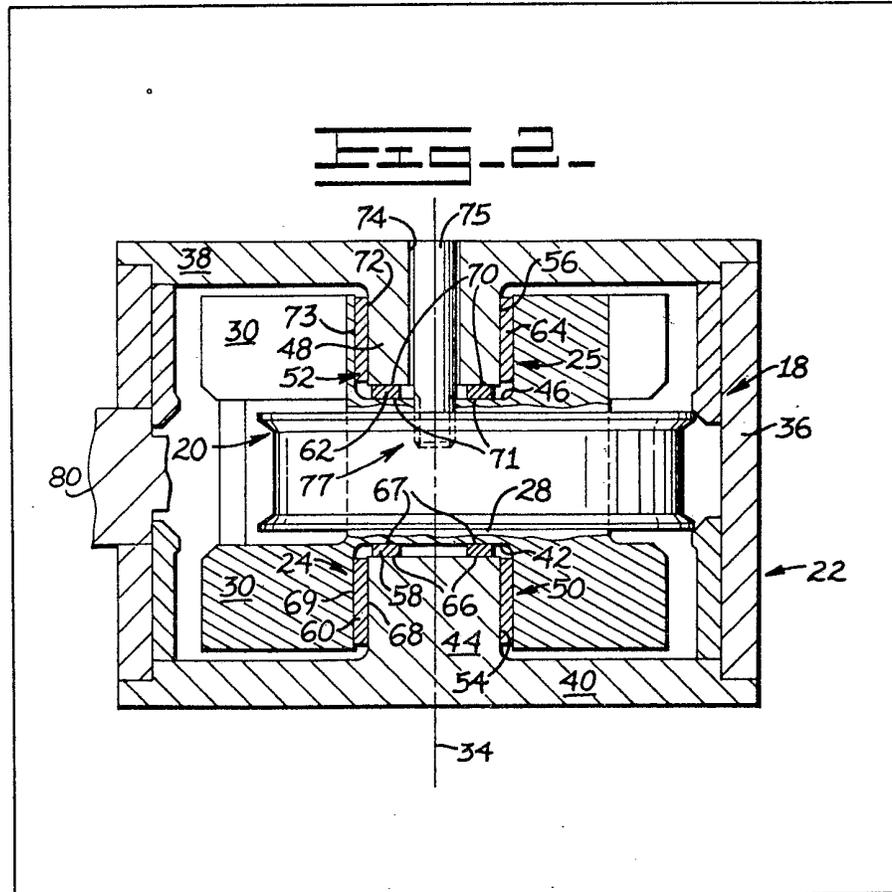


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(54) Rotatable assembly

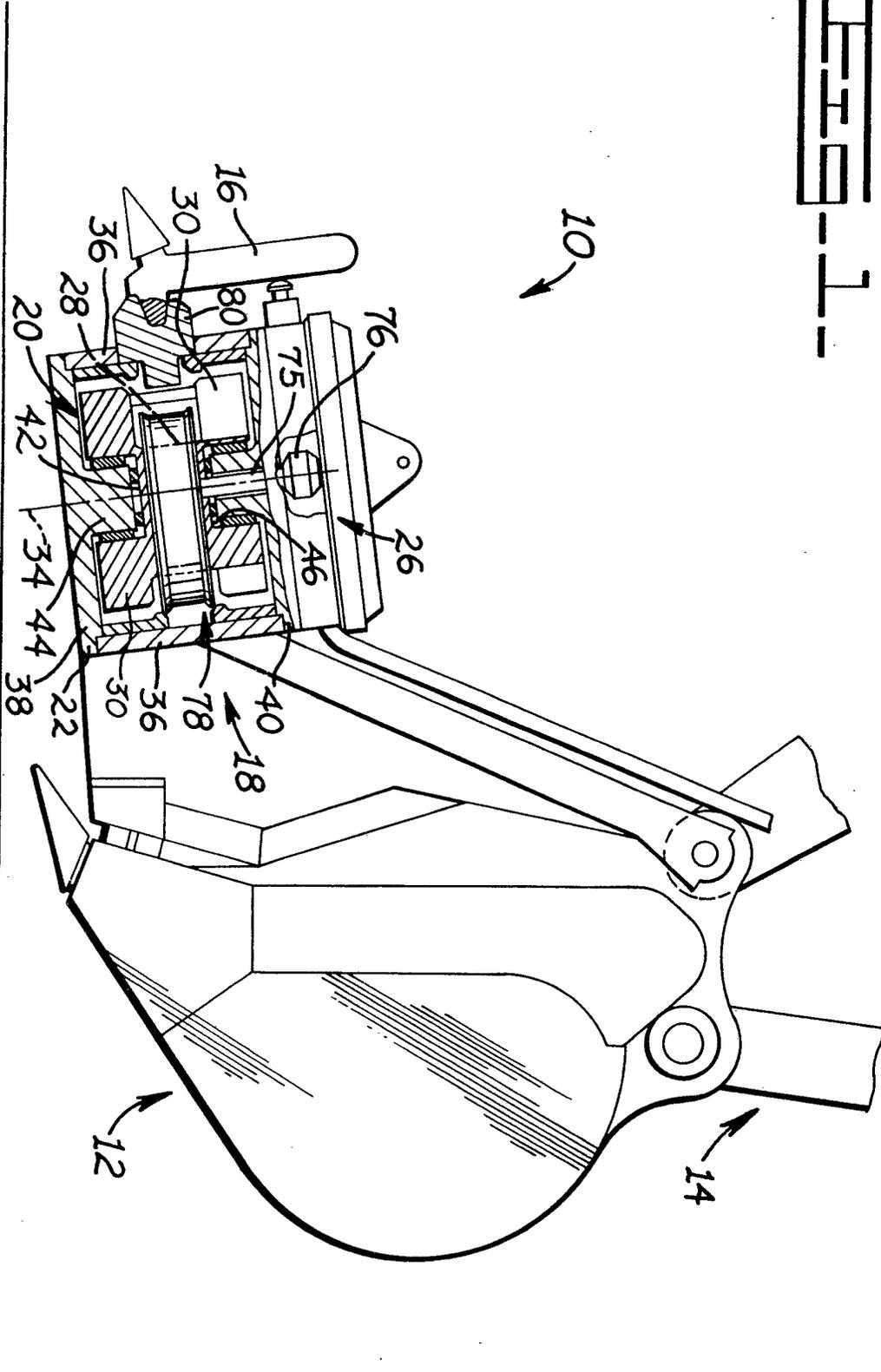
(57) A rotatable assembly has a rotatable member (20) such as a crankshaft assembly used to transmit energy to a fracturing tip of a rock breaker or a shaft assembly of a pump supported by a frame (22). To save space, instead of providing a journal shaft to support the rotatable member (20), an opening (42) is provided in

