

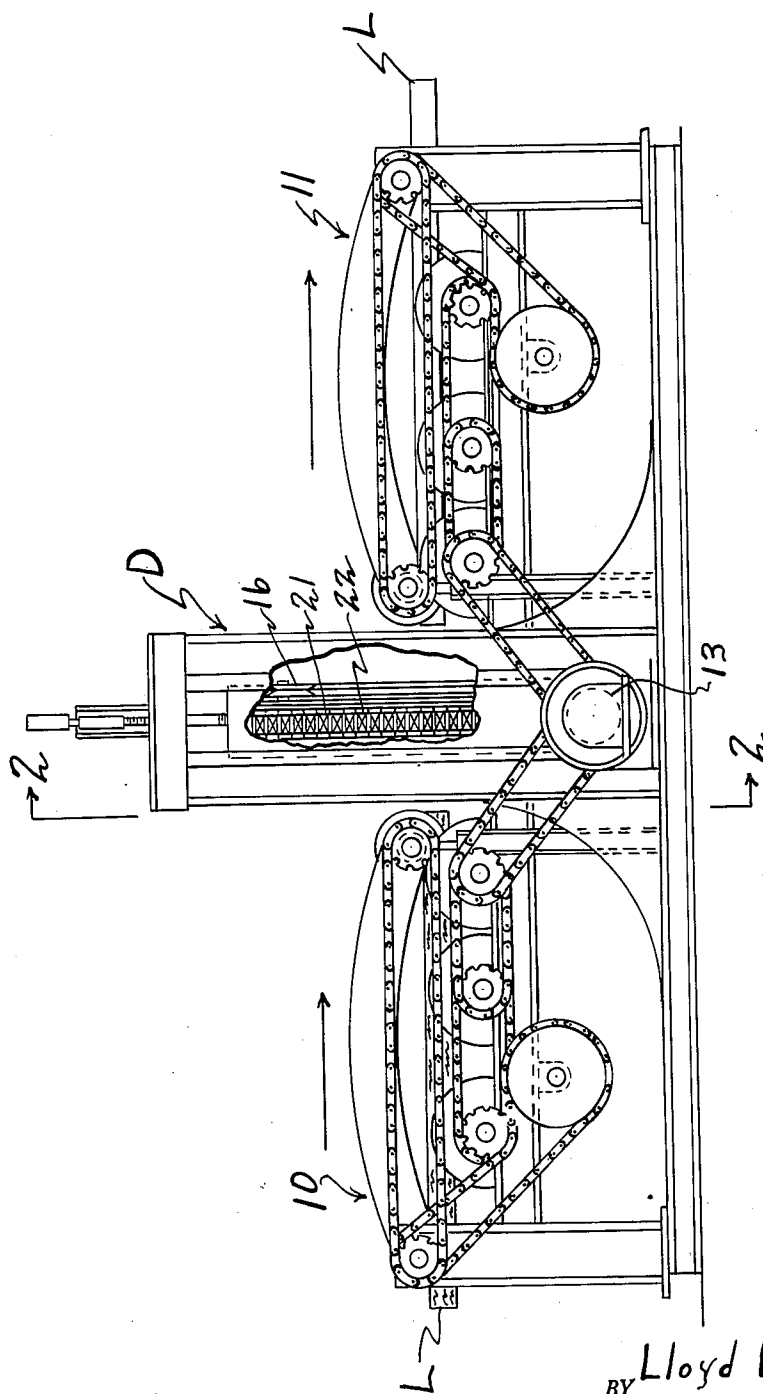
Oct. 16, 1962

L. B. SMITH
RING TYPE DEBARKER

3,058,500

Filed Aug. 31, 1959

6 Sheets-Sheet 1



INVENTOR.
BY Lloyd B. Smith
Jennings, Carter & Thompson
Attorneys

Oct. 16, 1962

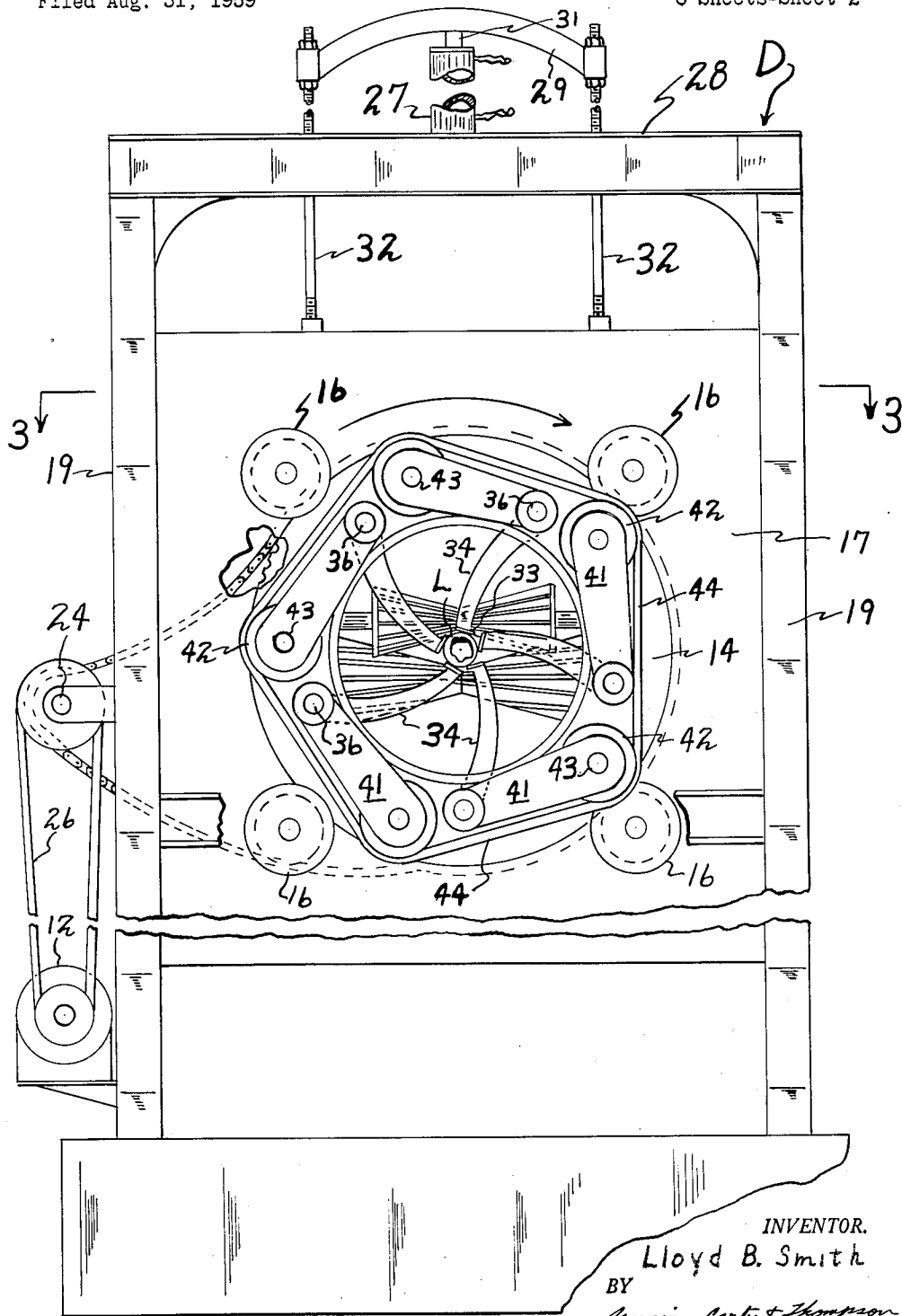
L. B. SMITH

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RING TYPE DEBARKER

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6 Sheets-Sheet 2



III-2

INVENTOR.
Lloyd B. Smith
BY
Jennings, Carter & Thompson
