Jan. 30, 1968 A. W. FRENCH ET AL 3,366,039

SCREW PRESS

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FIG-1

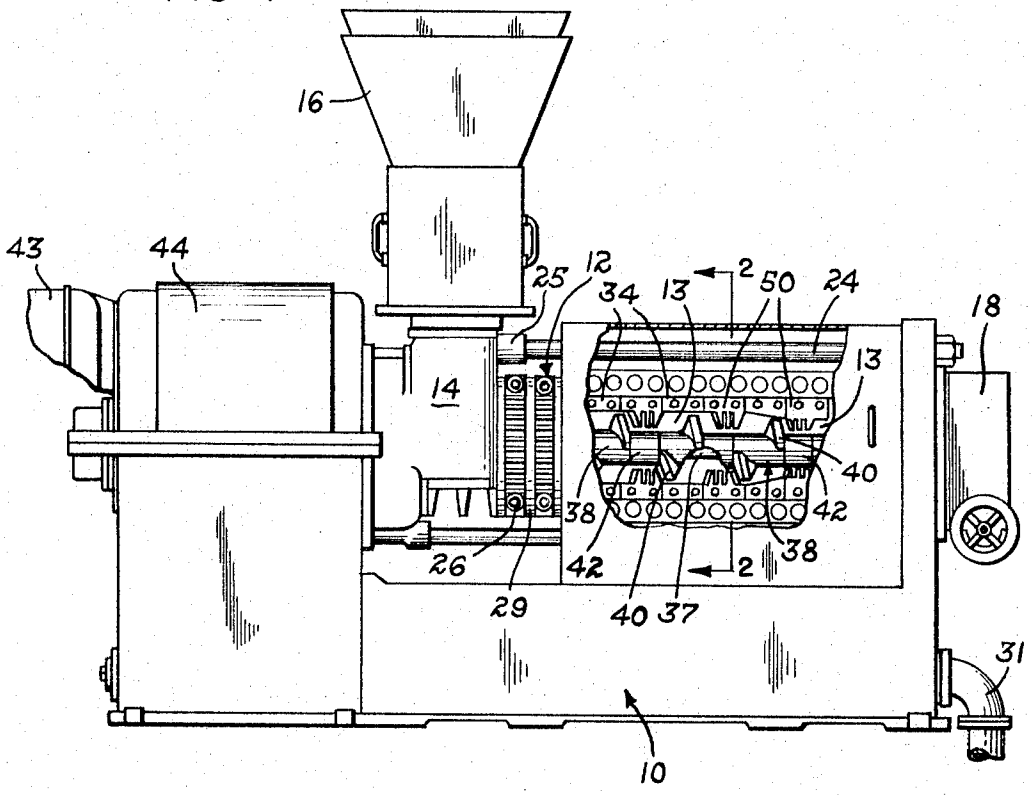
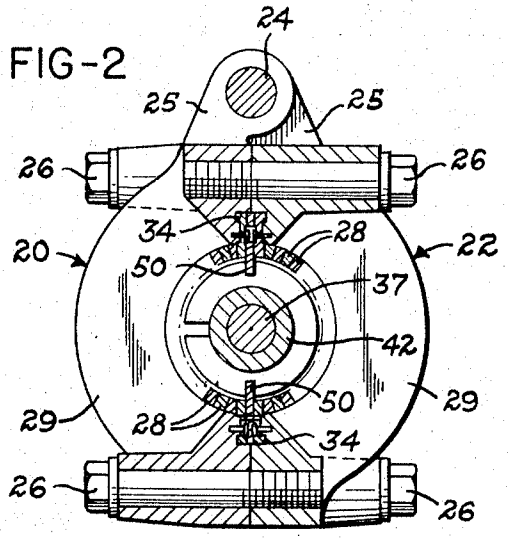


