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④ Continuous excavating apparatus.

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Description

The present invention relates to continuous excavating apparatus including an endless line of excavating buckets driven by sprockets.

Such an apparatus is known from CH—A—314214.

The extreme forces of excavation lead to severe wear in the bucket line and between the bucket line and the driving sprockets. To reduce this wear the invention provides an arrangement wherein adjacent buckets are connected by a common hinge pin and the pin has enlarged ends which engage the sprockets and during operation roll on the sprockets to rotate the hinge pin.

The hinge pins or common pivot shafts connecting the buckets are thus caused by rolling on the sprockets to rotate in contact with the hinges, thereby distributing shaft wear. The rolling of the hinge pins on the sprockets reduces sliding friction and extends the useful life of the pins.

The hinge is preferably a piano-hinge consisting of interdigitated hinge parts of the adjacent buckets interconnected by the hinge pin, which is free to rotate in both parts.

The invention will be described in more detail with the aid of an example illustrated in the accompanying drawings, in which:—

Figure 1 is a side elevational view of a continuous excavating apparatus embodying the present invention,

Figure 2 is a top plan view thereof,

Figure 3 is a transverse sectional view taken along line 3—3 of Figure 1 illustrating the gimbal mounting of the excavating boom and details of the bucket structure, and

Figure 4 is a fragmentary longitudinal sectional view through the excavating boom illustrating additional details of its construction.

The main features of the structure to be described are the subject of the parent European application No. 80303996.5 (Publication No. EP—B1—0028 930) from which the present application has been divided.

With initial reference to Figures 1 and 2, the continuous excavating apparatus includes a main frame 10 having most of its weight in substantially vertical side walls 12 and 14, each formed by a pair of contiguous plates which are welded or otherwise secured at their front, rear, and the top and bottom edges thereof. The frame plates are joined by transverse braces 16, 18 so that the overall configuration of the frame is in the form of a hollow channel or box-like configuration.

To provide mobility of the heavy elongated main frame 10, a pair of endless tracks 20 are mounted therebelow at a position such that the endless tracks project at the forward end of the main frame 10 but are recessed from the rearward end of the frame.

To power the endless tracks an electric motor 22 of appropriate power is mounted at the rearward end of main frame 10 on one of the mentioned transverse braces.

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Adjacent the forward extremity of the elongated main frame 10, the upper and lower transverse braces 16 are joined rigidly to the side wall 12 and 14 to support gimbal pins 24, 26 that rotatably carry an open rectangular gimbal frame which, as best shown in Figure 3, can pivot about a generally upright axis and is, in turn, arranged to pivotally support on a transverse shaft 30 the parallel side plates 32, 34 of an excavating boom, generally indicated at 36, enabling its pivotal adjustment about a transverse axis so that the excavating boom can be pivoted both vertically and transversely an amount sufficient so that its extremity can move beyond the lateral and upright contour of the described supporting frame, as indicated by phantom lines in Figures 1 and 2, thus enabling a tunnel to be excavated which will subsequently allow the passage of the entire frame therethrough.

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The side plates 32, 34 of the excavating boom 36 are held in laterally spaced relation by simple rigid metal braces 38 and the outer surfaces thereof mount balls 40, 42 for universal connection to ball sockets 44, 46 at the forward ends of double-acting hydraulic rams 48, 50 whose opposite extremities are universally joined to a forward extension 10a of the main frame 10 by similar ball and socket joints 52, 54 to allow the excavating boom to be adjusted vertically or horizontally through actuation of the hydraulic rams 48, 50 by a hydraulic pump 56 that is driven by the previously described electric motor 22. One valve (not shown) is associated in a conventional fashion with each hydraulic ram and is arranged to supply hydraulic pressure to one or the other end of its associated ram so that, as will be apparent, if both valves are open in one direction, both hydraulic rams will extend or retract to raise or lower the excavating boom, whereas on the other hand, if one valve is open in one direction while the other is open in the opposite direction, a lateral motion of the boom will occur; for example, to the phantom-line disposition shown in Figure 2.