Attorneys

Oct. 16, 1962

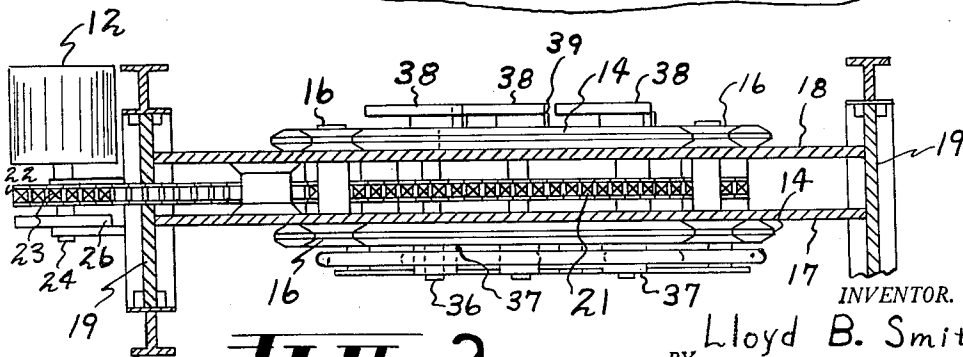
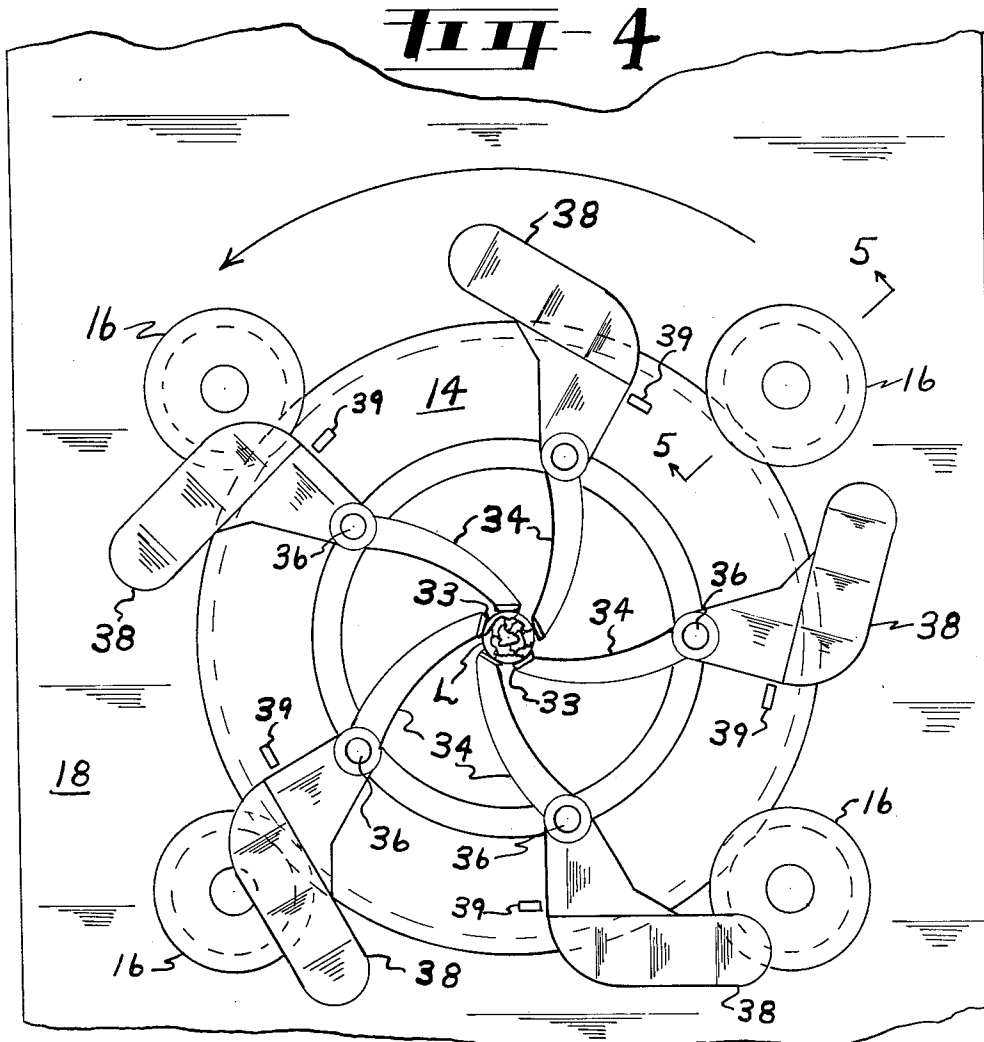
L. B. SMITH

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RING TYPE DEBARKER

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6 Sheets-Sheet 3



INVENTOR.
Lloyd B. Smith
BY *Fleming, Lutz & Thompson*
Attorneys

Oct. 16, 1962

L. B. SMITH

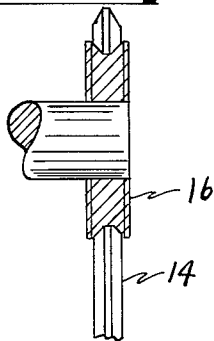
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RING TYPE DEBARKER