FIG-2



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FIG-3

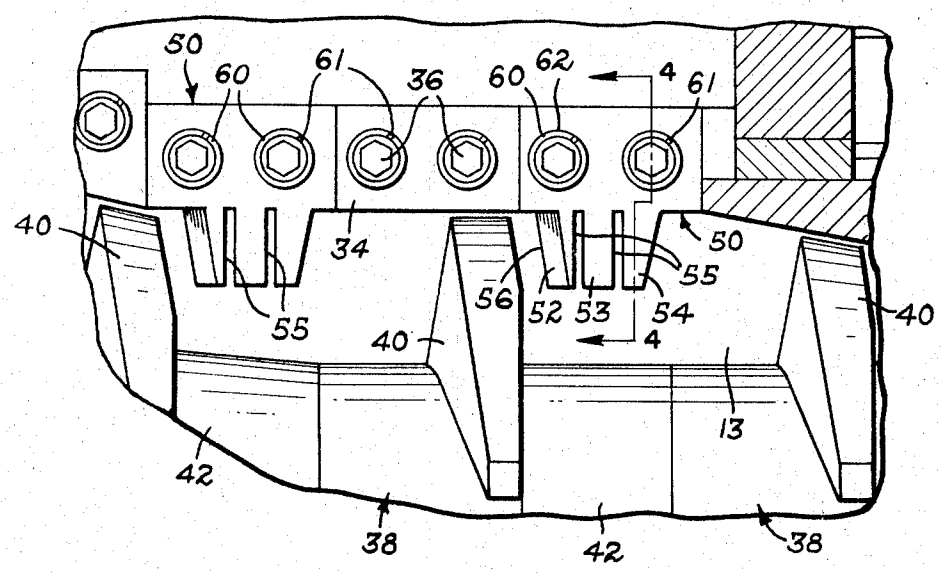


FIG-4

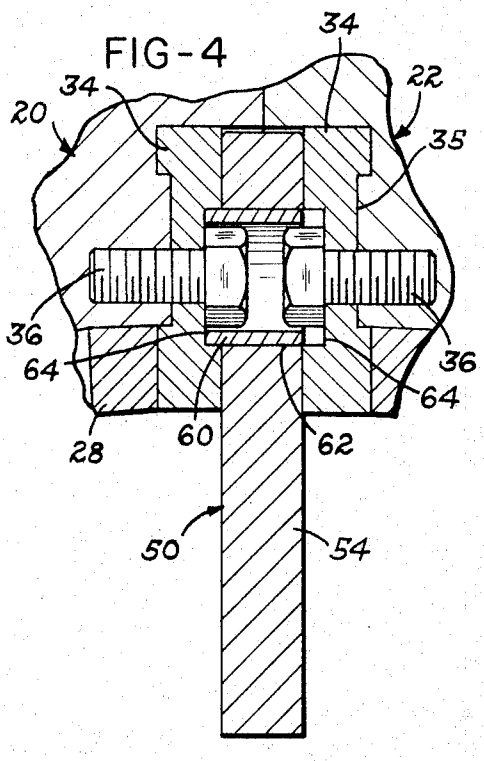
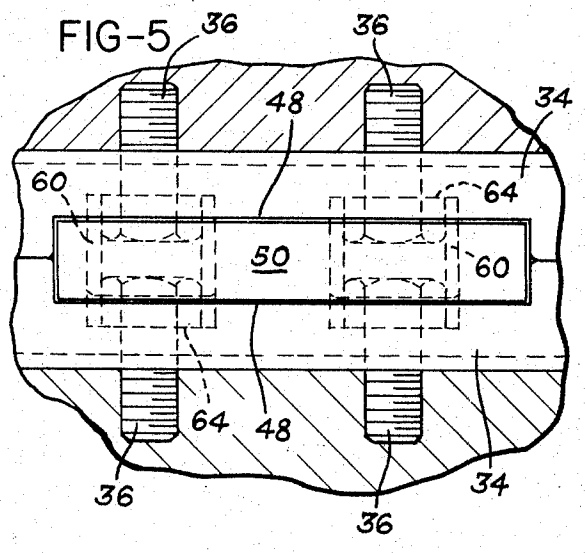


FIG-5



United States Patent Office 3,366,039
Patented Jan. 30, 1968

3,366,039

SCREW PRESS

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Filed June 20, 1966, Ser. No. 558,854
7 Claims. (Cl. 100—150)

ABSTRACT OF THE DISCLOSURE

A mechanical screw press has mating cage sections with spaced screen bars secured by retaining bars for defining a pressing chamber with drainage openings. A shaft supports interrupted screw flights within the chamber, and separate breaker members extend through slots formed within adjacent retaining bars. Each breaker member has a plurality of lug sections projecting into the chamber between the flights and is normally secured to an adjacent retaining bar so that it is automatically released upon separation of the cage sections when the breaker member is surrounded by material remaining in the press.