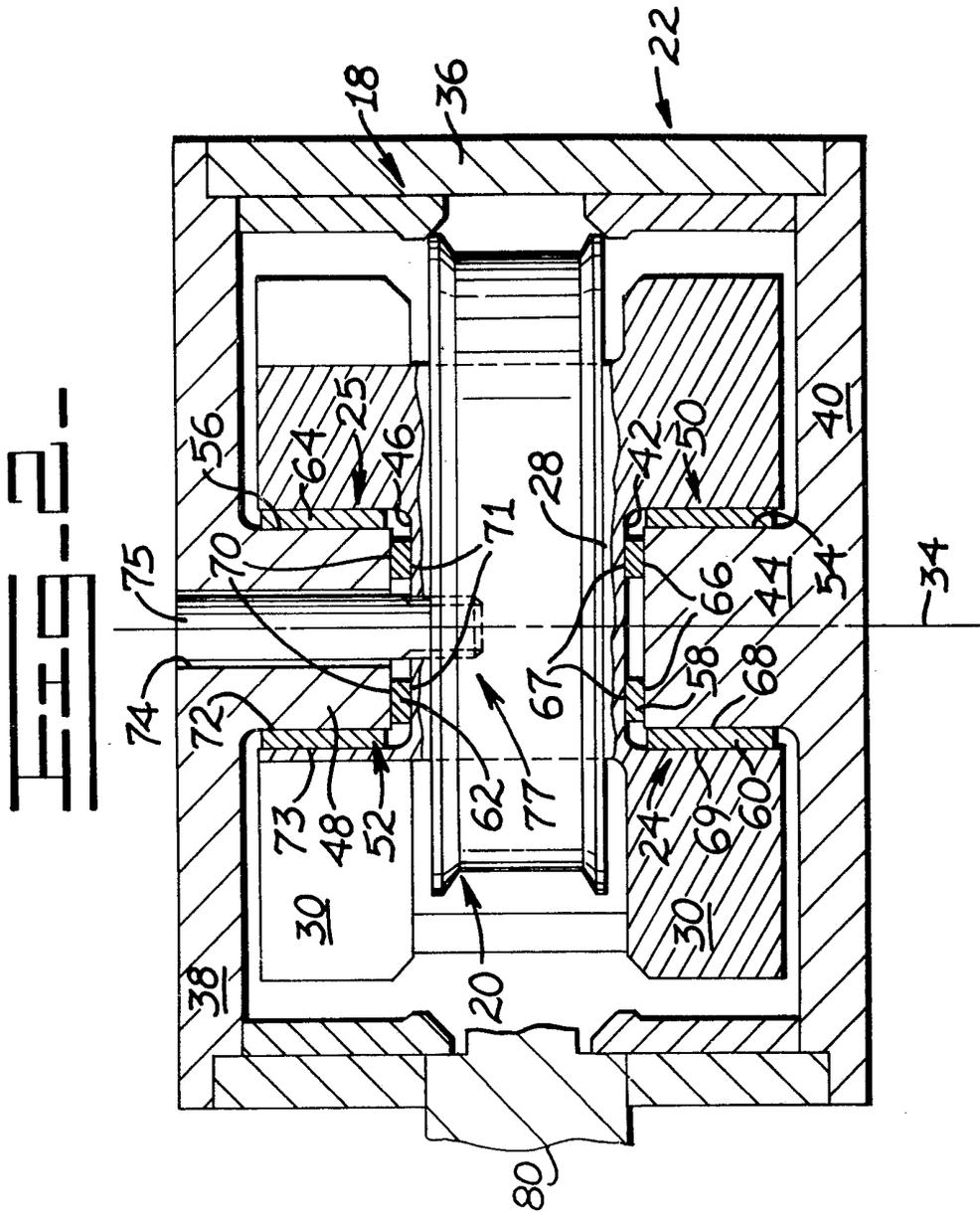
the rotatable member (20). The frame (22) has a protrusion (44) extending into the opening (42) and a journal and thrust bearing (64, 62, 58) maintains the rotatable member (20) in rotatable, supported relationship on the frame protrusion (44). A second protrusion (48) may extend into an opening (46) on the side of the rotatable member opposite to the first opening (42).



