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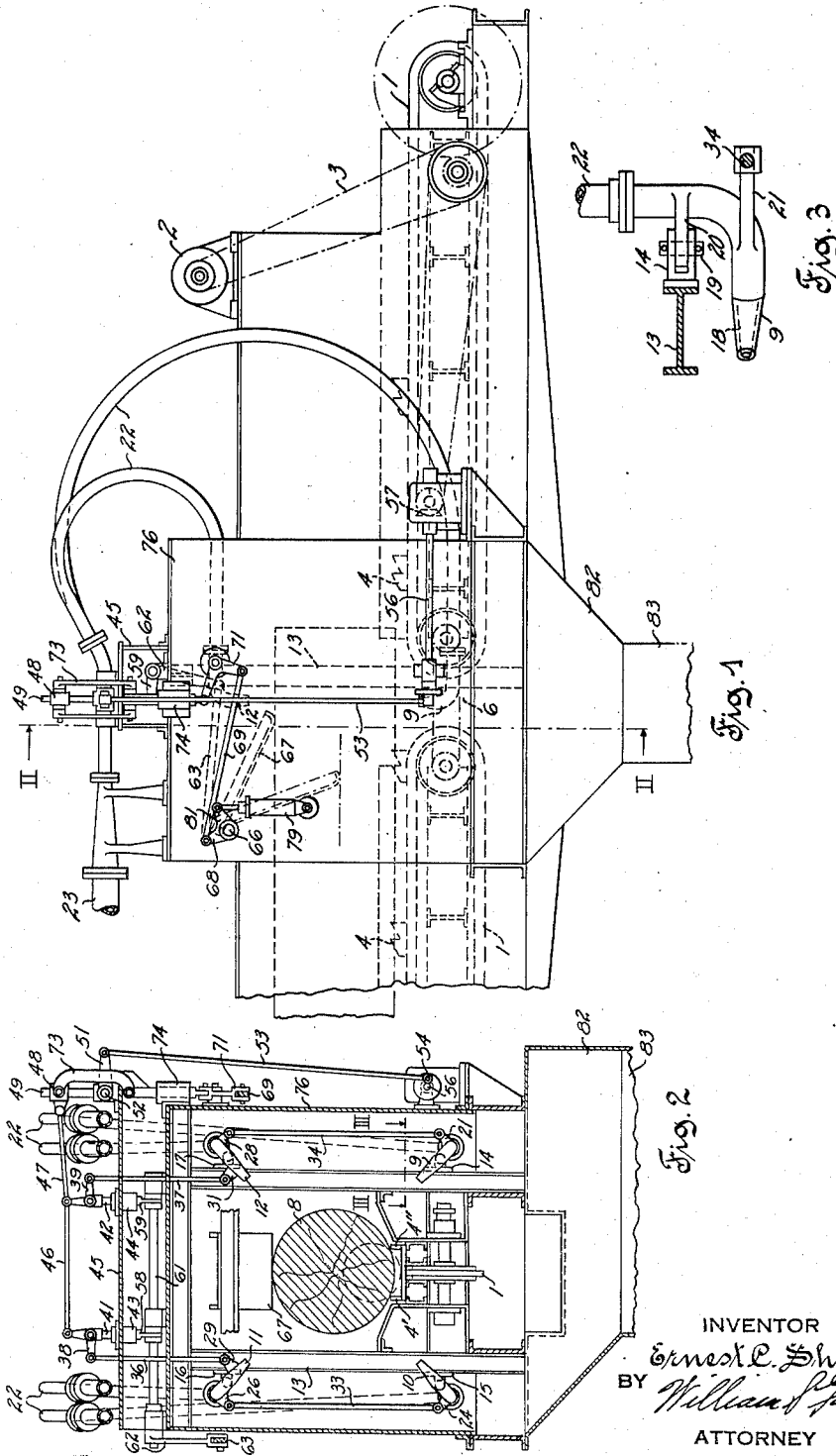
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LOG BARKING APPARATUS HAVING CONVERGING OSCILLATABLE
WATER JETS AND MEANS TO PROPORTIONALLY VARY CENTER
OF CONVERGENCE AND AMPLITUDE OF OSCILLATION