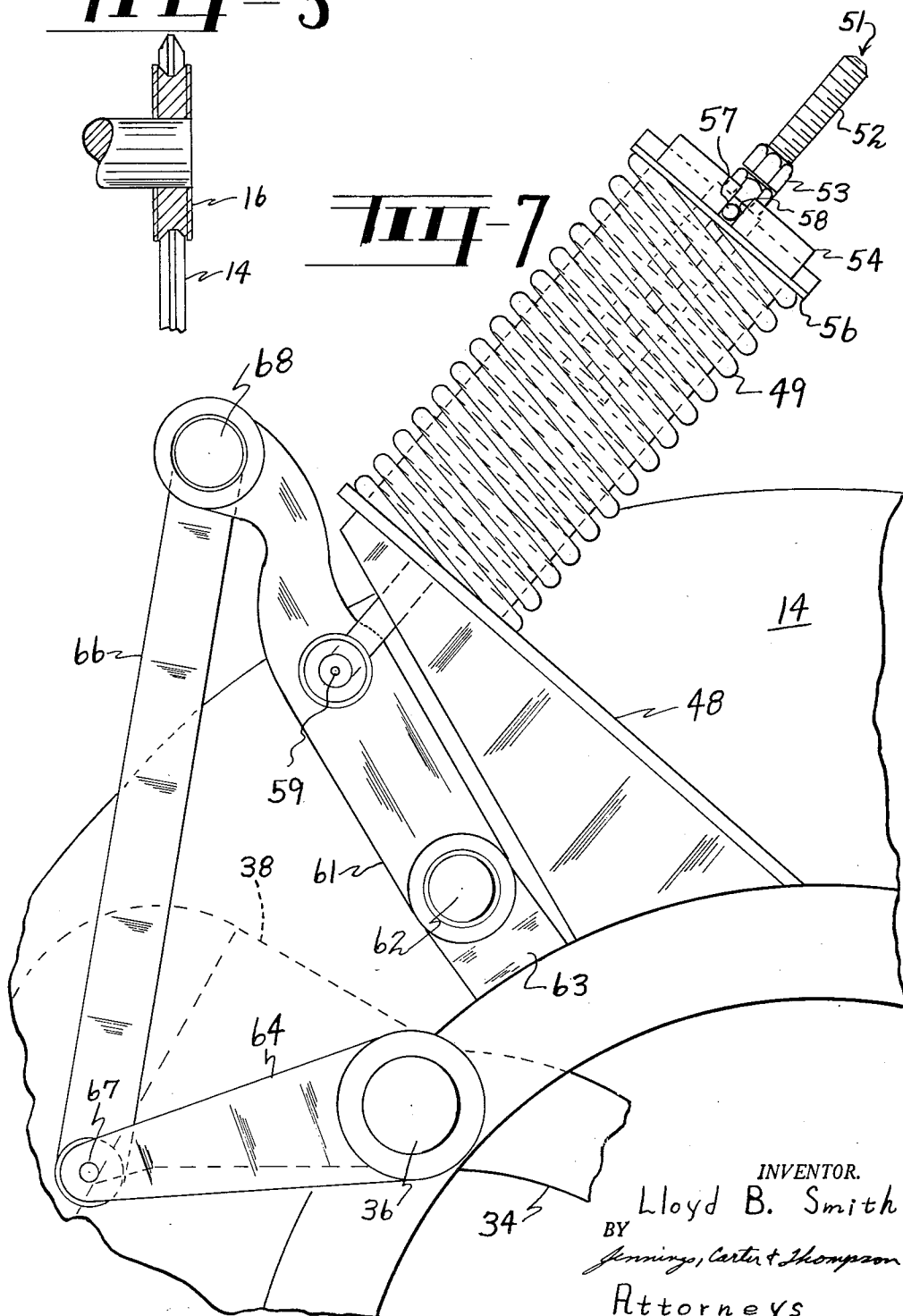
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6 Sheets-Sheet 4