This invention relates to mechanical screw presses and particularly to an improved breaker bar construction for a screw press having interrupted screw flights.

The invention is ideally suited for use with a drainage type screw press wherein the cage is formed in two half cylindrical sections with each section having mounted therein a series of parallel spaced screw bars extending longitudinally within the section. These screen bars are spaced apart by wedge-shaped spacing members to define drainage openings therebetween and are normally secured or clamped in place by a series of retaining bars from which extend integral breaker bars. Rotatably mounted within the cage is a shaft on which a series of spiral screw flights which are broken or separated by annular collars to define what is termed interrupted flights. The breaker bars extend inwardly toward the shaft between the flights, and primarily serve to prevent substantial rotation of the material being moved from one to the other of the screw flights, and thus aid in directing the compacted material axially toward the discharge end of the press.

It is to be understood, however, that the breaker bar construction of the invention is not limited to use solely on a split cage drainage type screw press, but may be used on any type of screw press wherein material is conveyed under pressure towards the discharge end of the press and it is desirable to resist rotation of the material with the screw member.

In many applications for screw presses, it has been found substantially impossible to prevent any foreign material from entering the press along with the material being processed. For example, when a screw press is used in the sugar industry, it has been found substantially impossible to separate 100% of all the rocks and chunks of metal from the sugar material or bagasse and thus eventually some of these objects are received within the screw press along with the material. Occasionally one of the foreign objects is jammed between one of the breaker bars and a screw flight and promptly causes the breaker bar to shear and be carried with the material along with the foreign object toward the discharge end of the press. Due to the size of some of the wider breaker bars, however, when such a breaker bar shears from a retaining bar, additional damage may result further down the press to other breaker bars, screw bars or to the worm flights. Furthermore, the loss of a breaker bar handicaps the press or renders it less efficient since there is no longer a restriction to prevent the compacted material from rotating with the adjacent worm members or collars mounted on the shaft.

Another problem is presented when it is necessary to shut down a screw press under pressure for servicing. Frequently, it is difficult to disassemble the two half sections of the cage, especially when the compacted material is allowed to set or harden and form a hard ring around the collars between the screw flights and surrounding the breaker bars. Thus, when the half sections of the cage are separated a substantial force must be applied in order for the breaker bars to break up the hardened material. Furthermore, when it is necessary to replace a breaker bar the integral retaining bar must also be replaced which results in loosening the screen bars clamped within the cage section by the retaining bar. Furthermore, to provide certain physical properties for the breaker bars, the entire integral retaining and breaker bar must be constructed from an expensive alloy steel.

Accordingly, it is one primary object of the present invention to provide an improved breaker bar assembly for a high pressure mechanical screw press wherein if a foreign object carried within the material being processed is jammed against the breaker bar, only a smaller portion of the breaker bar will shear thereby reducing the likelihood of damage to the remaining portion of the screw press, and in addition, the remaining portion of the breaker bar prevents a significant reduction of efficiency of the press.

As another object, the invention provides a novel breaker bar assembly for a mechanical screw press as outlined above wherein the breaker bars are less costly to manufacture and assemble, and require less time and expense to replace when the press is shut down for repair.

Still another object of the invention is to provide an improved mechanical screw press which can be more easily disassembled during a shut down under pressure, especially after compacted material has hardened within the press, thus reducing the costly time required for shut down.

It is also an object of the present invention to provide a novel mechanical screw press in which the breaker bars can be removed and replaced without loosening the retaining members which secure the screen bars to the cage sections.

As another object, the present invention provides a breaker bar assembly for a mechanical screw press having a two section cage, wherein the breaker bars can be easily attached to either section of the cage, and can remain within a hardened compacted ring of material when the cage sections are separated during a shut down under pressure to prevent the breaker bars from being damaged and to simplify disassembly.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawing and the appended claims.

In the drawing:

FIG. 1 is an elevational view of a typical high pressure mechanical screw press showing the general arrangement of an improved breaker bar assembly in accordance with the present invention;

FIG. 2 is an elevational sectional view of an assembled screw press cage as viewed along the line 2—2 of FIG. 1;

FIG. 3 is an enlarged detailed view of a breaker bar assembly formed in accordance with the invention;

FIG. 4 is a section view of an assembled breaker bar as would be seen along the line 4—4 of FIG. 3; and

FIG. 5 is a top view of the assembly breaker bar shown in FIG. 4.