Filed Nov. 18, 1948

2 Sheets-Sheet 1



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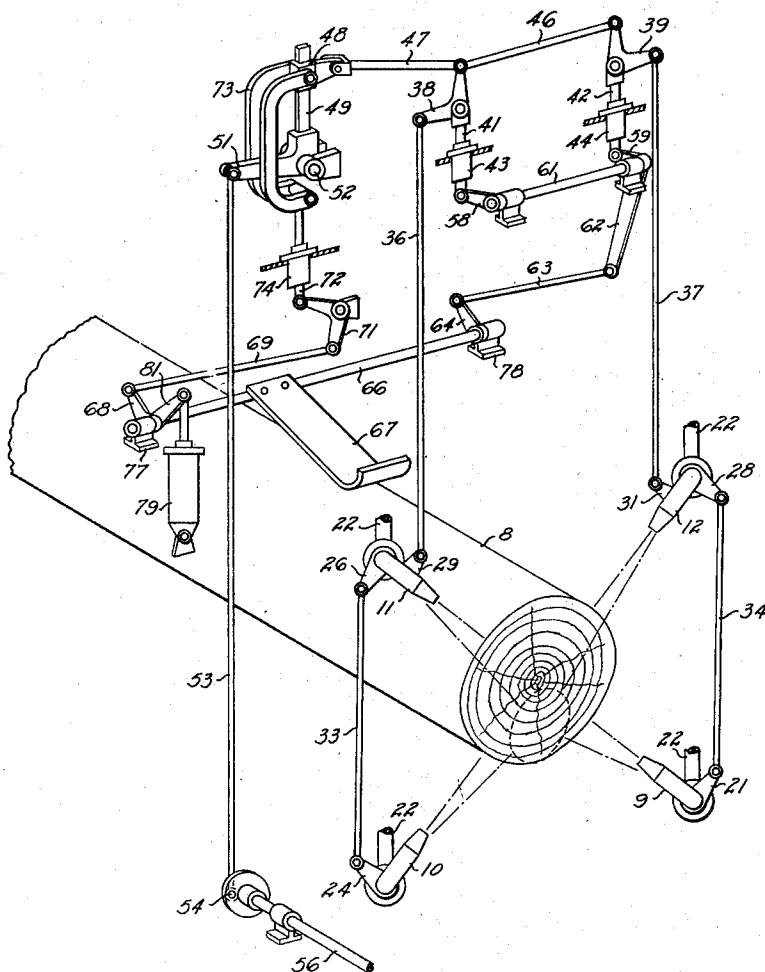


Fig. 4

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LOG BARKING APPARATUS HAVING CONVERGING OSCILLATABLE WATER JETS AND MEANS TO PROPORTIONALLY VARY CENTER OF CONVERGENCE AND AMPLITUDE OF OSCILLATION

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This invention relates to improvements in mechanism for barking and cleaning or treating logs or similarly formed objects of varying sizes by directing high pressure jets of water or other liquid against their surfaces.

The barking and cleaning of logs for saw and pulp mills by hydraulic jets has been successfully accomplished in the past by machines turning logs like a lathe with a traveling jet acting as a tool, by rotating and actually moving a log so that its surface is acted upon by stationary tools and hydraulic jets, and by hydraulic jets oscillating in planes both perpendicular to and longitudinal of the log axis while rotating and advancing the log longitudinally continuously or intermittently.

The nature of the present invention is the provision of a novel combination of elements in a mechanism for causing hydraulic jets from a limited number of nozzles to act effectively upon the peripheral surfaces of cylindrical objects of various diameters as they pass the jets, the objects being conveyed in a longitudinal direction without rotation by a conveyor of suitable type. The present invention also concerns provision of a mechanism for simultaneously adjusting a plurality of nozzles to direct the same substantially in radial relation towards a shifting common center to accommodate cylindrical objects of different sizes.

Still more particularly the nature of the invention is the provision of means for simultaneously oscillating the nozzles of such a hydraulic jet mechanism in planes substantially perpendicular to the longitudinal conveying axis, through angles proportional to the size of the object being handled, to maintain efficient and effective covering of peripheral surfaces of objects of different sizes in passing.