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III-7



INVENTOR.
Lloyd B. Smith
BY *James, Carter & Thompson*
Attorneys

Oct. 16, 1962

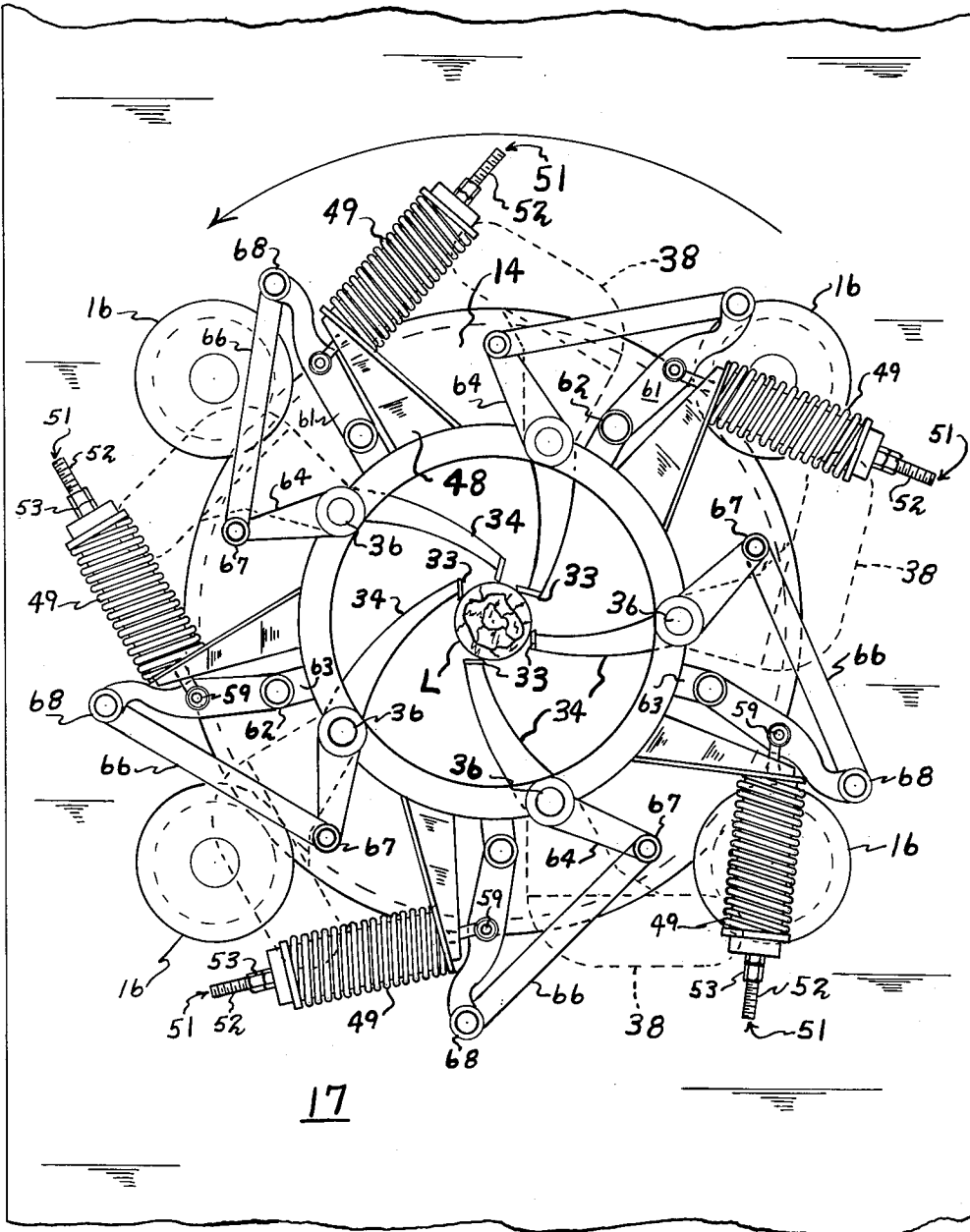
L. B. SMITH

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RING TYPE DEBARKER

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6 Sheets-Sheet 5



III-6

INVENTOR.

