example, in the U.S. Pat. to Rumpel, No. 2,881,981 of Apr. 14, 1959 and assigned to the same assignee of this application.

A conventional manganese concave ring 9 forms one crushing member and is secured to the support ring 2 in the conventional manner. A hopper 11 is located at the top of the crusher for receiving material such as rock, ore or other material to be crushed.

An eccentric shaft 8 is journalled by anti-friction roller bearings 10 and 10a on the main frame, and an eccentric 12 is formed adjacent the upper end of shaft 8. A counterbore 13 is also provided in the upper end of the eccentric 12 for a purpose that will hereinafter appear.

A vertically extending and centrally located lubrication passage 14 is located in the lower end of shaft 8 and is in communication with a chamber 15 in shaft 8 which in turn communicates with lubricating passages 16 and 17 extending, respectively to communicate with the anti-friction bearings 10 and vertically disposed roller anti-friction bearings 10*a*. Bearings 10*a* journal the eccentric shaft 8 in the main frame and absorb the radial thrust while the anti-friction bearings 10 are horizontally disposed and absorb the vertical thrust and weight of the eccentric shaft and its head 30, to be described.

The lower end of the frame is closed and sealed by a plate 20 and thus a fluid reservoir FR is formed at the bottom of the crusher. Fluid pressure from a lubrication pump (not shown) supplies lubricating fluid via conduit 21 to a swivel coupling 22 fixed on the bottom of gear 25 which is bolted to the bottom end shaft 8, thereby supplying fluid to passage 14.

To the lower end of the eccentric shaft 8 is secured a large bevel gear 25 which is in constant mesh with the bevel pinion 26 which, in turn is fixed to the drive shaft 27. Power is furnished to the drive shaft by the multiple V-pulley 28 which in turn is driven by a conventional power source (not shown).

A lower crushing member in the form of a generally conical shaped head 30 is journalled by the horizontally disposed, anti-friction roller bearing assemblies 31 on a generally horizontally extending portion 32 of the eccentric shaft 8. Additional anti-friction roller bearings 33 are vertically disposed between the upper portion of the eccentric and the vertical bore 35 of the head. Thus

the head is journalled on the eccentric shaft in both radial and vertical thrust absorbing directions.

A hydraulic motor **40** is located and fixed in the counterbore **13** of the eccentric and a drive shaft **41** of the motor is connected to a drive plate **43** which in turn is fixed by the bolt means **44** to the head **30.**

If a more complete description of the motor and its connection to the head is deemed to be either necessary or desirable, reference may be had to the copending U.S. Pat. application Ser. No. 212,553, filed Dec. 27, 1971, and entitled "Gyratory Crusher having Anti-Spin means for Head" which issued on, 1973 as U.S. Pat. It is believed sufficient to say that a plate **45** is bolted by bolt means **46** to the upper end of the eccentric **12** and other bolt means **47** extend through plate **45** and into the top of the motor housing to thereby hold the motor firmly, but removably in place in the eccentric without the necessity of removing the motor when the head is removed.

Motor **40** is of the gerotor type and receives its driving pressure fluid through conventional inlet ports **42** in its housing and from the fluid pressurized chamber **15.** After passing through the motor **40,** the fluid then passes over and through bearings **33** and then through bearings **31.** The fluid then passes through port means **48** to lubricate bearings **49** of the drive shaft, and then returns to the reservoir FR at the bottom of the crusher.

An oil lever float switch assehbmly **50** is mounted in plate **20** and located in the reservoir. Electric wires **51** lead from the assembly to a control panel (not shown) to sound an alarm or stop the crusher if oil level is too low.

## MAIN FRAME

The main frame F of the crusher is shown in FIGS. **2** to **5.** This main frame includes an outer portion OP which is also shown by itself in FIGS. **6** and **7.** This outer portion includes a circular wall **70** fabricated from sheet steel to which a cast steel upper ring **71** is welded around the inner and outer periphery of the wall **70,** as at **72** and **72***a*, respectively. The previously referred to flange **6** is formed as a part of the upper ring **71.** The upwardly diverging surface **3** is also formed in this ring **71,** and the lower inner edge of surface **3** terminates at **3***a* which is located radially inwardly of the internal surface of wall **70.** Surface **3** receives the concave support ring **2.** The outer, generally circular portion **70** of the main frame sets on a horizontally disposed, steel plate **75** which is welded at the edge of its central opening **77,** as at **76** (FIG. 4) and also is welded on the inside lower edge of the wall as at **76***a*. The plate **75** thus forms an outwardly extending flange at the lower end of the wall **70.** No reinforcing gussets are required between the wall **70** and plate **75.**

It should also be noted that the circular wall **70** has a semi-circular opening **78** formed at one of its lower sides and also has openings **79** and **79***a* formed 120° apart in the lower portion of its walls.