An object is to provide a simple and effective mechanism for barking and cleaning logs by a plurality of oscillating hydraulic jets controllable to simultaneously vary the mean direction and amplitude of oscillation of each of the jets to bark the entire circumference of logs of varying sizes in a single pass through the machine with a minimum overlapping of the paths of the jets.

The invention, having above and still further objects and advantages, may be carried into practical effect as described hereinbelow with reference to the accompanying drawing, in which:

Fig. 1 is a fragmentary side view of a log barker according to the invention;

Fig. 2 is a cross sectional view of the barker taken on line II-II of Fig. 1;

Fig. 3 is a detail view to an enlarged scale of a nozzle mounting in the structure of Figs. 1 and 2; and

Fig. 4 is a phantom view of the nozzle adjusting

and control and actuating mechanism of the invention.

The invention may be embodied in a device as illustrated in the drawing, in which a continuous chain or other known type of endless moving conveyor 1 is driven by a motor 2 through a suitable known type of transmission 3 such as is indicated in construction lines. The conveyor 1 may be of any known type having an element or elements 4 forming a trough-like table or bed on which a cylindrical object will be in a naturally stable position supported by contact at several chordally spaced points of its periphery with suitable surfaces of such bed or table. If a stationary trough or bed is used, suitable known means may be used to push or pull the object along the bed or trough, but in the preferred form illustrated in the drawing, a pair of identical endless chain conveyers, having specially formed material engaging links or elements 4 movable with the endless chain are longitudinally aligned with a short gap between them as shown at 5 so that an interrupted continuously moving conveyor table or bed is formed, the gap between the two sections being short enough to be readily spanned by elongated objects of the sizes to be handled. No reference character is assigned to the bed or table per se because in the device illustrated it is formed by the series of pairs of laterally spaced points 4' and 4'' of elements 4 as they move along the upper reach of the conveyor, suitably supported on horizontal guide surfaces in a well known manner. Elements 4 form in themselves a guide for objects to be conveyed.

It will be seen that an object 8 placed on conveyor 1 at the left end of Fig. 1 rests upon elements 4 with chordally spaced lower portions of its peripheral surface engaged by the spaced points 4' and 4'', and that if an object of smaller diameter is substituted, as shown in broken lines in Fig. 2, such object will similarly rest on points 4' and 4'' along longitudinal elements of lower portions of its peripheral surface traveling in paths identical with those along which similar lower longitudinal surface elements of a larger object 8 will travel, and that the centers of the circular cross sections of such objects of dissimilar size will travel in different paths, at different heights, in a vertical plane midway between and perpendicular to the chord between 4' and 4''.

One of the uses of the present machine is the debarking and cleaning of logs by action of hydraulic jets upon its peripheral surface. These hydraulic jets will remove bark over a substantial area surrounding the point of impact, but if all bark is to be removed from a log 8 in passing on conveyor 1, it will be necessary either to provide a great many jets, or to move the points of im-

pingement of one or more jets circumferentially with relation to the log surface as the log moves longitudinally. The present invention contemplates use of a smaller number of jets than would be required to remove all bark in longitudinal strips without relative circumferential motion and to move the points of impact of these jets circumferentially through limited arcs as the log passes in longitudinal translational movement.

Nozzle elements 9, 10, 11, and 12 are mounted at four portions of nozzle support framework 13, these portions being pivot bearing brackets 14, 15, 16 and 17, located in equiangularly spaced relation about a mean path of material travel represented in the drawing by the path of the center of a mean or average size log 8, and equally radially spaced therefrom. Each nozzle element has a jet forming fluid passage 18, with its longitudinal axis in a plane perpendicular to its pivot axis, that is the axis of pin 19 shown in Fig. 3 through the pivot arm 20 of the nozzle element 9 which has a crank arm 21. Passage 18 is connected by a curved passage within the nozzle body with a flexible conduit 22 leading from a source of supply of fluid such as pipe 23.