Lloyd B. Smith

BY

Jennings, Carter & Thompson

Attorneys

Oct. 16, 1962

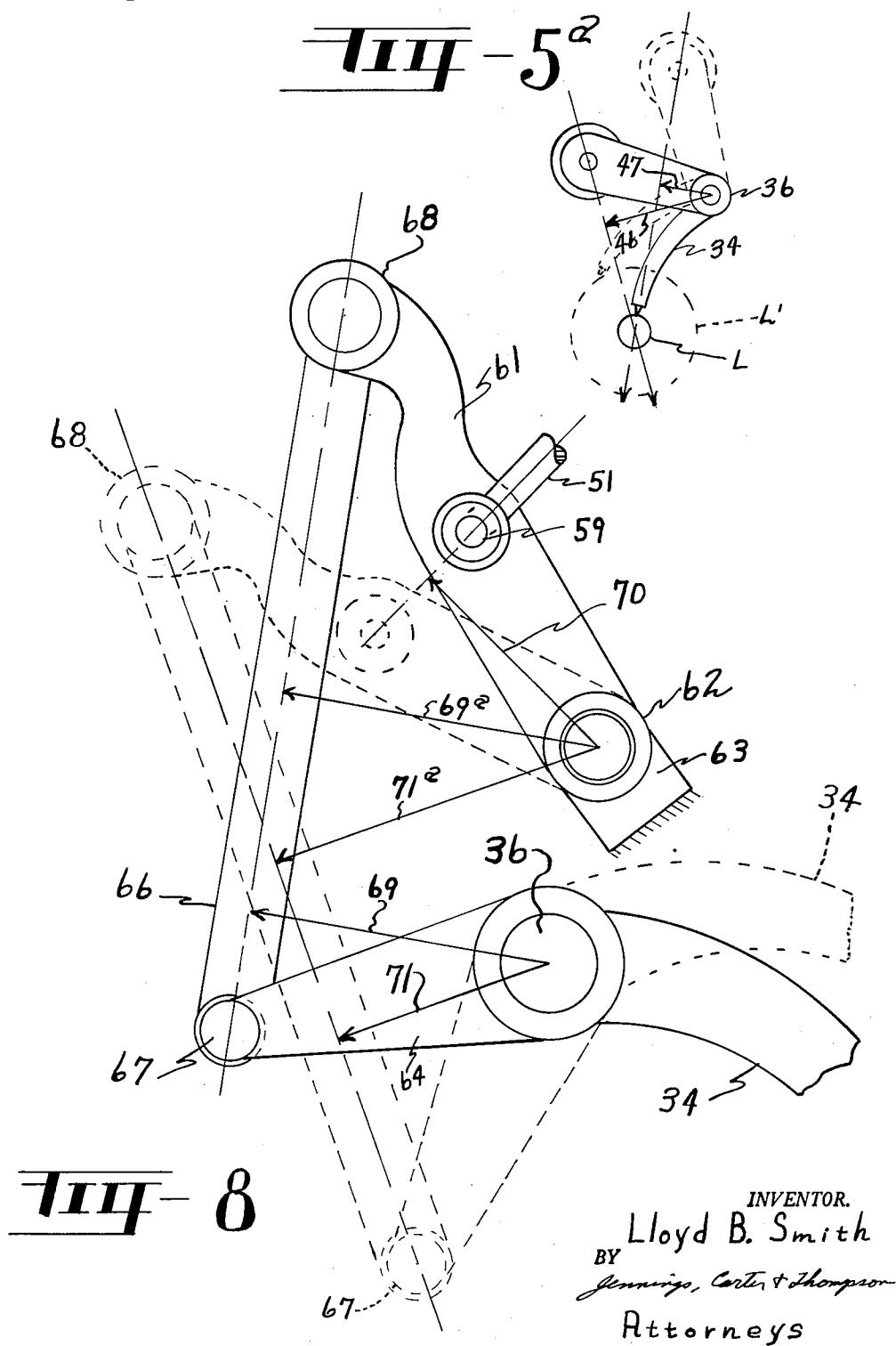
L. B. SMITH

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RING TYPE DEBARKER

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6 Sheets-Sheet 6



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3,058,500

RING TYPE DEBARKER

Lloyd B. Smith, % Owen-Richards Co.,
824 N. 31st St., Birmingham, Ala.

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2 Claims. (Cl. 144-208)

This invention relates to debarkers of the rotary ring type and more specifically to improved means for holding the debarking or rossing tools to their work, thereby improving the efficiency of the debarking operation.

Many ring type debarkers have been patented and used commercially. In recent years workers in this art have sought to improve the bark removing efficiency of such machines by making improvements in the means to load the debarking tools, that is, the means to hold them to their work throughout the usual large range of log sizes. In every case known to me, prior workers have based their designs upon the assumption that the tools should be urged with greater force against a large log than against a small log. Apparently this concept has been predicated upon the assumption that for a constant speed of rotation of the ring, the tools must be pressed harder against a large diameter log because the peripheral speed of the tools about such large log is greater than the peripheral speed of the tools about a smaller log. Stated differently, it heretofore has been accepted as axiomatic that for a given ring speed the force of the tools against the log should vary in direct ratio to the diameter of the log then being debarked. It is known that prior debarkers either leave some of the bark on some logs or gouge beneath the cambium layer and damage the wood.

In my investigations into this subject I have discovered that instead of varying the loading of the tools the same should be substantially constant for all sizes of logs from about 3 inches in diameter to about 26 inches in diameter. My experiments and actual experience in the field indicate that the removal of bark from a large diameter log, insofar as concerns the considerations here pertinent, is not substantially more difficult than removing bark from a smaller diameter log. I find that instead of having a compromise between less force for small logs and large force for large logs, a steady, constant tool loading force is far more efficient in removing bark and less damaging to the wood. So long as the tool loading force is adequate for, say, a 6 inch diameter log, I have found it to be adequate for, say, a 24 inch diameter log.