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FIG. 1





SPECIFICATION

Rotatable assembly

This invention relates to rotatable assemblies comprising a frame supporting a rotatable member, as is incorporated for example, in a rock breaker or in an engine to transmit power. In such assemblies it is desirable to reduce the axial length of the assembly to save space in some situations.

A rotating assembly is used in a rock breaker to transmit energy to a rock-fracturing tip, in a pump assembly to provide rotational movement to drive the pump components, or in other applications requiring a rotatable member supported in a frame. For example, a rock breaker, said rotatable member may be a crankshaft rotated by a hydraulic motor. As disclosed in British Patent No. 1,474,091, the rotatable member has journal shafts extending to and supported by a frame. This requires additional length on the bottom portion of the rock breaker frame to accommodate the journal shaft and frame support.

In using the rock breaker, the bottom portion of the rock breaker can sometimes interfere with the most desirable positioning of the rock-fracturing tip of the rock breaker relative to the rock to be fractured. This can result in increased wear or breakage of components and waste of time and labour for the operator to use the rock breaker in a less desirable manner.

According to the invention, a rotatable assembly comprises a rotatable member having a first opening, a supporting frame having a protrusion extending into said first opening, first bearing means in contact with said rotatable member and said protrusion, said first bearing means locating said rotatable member radially and axially in one direction for rotation around said protrusion, and second means locating said rotatable member axially in an opposite direction on said protrusion.

The use of protrusion fitting in the opening in the rotatable member eliminates the need for a journal member of the rotatable member extending to and supported by the frame and results in reduced axial length and weight of the assembly and simplifies the construction of the assembly.

An example of an assembly in accordance with the invention incorporated in a rock breaker is illustrated in the accompanying drawings in which:—

Figure 1 is a side view of the rock breaker showing the assembly in section; and

Figure 2 is a section through the assembly alone to a larger scale.

Referring to the drawings, a rock breaker 10 is connected to a bucket assembly 12 of a work vehicle 14 such as an excavator 14, for example. The rock breaker 10 has an impact mechanism 16 and a rotating assembly 18. The rotating assembly 18 has a rotatable member 20, a frame 22, and first and second bearing elements 24, 25. It is desirable to provide first means 26 for rotating the rotatable member 20 relative to the frame 22. As

is shown, the rotatable member 20 is a crankshaft assembly. Said crankshaft assembly 20 has a shaft portion 28 and a flywheel 30 connected to the shaft portion 28. The shaft portion 28 has an axis of rotation 34. The frame 22 has a case 36 and top and bottom lids 38, 40.

The rotatable member 20 has a first opening 42. The frame 22 has a first protrusion 44 extending into said opening 42. The bottom lid 40 of the frame 22 has the first protrusion 44. The rotatable member 20 preferably has a third opening 46. The top lid 38 of the frame 22 has a second protrusion 48 extending into said third opening 46. Said protrusions 44, 48 each have a respective first end portion 50, 52 and a respective side portion 54, 56.

The bearing element 24 is in contact with the rotatable member 20 and the frame 22. The second bearing element 25 is in contact with the rotatable member 20 and the frame 22. Said bearing elements 24, 25 are of a construction sufficient for maintaining the rotatable member 20 in rotatable, supported relationship about the respective protrusion 44, 48 of the frame 22.