Referring to the drawings which illustrate a preferred embodiment of the present invention, the high pressure mechanical screw press shown in FIG. 1 generally includes a base 10 which supports an elongated cylindrical cage 12. The cage 12 defines a circular pressing chamber 13 having an inlet end in communication with an inlet

housing 14 into which material for processing is fed from the hopper 16, and an outlet end in communication with a discharge housing 18. As shown in FIG. 2, preferably the cage 12 is formed in two half sections 20 and 22 which are hinged together at the top by an elongated rod 24 extending through the ears 25. The cage sections 20 and 22 are clamped together by a series of bolts 26 which extend through the upper and lower portions of the cage sections 20 and 22.

A series of axially extending screen bars 28 are mounted in parallel relationship around the internal circumference of the cage ribs 29 and are spaced apart by wedge-shaped spacing members (not shown) so that the screen bars 28 define therebetween narrow elongated drainage passageways. The fluid which is expressed from the material through these drainage passageways is collected in the bottom of the base 10 and is drained from the press through the conduit 31. The screen bars 28 and the spacing members are clamped within the cage sections 20 and 22 by a series of retaining bars 34 (FIG. 3) which have longitudinal extending recesses 35 (FIG. 4) for interlocking with the cage sections 20 and 22. A series of bolts 36 secure the retaining bars 34 to the cage sections.

Rotatably mounted within the cage 12 and extending from the inlet end to the discharge end is a shaft 37 (FIGS. 1 and 2) on which are mounted a series of worm members 38 each of which includes a spiral flight 40 as shown in FIG. 3. The worm members 38 are spaced apart by annular collar members 42 which may be tapered or cylindrical in configuration and are mounted on the shaft 37 to provide gaps or interruptions between adjacent spiral flights 40. The shaft and worm members 38 are driven from the feed end of the shaft by an electric motor 43 through a gear reduction unit enclosed within the housing 44.

By either reducing the inside diameter of the pressing chamber 13 as shown in FIG. 1, or by increasing the diameter of the body of the worm members 38, or by decreasing the pitch between the flights 40, the volumetric space defined between the adjacent flights 40 and the cage 12 is progressively reduced toward the discharge end of the press to provide the desired compression of the material being processed.

As shown in FIGS. 4 and 5, each pair of mating retaining bars 34, which are secured to the cage sections 20 and 22 by the bolts 36 to retain the screen bars 28, are provided with corresponding recesses 48 (FIG. 5) which are aligned when the cage sections 20 and 22 are assembled to define a slot in which is mounted a breaker bar 50 having a thickness substantially the same as combined depth of the recesses 48. Extending radially inwardly and forming an integral part of the breaker bars 50 are a plurality of lug sections or members 52, 53 and 54 which are defined by the slots 55 and are located within the cage 12 in aligned relationship with the collars 42. Preferably, the lug member 52 is provided with a sharp leading edge 56 which cooperates with an adjacent flight 40 to aid in shredding the material being processed.

It has been found that by providing the breaker bar 50 with the lug members 52–54, the likelihood of shearing all of the lug members at one time by a foreign object is substantially reduced. In fact, it has been found that rarely will more than one of the lug members break when a solid foreign object is jammed between a lug member and a screw flight.

The breaker bars 50 are each retained within the recesses 48 by a pair of cylindrical spring pins 60 having axially extending slots 61. The pins are pressed into circular openings 62 (FIG. 4) formed in the breaker bars and extend into corresponding counterbores 64 (FIG. 4) formed within the retaining bars 34. Thus the cylindrical shaped spring pins 60 surround the head of the bolts 36 which secure the retaining bars 34 to the cage sections. As shown, the axial length of each spring pin 60 is slightly greater than the thickness of a breaker bar 50 to assure that the pins will always be retained within a counterbore 64.

Depending in which of the counterbores 64 the spring pins 60 are inserted, however, determines which section of the cage will normally retain the breaker bars 50 when the sections are assembled or are separated during servicing. Furthermore, it can be seen that when the cage sections 20 and 22 are separated the breaker bars 50 can be easily removed simply by tapping or lifting the breaker bars out of the recesses 48 causing the slotted spring pins 60 to pull out of the counterbores 64.