In view of all the foregoing my invention contemplates a rotary ring debarker in which the tools are held to their work by forces which are substantially constant throughout the entire range of log sizes for which the apparatus is designed.

A more specific object is to provide apparatus of the character designated in which the tool loading force may be obtained either by a spring for each tool or by a wrap-around type elastic member, common to all the tools, the elastic member being mounted to rotate bodily with the ring as distinguished from being non-rotatably mounted relative thereto.

A further object is to provide in combination with either of the above tool loading means counterweights effective substantially to eliminate the variable loading of the tools which otherwise prevails by reason of centrifugal force as the ring rotates.

A still further object is to load each tool through simple, uncomplicated and rugged linkages, assuring long, trouble-free service from the apparatus.

Apparatus illustrating features of my invention is shown in the accompanying drawings forming a part of this application, in which:

FIG. 1 is a side elevational view, partly broken away,

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and showing a general view of my improved debarker;

FIG. 2 is an enlarged fragmental view taken generally along line 2-2 of FIG. 1 and showing the tools loaded to their work by means of my improved continuous elastic member;

FIG. 3 is a detail sectional view taken generally along line 3-3 of FIG. 2;

FIG. 4 is a view looking at the opposite side of the apparatus from that shown in FIG. 2 and illustrating the counterweights for the tools;

FIG. 5 is a detail sectional view taken generally along line 5-5 of FIG. 4 and showing one of the supporting rollers for the rotary ring;

FIG. 5a is a diagrammatic view illustrating the change in the effective lever arm through which the tool loading force is applied in different positions of the tools;

FIG. 6 is a view corresponding generally to FIG. 2, on an enlarged scale, and showing a modified form of tool loading mean embodying springs;

FIG. 7 is an enlarged detail view of one of the spring loading means and the linkages for transmitting the force thereof to the tools; and

FIG. 8 is a diagrammatic view illustrating the manner of transmitting force to the debarking tools.

Referring now particularly to FIGS. 1 to 5a inclusive, I illustrate my invention in association with a ring type debarker which has associated therewith a log infeed mechanism indicated generally by the numeral 10 and an outfeed mechanism for the debarked logs indicated generally by the numeral 11. The debarker proper is indicated in FIG. 1 generally by the letter D. A motor 12 shown in FIG. 2 drives the ring of the debarker by means presently to be described, while a motor 13 drives the log infeed and log outfeed mechanisms 10 and 11.