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Between opposite ends of the described boom side plates 32, 34 laterally-spaced sprockets 58, 60 are mounted at the extremities of tubes 62, 64 which are keyed to mounting shafts, one of which is the previously described shaft 30 (see Figure 3) and the other of which is an idler shaft 66 (see Figure 4) rotatably supported between the side plates 32, 34 at the remote free end of the excavating boom 36. Each pair of sprockets engages the enlarged opposite ends of a hinge pin 68 which is arranged in bridging relationship between the laterally-spaced sprockets to rotatably extend through a piano-hinge connection in the form of interdigitated hinges 70, 72 at the front and rear of adjacent excavating buckets 74, which provide the material excavating elements of the unit. When it is remembered that considerable forces are encountered during the excavating operation, the enlarged ends of the pin 68 will rotate to provide only rolling friction with the engaged sprocket, thus to reduce sliding friction and extend the useful life of the elements to a

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considerable extent. Furthermore, it will be seen that each hinge pin 68 common to the foremost extremity of one bucket and the rearmost extremity of the adjacent bucket will rotate in the hinges 70, 72, thus to distribute wear and maintain the roundness of the hinge pin and the hinges.

The line of buckets mounted on the sprockets is arranged for counterclockwise motion, as shown in Figure 1, when driven by a pair of hydraulic motors 80, 82 which are connected to opposite ends of the sprocket-mounting shaft 30 at the inner end of the bucket line by suitable gear reduction units 84, 86, such hydraulic motors each being capable of delivering as much as 150 horsepower when energized by the hydraulic pump 56 driven by the previously described electric motor 22.

Material excavated and carried by the excavating buckets will be dumped therefrom as they pass in succession over the rear sprocket 58 onto suitable endless conveyor 88 which lies thereunder and is mounted for conveyance of material deposited thereon beyond the rear end of the frame at an upper elevation so that the material conveyed on the belt can be dumped into a suitable truck or other receptacle (not shown) for removal and subsequent processing. The conveyor 88 is supported between the frame plate and is powered by suitable connection to the motor 22.

Claims

1. Continuous excavating apparatus including an endless line of excavating buckets (74) driven by sprockets (60) wherein adjacent buckets are connected by a common hinge pin (68) and the pin has enlarged ends which engage the sprockets (60) and during operation roll on the sprockets to rotate the hinge pin.

2. Apparatus as claimed in claim 1 in which the hinge pin (68) extends through a piano-hinge

connection between hinge parts (70, 72) on adjacent buckets (74) and in operation is caused to rotate in the hinge parts to distribute wear and maintain roundness of the hinge pin and the hinges.

Patentansprüche

10. 1. Kontinuierlich arbeitendes Baggergerät mit einer Endlosbahn von durch Kettenräder angetriebenen Eimern (74), wobei benachbarte Eimer durch einen gemeinsamen Scharnierzapfen (68) mit verbreiterten Enden verbunden sind, die in die Kettenräder (60) eingreifen und während des Betriebs auf diesen abrollen, um den Scharnierzapfen zu drehen.

15. 2. Baggergerät nach Anspruch 1, dadurch gekennzeichnet, daß der Scharnierzapfen (68) sich durch eine Klavierscharnierverbindung zwischen Scharnierteilen (70, 72) an benachbarten Eimern (74) erstreckt und beim Betrieb in den Scharnierteilen zum Drehen veranlaßt wird, um Verschleiß zu verteilen und die Rundheit des Scharnierzapfens und der Scharniere aufrechtzuerhalten.

Revendications

30. 1. Appareil pour excaver de façon continue, comportant une chaîne sans fin de godets excavateurs (74) entraînés par des dents (60) de pignon, dans lequel les godets adjacents sont reliés par une broche commune (68) et en fonctionnement roulement sur les dents de pignon pour entraîner la broche en rotation.