From the drawings and above description, it can be seen that a breaker bar assembly formed in accordance with the invention has several desirable features and advantages. Basically, the individual breaker bars 50 are separate from the retaining bars 34 and thus the retaining bars can be formed from a different and less expensive material than the hardened steel breaker bars 50. This has been found to reduce significantly the construction cost of the cage assembly. The separate breaker bars 50 may also be easily removed from the cage sections 20 and 22 without removing the bolts 36 which secure the retaining members 34 for the screen bars 28. Thus the breaker bars 50 can be replaced without disturbing the precise spacing between the screen bars.

It has also been found that when the cage sections are separated during shut down after a hardened compacted ring of material has formed around a collar 42, the lug members 52–54 of the breaker bar 50 can remain in the hardened material as the cage sections are separated since the breaker bar 50 is free to separate from the cage section. This not only simplifies disassembly but eliminates the danger of bending or shearing a breaker bar which is embedded within the hardened material.

Another important feature is provided by forming the slots 58 within the breaker bars 50 to define the separate lug members 52–54. As explained above, when one lug member is sheared by a rock or some other foreign object, other lug members remain to prevent the material being processed from rotating with the worm members 38 and thereby prevent clogging or a reduction in efficiency of the screw press. Also, the single lug member which is sheared from the breaker bar is more likely to pass through the press without causing further damage.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. An improved mechanical screw press comprising a cage having means defining an elongated tubular pressing chamber, shaft means extending through said chamber and means for driving said shaft means, spiral flight means on said shaft means arranged to move material in a direction from the inlet end of said chamber to the discharge end, means defining a plurality of gaps in said flight means, breaker bars supported by said cage and each including a portion projecting into said chamber and extending into said gaps to resist the rotation of the material with said flight means, and means defining at least one slot in each said portion to form a plurality of smaller separate lug sections which can break away from the bar independently if jammed by a foreign object to minimize the possibility of a significant reduction in efficiency of the press and of further damage to the press.

2. A screw press as defined in claim 1 including means defining a sharp cutting edge on the leading lug section of said projecting portion of at least one said breaker bars for cooperating with said flight means to shred the material.

3. An improved high pressure mechanical screw press adapted to be easily disassembled during a shut down under pressure after material has hardened within the

press and to reduce the time and expense of servicing, comprising a pair of mating cage sections removably secured together to define a generally cylindrical cage, spaced screen bars mounted within said sections to define an elongated circular pressing chamber having drainage openings, a series of retaining bars mounted on said cage sections for securing said screen bars, a shaft extending through said chamber, means for driving said shaft, spiral flight means carried by said shaft for moving the material in a direction from the inlet end of said chamber to the discharge end, means defining a series of gaps in said flight means, a series of separate breaker members supported by said retaining bars and each including a portion projecting into said chamber and adapted to extend into said gaps to resist the rotation of the material with said flight means, means normally securing each said breaker member to an adjacent said retaining bar, and said securing means operable to release the corresponding said breaker member from such retaining bar automatically upon separation of said cage sections when said breaker member is surrounded by material remaining in the press.

4. An improved high pressure mechanical screw press as defined in claim **3** including means defining a series of slots within adjacent said retaining bars for receiving said breaker members.

5. An improved press as defined in claim **3** wherein said means for securing at least one of said breaker members include means defining aligned holes in said breaker member and an adjacent retaining bar, and a generally cylindrical resilient pin extending through said holes.

6. A screw press as defined in claim **3**, including means defining at least one slot in said projecting portion of each said breaker member to form a plurality of smaller separate lug sections which can break from the bar independently.

7. An improved high pressure mechanical screw press adapted to be easily disassembled during a shutdown under pressure after material has hardened within the press and to reduce the time and expense of servicing, comprising a pair of mating cage sections removably secured together to define a generally cylindrical cage, spaced screen bars mounted within said sections to define an elongated circular pressing chamber having drainage openings, a series of retaining bars mounted on said cage sections for securing said screen bars, a shaft extending through said chamber, means for driving said shaft, spiral flight means carried by said shaft for moving the material in a direction from the inlet end of said chamber to the discharge end, means defining a series of gaps in said flight means, means defining a series of axially spaced slots between adjacent said retaining bars, a separate breaker member mounted within each said slot and including a portion projecting into one of said gaps to resist the rotation of the material with said flight means, means for removably retaining each said breaker member within its corresponding said slot, and said retaining means operable to provide for individual replacement of each said breaker member without removing said retaining bars and without replacing an adjacent said breaker member.

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