The crank arms 21, 24, 26 and 28 of nozzle elements 9, 10, 11 and 12, respectively, are employed to link the nozzle elements together for simultaneous oscillating motion. In the device shown, additional crank arms 29 and 31 are formed on nozzle elements 11 and 12, respectively, to accommodate parts of a linkage to obtain the desired nozzle motions. Links 33 and 34 connect equally eccentric points on nozzle pairs 10—11 and 9—12. Links 36 and 37 connect equally eccentric points on crank arms 29 and 31 with bell cranks 38 and 39 pivoted on push rods 41 and 42, respectively. Push rods 41 and 42 are slidable in suitable guide members 43 and 44 in a linkage frame member 45 suitably connected with the stationary base as by nozzle support framework 13. Another arm of each of the bell cranks 38 and 39 connects with a connecting link 46, substantially perpendicular to links 36 and 37, to complete the linkage connecting all nozzles for simultaneous oscillation. It will be noted that links 33 and 34 are, in a mean position, substantially parallel to and equally spaced from lines joining the pivot axes of nozzle pairs 10—11 and 9—12, and links 36 and 37 are substantially parallel.

Link 47 connects an eccentric point of bell crank 39 with a pivot point on a block 48 mounted to slide along an arm 49 of an adjustable bell crank 51 pivoted at 52 on the stationary frame member 45. Another eccentric point on bell crank 51 is connected to a connecting rod 53 which connects it with crank pin 54 on a rotatable shaft 56, suitably connected with a drive means such as gears 57 for rotating the shaft 56. Gears 57 may be driven by any suitable source of power (not shown); and it will be seen that rotation of shaft 56 will oscillate crank 51 causing link 47 to reciprocate and nozzles 9, 10, 11 and 12 to simultaneously oscillate.

The crank arms of the linkage are of lengths and arrangement which will result in equiangular oscillation of the nozzles 9, 10, 11 and 12 through an angle determined by the crank arm lengths and the setting of push rods 41 and 42.

Push rods 41 and 42 are suitably coupled to eccentric points of bell crank levers 58 and 59 on an oscillatable shaft 61 having a third lever arm 62, joined by a link 63 with lever arm 64 on a con-

trol shaft 66, pivotally mounted with relation to the common base of the conveyer 1 and nozzle mounting framework 13, as more particularly described hereinbelow. The control shaft 66 has a size sensing object contacting lever or rider 67, which is arranged to swing from above into the path of objects moving along on the conveyer 1, and is shown in Fig. 1 in two different positions (the lower one being in construction lines). This rider 67 will occupy a position dependent upon the height of the object surface contacted, above the conveyer bed or points 4' and 4'', which is a rough measure of the diameter in the case of cylindrical objects.

The control shaft 66 also has another lever arm 68 connected by a link 69 with an eccentric point of a bell crank lever 71, another eccentric point of which is connected by a push rod 72 and link 73 with block 48 in such a manner that the effective length of the arm 49 is controlled by the position of rider 67, which is dependent upon the size of object being handled. Push rod 72 is slidable in a suitable guide member 74 on frame member 45.

Framework 13, the nozzle elements 9, 10, 11 and 12 and the adjacent portion of the conveyer 1, are enclosed by a tunnel like housing 76, which may support the bearings for the control shaft 66, which bearings may take the form of suitable brackets 77 and 78, shown in Fig. 4, appropriately secured to the housing in any suitable known manner (not illustrated).

The device shown at 79 is a dashpot, of any suitable known construction, pivotally connected with a suitable stationary part of the frame or housing and with a crank arm 81 on control shaft 66, to prevent too rapid dropping of rider 67, check bouncing, etc.; and this dashpot device 79 may have an external spring (not shown) to bias the rider downwardly if its weight is insufficient to operate the linkage in a nozzle lowering direction.

Suitable means such as hopper 82 and conduit 83 may be connected with the bottom of housing 76 to receive fluid and debris from the operation of the device.

Operation of the device illustrated is described as follows:

The fluid supply conduit 23 is connected with a suitable controllable source (not shown) of hydraulic fluid under high pressure (pressures on the order of 500—1200 p. s. i. being ordinarily employed in operations for removing the bark from logs). The nozzle elements 9, 10, 11 and 12 will project the hydraulic fluid from the nozzle passages 18 at a very high velocity, and the resulting jets will oscillate and sweep across objects traveling along the conveyer bed, in a plane perpendicular to the line of travel of such objects.