Referring more particularly to FIGS. 2, 3 and 4, the debarker D comprises generally a ring formed of a pair of spaced plates 14 mounted on grooved rollers 16 in a frame made up of plates 17 and 18. The plates 17 and 18 are supported in vertical framework 19. A sprocket 21 is carried by the ring and a chain 22 passes over the sprocket 21 and over a sprocket 23 on a jack shaft 24 mounted in suitable bearings from the adjacent vertical supporting frame 19. The motor 12 drives the jack shaft 24 by means of a V-belt 26.

The entire ring and plates 17 and 18 are mounted for vertical movement in the supporting framework 19. Movement is accomplished by means of a fluid pressure cylinder 27 mounted on a cross member 28. A yoke 29 is carried by the piston rod 31 of the cylinder and in turn is connected by rods 32 to the entire mechanism comprising the plates 17-18 and the rotary ring. The mechanism thus can be accommodated to logs of different diameters without the necessity of raising or lowering the infeed and outfeed mechanisms 10 and 11.

The machine described so far is, by and large, standard in the art. My invention comprises the manner of loading the debarking tools 33. The tools 33 are carried on the outer ends of arms 34 which are fast on pins indicated at 36 and the pins pass through both of the rings 14 and are supported for rotation therein in suitable bearings indicated at 37. The arms 34 are sloped on the infeed sides thereof so that as a log approaches the ring the arms spread outwardly to admit the log.

Mounted on each arm 34, opposite the pivot point formed by the pin 36, is a counterweight 38. The counterweights 38 are of such magnitude so as to exert a force on the arms and hence the tools 33 to nullify the change in working pressure of the tools 33 occasioned by the centrifugal force-weight relationship of the arms 34 and tools 33 as the ring rotates. Stops 39 are provided against which the outer ends of the arms carrying the

counterweights may rest to limit the inward movement of the arms.

Secured to the opposite end of each pin 36, that is, on the infeed side of the machine, is an arm 41. The arms 41 carry rollers 42 in their outer ends which are mounted on suitable bearings in turn carried on pins 43 in the outer ends of the arms. One form of my improved means for urging the tools 33 toward the log L comprises an endless resilient member 44 and which is stretched taut over the rollers 42 on the ends of the arms 41. For instance, the member 44 may well be an endless length of "shock cord" such as is used for shock absorber purposes in connection with aircraft landing gear. This material generally is made of a plurality of strands of rubber and when stretched forms a very efficient and long lasting force exerting member. It is to be particularly noted that the elastic member 44 rotates with the arms 41 and the ring as distinguished from having the ends of the same anchored to the stationary frame, as for instance in Patent No. 2,843,168, issued July 15, 1958, to Edward O. Lunn.

It will further be noted that the relationship of the arms 41 and the tool arms 34, both of which are of course fast on the pins 36, is such that as the diameter of the log L increases the effective leverage on the arms 34 exerted by the tension member 44 decreases. By reference to FIG. 5^a it will be seen that with the parts in the position shown in full lines, being the position for a small log, the effective lever arm is indicated by the line 46. It will be appreciated that the force of the member 44 is radially inward in all positions of the parts. When a larger log L¹ is in the machine the parts move to the dotted line position shown in FIG. 5^a. In this case the effective lever arm urging the tools to their work is indicated by the line 47. It will thus be seen that while the total force of the member 44 increases due to further stretching of the same upon the insertion of a larger log, I proportion the lengths of the arms 34 and 41 so that the working force of the tools remains substantially constant regardless of the diameter of the log from the smallest to the maximum that the machine will take.

Referring now particularly to FIGS. 6, 7 and 8 I show a modified form of force exerting means for the tool arms 34. In this instance I provide brackets 48, one for each tool arm, on the side of one of the ring plates 14 and these form seats for coil springs 49. Passing through each spring 49 is a shaft 51 having an outer threaded end 52 carrying a pair of lock nuts 53. The spring surrounds a cylindrical member 54 which prevents the spring from collapsing. Mounted about the cylinder 54 is a slide member 56. A pin 57 passes through the shaft 51 and rests on top of a flange of the member 56 and in turn slides in slots 58 in the side walls of the cylinder 54. Thus, the slide 56 rests against the upper end of the spring and compresses it between the slide and the bracket 48 as the shaft 51 moves inwardly.

The lower ends of each of the members 51 are pivotally connected at 59 to a force exerting arm 61 in turn pivotally connected at 62 to bracket 63 on the ring plate 14.

Extending outwardly from the pins 36 and fast thereon are arms 64. A link 66 is pivotally connected at 67 to the arm 64 and at 68 to the arm 61. It will be understood that the counterweights 38 heretofore described preferably are employed also with the form of the invention being described and that they may be mounted on the opposite ends of the pins 36 as shown in dotted lines at 38 in FIGS. 6 and 7.