A central hub portion **80** is formed generally as a casting and has a one piece, cylindrical and continuous extension **82** extending radially outwardly from one side thereof. This extension **82** forms a housing for the drive means of the crusher. This extension has an internal, annular mounting surface **83** (FIG. 3) at its open end and another internal, annular mounting surface **84** at its inner end. A cylindrical bearing box **85** (FIG. 1) of the power shaft is accurately located on the annular bearing surfaces **83** and **84.** The height of the lower portion of surfaces **83** and **84** are the same. In order to assemble the bearing box **85** for the power shaft, the bearing box **85** is simply inserted into the open end of the cylindrical portion **82** and as it is inserted in the opening, it is automatically seated on the bearing surfaces **83** and **84.** The one piece housing and extension **82** permits the bearing box **85** and power shaft to be readily assembled in the main frame and no particular alignment problems are involved in the assembly operation. Cap screws **86** hold the bearing box **85** in the cylindrical extension **82.**

The central portion **80** of the main frame also includes a pair of circumferentially spaced, integral portions **87** and **88** which are spaced 120° apart and are also spaced 120° apart from the centerline of the cylindrical portion **82.** These portions **87** and **88** extend radially outwardly and terminate in a flat surface **87***a* and **88***a*, respectively. The portions **87** and **88** extend radially to an extent generally co-extensive with the upper circular portion **90** of the central hub **80.**

Lubrication passages **91** and **92** (FIGS. **2, 3** and **5**) are cast in portions **87** and **88,** respectively and a third lubricating passage **93** is formed in a flange portion **94** of the central portion **80.** In this manner, three equally spaced lubricating passages are provided for the lubricating fluid which flows as indicated by the arrows in FIG. **9** and which has been delivered by the pump **22,** previously mentioned. Debris collecting screens **91**a (FIG. **9**) are located in passages **91** and **93** to prevent damage to the gears **25** and **26.**

The central portion **80** also has circumferentially spaced reinforcing gussets **97** formed integrally between its lower bowl-like portion **98** and its upper portion **99** (FIGS. **4** and **8**)

The outer portion **70** is secured to the inner hub portion **80,** not only by the cylindrical extension **82,** but also by sheet steel, channel shaped hollow and enclosed arms **100** and **101** as shown in FIGS. **1, 3** and **9** which are welded, respectively between the inner surface of wall **70** as at **79***b* (FIG. **3**) and the flat surfaces **87***a* and **88***a* of the integrally cast portions **87** and **88.** In other words, the flat surfaces **87***a* and **88***a* of the cast portions are accurately cast, and to which surfaces the arms **100** and **101** can be conveniently, easily, and securely welded. As shown clearely in FIGS. **3** and **5,** the arms **100** and **101** do not extend through the openings **79** and **79**a in the wall **70,** but terminate short of the outside of wall **70** and are welded there, as at **79***c*. Separate cover plates **102** are welded to the outside of wall **70** to close the openings **79** and **79***a*.

A reinforcing plate **110** is welded between the wall **70** and the cylindrical portion **82** of the central portion **80.**

With the present invention, lubricating passages (FIG. **3**) are formed at three equally spaced locations around the main frame and permit complete and quick draining of the lubricating fluid which is forced upwardly by the pump **22** and through the various bearings. There is no need to conduct returning lubricating fluid by gravity from one higher side of the frame to a lower side, but instead it drains readily through the passages provided and back to the sump at the bottom of the frame.

The frame provided by the present invention is more readily fabricated and assembled than prior art devices

and its parts are more easily aligned for welding thereof.

We claim:

1. A gyratory crusher main frame comprising, a circular vertical wall fabricated from sheet steel, circumferentially spaced openings in said wall, an inner central portion for rotatably supporting crusher mechanism and formed as a steel casting, said central portion located within and extending upwardly into said circular vertical wall, said central portion having circumferentially spaced and radially extending integral portions each terminating in a flat surface, a hollow and enclosed sheet steel arm welded at its inner end to each of said surfaces and extending radially outwardly therefrom, said arms being in circumferential alignment with said wall openings and extending therein, said arms being welded to said wall.

2. The main frame set forth in claim 1 further characterized in that said circumferentially spaced, radially extending portions have a lubricating oil return passage extending generally vertically therethrough.

3. The main frame described in claim 1 further characterized in that said inner central portion has a radially extending, integrally cast, continuous housing for a drive means of said crusher.

4. The main frame described in claim 2 further characterized in that said inner central portion has a radially extending, integrally cast, continuous housing for a drive means of said crusher.

5. A main frame for a gyratory crusher and comprising, a circular vertical wall fabricated from sheet steel, circumferentially spaced openings in said wall, a horizontal plate on which the lower end of said wall rests and is welded thereto, said plate having a large central opening, an inner central portion for rotatably supporting crusher mechanism and formed as a steel casting, said central portion located within said central opening of said plate and extending upwardly into said circular vertical wall, said central portion having circumferentially spaced and radially extending integral portions each terminating in a flat surface, a hollow and enclosed sheet steel arm welded at its inner end to each of said surfaces and extending radially outwardly therefrom, said arms being in circumferential alignment with said wall openings and extending therein, said arms being welded to said wall to form a unitary main frame of said circular wall and said inner central portion.

6. The main frame set forth in claim 5 further characterized in that said circumferentially spaced, radially extending portions have a lubricating oil return passage extending generally vertically therethrough.

7. The main frame described in claim 5 further characterized in that said inner central portion has a radially extending, integrally cast, continuous housing for a drive means of said crusher.

8. The main frame described in claim 6 further characterized in that said inner central portion has a radially extending, integrally cast, continuous housing for a drive means of said crusher.

* * * * *