35. 2. Appareil selon la revendication 1, dans lequel la broche (68) traverse un liaison à articulation du type piano entre des parties articulées sur les godets adjacents (74), et en fonctionnement est entraînée en rotation dans les parties articulées pour répartir l'usure et pour maintenir l'arrondi de la broche et des articulations.

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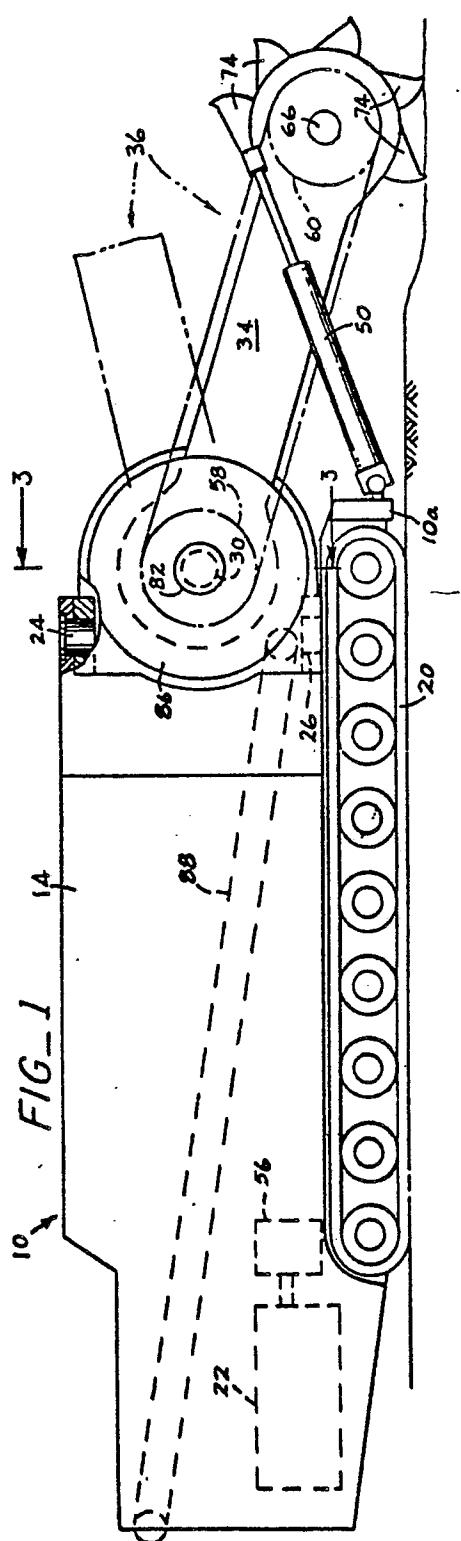
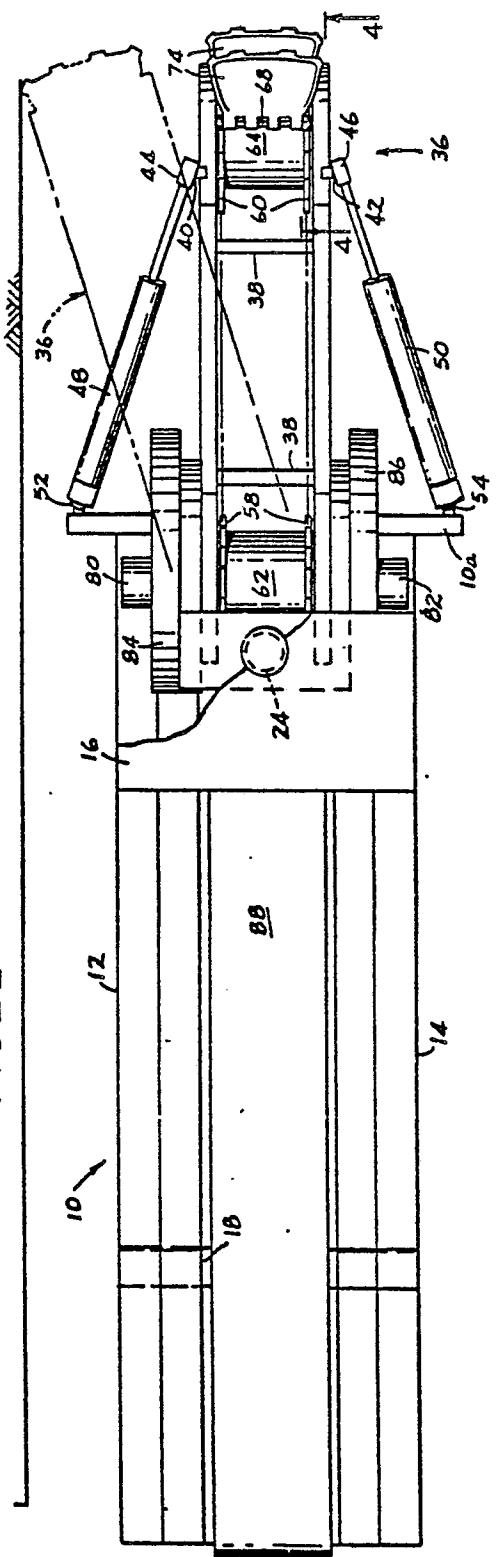
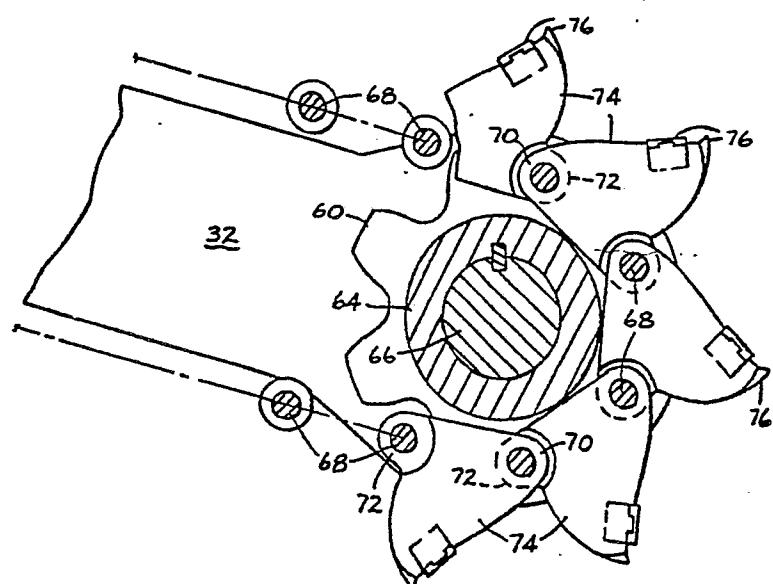
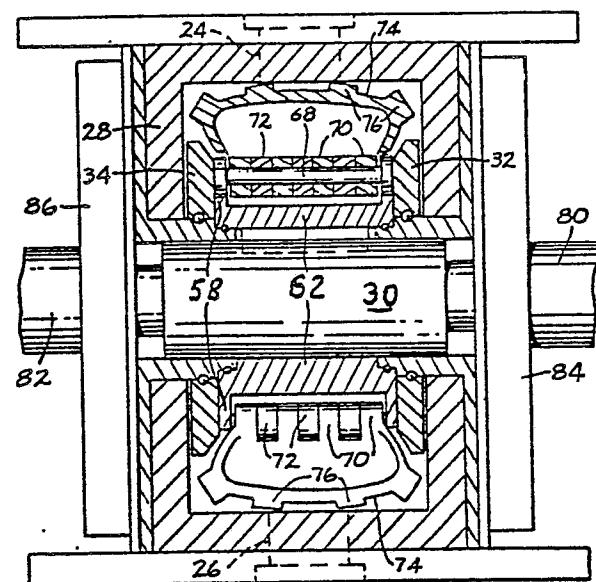


FIG-2



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FIG_3



FIG_4