The bearing elements 24, 25 each have respective thrust and main bearing portions 58, 60, 62, 64. The thrust bearing portions 58, 62 each have respective first and second surfaces 66, 67, 70, 71. The main bearing portions 60, 64 each have respective first and second surfaces 68, 69, 72, 73. Each of the thrust bearing portions 58, 62 is in contact at one surface 66, 70 with a respective first end portion 50, 52 of the frame protrusions 44, 48 and at the other surface 67, 71 with the rotatable member 20. Each of the main bearing portions 60, 64 is in contact at one surface 68, 72 with a respective side portion 54, 56 of the frame protrusions 44, 48 and at the other surface 69, 73 with the rotatable member 20. Such bearing portions 58, 60, 62, 64 are well known in the art.

One of the protrusions 44, 48 has a second opening 74. Preferably, said first means 26 includes a shaft 75 extending through said second opening 74. The shaft 74 has a first end portion 77 and is connected at said first end portion 77 to the rotatable member 20. It is desirable that the second protrusion 48 have the second opening 74. Said first means 26 also includes second means 76 for rotating the shaft 75 relative to the frame 22. The second means 76 is preferably a motor 76.

In the operation of the rotating assembly 18, the shaft 75 rotates the rotatable member or crankshaft assembly 20 of the rock breaker 10 about the axis 34. The frame protrusions 44, 48 extend into respective openings 42, 46 of the crankshaft assembly 20 to support said crankshaft assembly 20 in rotation about said frame protrusions 44, 48. The bearing portions 58, 60, 62, 64 maintain the crankshaft assembly 20 in rotatable relationship about said protrusions 44, 48.

In the example shown, the rock breaker 10 is attached to the excavator 14 for convenient

positioning of the rock breaker 10 in different work situations. The second means or motor 76 rotates the crankshaft assembly 20. An eccentric portion and ring element 78 of the crankshaft assembly 20 thereby drive an impact member 80 and the impact mechanism 16 for fracturing rock and other hard material.

The frame protrusion 44 in the bottom lid 22 of the frame 22 supports the rotatable member 20 during rotation. Said protrusion 44 being positioned on the frame 22 and extending into the rotatable member first opening 42 shortens the length of the rotatable member 20. The resultant corresponding configuration of the frame 22 reduces the length of said frame 22. This provides additional clearance between the bottom lid 40 and the ground in positioning the rock breaker impact mechanism relative to the material to be fractured. Additionally, the rock breaker is reduced in weight and the thrust bearing portion 58 can be smaller.

It is also desirable, as is shown, to similarly support the rotatable member 20 at the opposite end from said first opening 42. In this manner, the above mentioned advantages are further incorporated into the rock breaker.

Other aspects, objects and advantages of this invention can be obtained from a study of the drawings, this disclosure and the appended claims.

CLAIMS

1. A rotatable assembly comprising a rotatable member having a first opening, a supporting frame having a protrusion extending into said first opening, first bearing means in contact with said rotatable member and said protrusion, said first bearing means locating said rotatable member radially and axially in one direction for rotation around said protrusion, and second means locating said rotatable member axially in an opposite direction on said protrusion.

2. A rotatable assembly according to Claim 1, wherein said protrusion has an axial opening through it, and wherein said rotating assembly

includes driving means for rotating said rotatable member relative to the frame, said driving means including a shaft having a first end portion connected to said rotatable member, said shaft extending through said axial opening of said protrusion, and means for rotating said shaft relative to the frame.

3. A rotatable assembly according to Claim 1 or Claim 2, wherein said frame protrusion has an end face and peripheral face and the first bearing means has thrust and main bearing portions each having first and second surfaces, said thrust bearing portion being in contact at one surface with said end face and at the other surface with said rotatable member and said main bearing portion being in contact at one surface with said peripheral face and at the other surface with said rotatable member.

4. A rotatable assembly according to Claim 3, in which said rotatable member has a second opening co-axial with said first opening and said frame has a second protrusion co-axial with and opposed to the first protrusion, said second protrusion extending into said second opening with further bearing means between said second protrusion and said second opening, said further bearing means having thrust and main bearing portions, said thrust portion being interposed between an end face of said second protrusion and said rotatable member and forming said second means, and said main portion being interposed between a peripheral face of said second protrusion and said rotatable member.

5. A rotatable assembly according to any one of the preceding Claims, wherein the rotatable member comprises a shaft portion having an axis of rotation and a flywheel fixed on said shaft portion.

6. A rotatable assembly according to Claim 1, substantially as described with reference to the accompanying drawings.

7. A rock breaker incorporating a rotatable assembly in accordance with any one of the preceding Claims.