From a consideration of FIG. 8 it will be seen that with the parts in the full line positions, namely, corresponding to the full line position shown in FIGS. 6 and 7, which is the position of the arms 34 for the smallest size log, the effective lever arm urging the tools toward the log remains constant. That is to say, when the parts move from the full to dotted line positions, the total force exerted by the spring increases. However, the torque

tending to rotate the tool arms can be mathematically stated as follows:

Torque on tool arm equals the effective length of the lever arm indicated by line 70 times the force exerted by spring 49 times the length of the lever arm indicated by line 69 divided by the length of the lever arm indicated by line 69^a. In the dotted line position, wherein the spring 49, being compressed, exerts more force, the torque applied to the tool arms is substantially equal to that in the full line position because of the torque decreasing effect of the effect of the ratio of the length of the lever arm indicated by line 70 divided by the length of the lever arm indicated by line 71^a. In both of the the above positions and all intermediate positions, I ignore the very minor effect of the slight change in effective lever arm 70 due to the movement of point 59 relative to pivot point 62. Therefore, by properly designing the lengths of arms 61 and 64 and positioning the pivot point 59 at the correct place on arm 61, I effectively maintain substantially constant force on the logs regardless of their diameter throughout the entire range of sizes for which the machine is built. It will be noted that the linkage arrangement just described contains at least one floating pivot point.

From the foregoing the method of constructing and using my improved apparatus will be readily understood. In the modification first described, instead of having the resilient member 44 anchored to a part of the fixed frame as heretofore has been done, I let the same travel bodily with the ring. This has the definite advantage of increasing almost indefinitely the life of the shock cord or other resilient member 44 when compared to those previous types of machines in which such member is anchored to a fixed part of one frame or runs over a pulley or roller mounted on a fixed part of the apparatus. While the counterweights 38 are not absolutely essential in either form of the invention shown and described, nevertheless, I find them to be highly advantageous in eliminating the varying tool pressures in response to the weight of the tools combined with the centrifugal force effect as the ring rotates.

In the modification shown in FIGS. 6, 7 and 8 the springs 49 may be selected so that a relatively large range of log sizes is permissible. Further, the force exerted by the springs may be regulated by means of the nuts 53 on the threaded shafts 51, in addition to building into the machine by proper proportioning of the arm lengths such force as may be desired or necessary.

As a general proposition and with respect to debarking short leaf pine (*Pinus echinata*), in sizes of from 3 inches to 26 inches in diameter, I find that a desirable force of contact of the tools 33 with the logs lies in the neighborhood of 275 pounds. In actual practice with a machine made in accordance with FIGS. 1 to 5^a, inclusive, I find that consistently for all practical purposes, my improved apparatus removes all the bark with negligible wood damage throughout the entire range of such sizes. Further, the presence of knots and projecting stub limbs on the trunk of the logs does not appear adversely to affect the removal of the bark. I attribute this primarily to the quick recovery of the tools to their working positions upon striking such projection due to their low inertia and to the improved ways of loading them described herein.

While I have shown my invention in but two forms, it will be obvious to those skilled in the art that it is not so limited but is susceptible of various other changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. The combination with a ring type debarker of the kind having a plurality of independently movable debarking tool arms mounted on the rotating ring with debarking tools on inner ends of said arms, of a com-

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pression spring for each tool arm operatively connected to and rotatable with the ring and tool arms and effective to exert increasing forces as the arms move from minimum log size positions toward maximum log size positions, a force exerting arm for each tool arm pivotally connected adjacent its inner end to the ring and rotatable therewith, a force transmitting connection from the spring connected intermediate the ends of the force exerting arm, and a link extending between and pivotally connected adjacent opposite ends to the outer end of each force exerting arm and the outer end of each tool arm, the distance between the pivot points on opposite ends of the links being greater than the distance between the pivot points of the tool arms and the force exerting arms so that the respective lengths of the leverages on the tool arms compensate for the changes in force exerted by the compression springs whereby substantially predetermined loading forces on the debarking tool arms are applied.

2. The combination with a ring type debarker having a plurality of independently movable tool carrying members pivotally mounted on a rotating ring with debarking tools on the ends of said tool carrying members, of a force transmitting arm for each tool carrying member pivotally mounted on the ring for rotation therewith and disposed closely adjacent its associated tool carrying member, a link extending between each tool carry-

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ing member and its associated force transmitting arm and pivotally connected at opposite ends to said arm and member, a compression spring for each force transmitting arm mounted on the ring for rotation therewith and effective to exert varying forces when debarking logs throughout a range of log diameters, a force transmitting connection from the spring to the associated arm, the distance between the pivot points on opposite ends of said link being greater than the distance between the pivot points of said arm and said tool carrying member on the ring, whereby the effective lengths of the leverages on the tool carrying members very to compensate for the changes in spring force.

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