Rider 67 will take a position dependent upon the vertical height above points 4' and 4'' of the uppermost surface of an object being treated. Rider 67, through control shaft 66, arm 64, link 63, lever 62, shaft 61 and levers 58 and 59, will adjust the position of pushrods 41 and 42 and the pivots of bell crank 38 and 39. The positions of the pivots of bell cranks 38 and 39 will determine the mean position of nozzle elements 9, 10, 11 and 12, assuming crank pin 54 to be midway of its stroke, or in its mean angular position with relation to the base framework. It will be seen, especially by reference to Fig. 4 of the drawing, that with rotary shaft 56 stopped with its crank pin 54 substantially horizontal or at half stroke position, raising of the pivots of bell cranks

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38 and 39 will raise both link 36 and link 37 causing nozzle elements 10 and 11 to move through a short angle counterclockwise, as seen in the drawing, and causing nozzle elements 9 and 12 to move through a similar angle in a clockwise direction so that with the jets or longitudinal axes of passages 18 arranged to intersect in a point at such a mean position of the oscillating mechanism, the point of intersection of the jets will be raised. Lowering of pushrods 41 and 42 obviously will reverse the action and lower the point of intersection of the jets.

The angle of oscillation of the jets (other things being held constant) will be determined by the adjusted effective length of lever arm 49, which is controlled by the rider 67 through shaft 66, lever arm 68, link 69, bell crank 71, push rod 72, and link 73. It will be clearly seen that raising rider 67 will increase the length of arm 49, thus increasing the arc of travel of block 48 and the movement of links 47 and 46, increasing the angular movement of bell cranks 38 and 39 and, through links 36 and 37, the angular movement of the nozzle elements 9, 10, 11 and 12. Thus, it will be understood that the higher the surface upon which rider 67 rides, the higher will be the point of intersection of the jets in their mean positions of oscillation, and the larger will be the angle of jet oscillation.

The lengths of the lever arms in the linkage of the invention may readily be calculated by the usual technique known to mechanical equipment designers to give an action such that with a cylindrical log of the smallest diameter to be handled the jets will, in a mean position between the extremes of their angular motion, be directed substantially toward the log center and will be oscillated through a small angle determined by the short length of arm 49, so that the jets will impinge upon the log surface at all times and sweep arcs on the log surface which will, in combination, substantially equal the full circumference of the log. The mean positions of the nozzle or jet axes, with a small log on the conveyor and under the rider, are shown in construction lines in Fig. 4. The mechanism will be so proportioned that raising of rider 67 through an angle, within practical limits, will cause a raising of the mean point of intersection of the jets substantially proportional to the change in diameter of the object handled, so that the mean point of intersection will substantially coincide with the center of circular cross section of the object being handled, within practical limits, and the angle of oscillation will simultaneously be adjusted so that the arcs of object surface subtended by the angle of limiting jet axis positions will continue to combine to substantially equal the circumference of the object.

While in the construction shown the pivot points of the nozzle elements can only be equidistant from the center of a cylindrical object of one particular diameter, and the arcs of surface covered by the jet axes can exactly equal the circumference only for such an object, the device will be designed for an object of about the average size to be handled, and the active pattern, or area of effectiveness of the jets on the log surface, may be made large enough so that objects of various diameters, within practical commercially useful limits, can be efficiently cleaned on the machine, with a minimum of overlapping and failure to impinge on the object surface.

In barking, the jets will each debark a sinusoidal strip of such amplitude and width, with

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relation to average mean log size and rate of travel, that the entire surface may be debarked in a single pass of such a log; and logs of various sizes, within practical limits of variation from the mean average, may be efficiently treated.

It will be apparent that the invention may be applied to the solution of problems of surface treatment other than debarking and cleaning of logs by high velocity hydraulic jets, such as spray painting or application of preservatives or other materials to cylindrical objects of various kinds.

It will also be understood that the description and drawings of a particular embodiment of the invention are illustrative only, and that the invention includes such modifications and equivalents of such structure as may readily occur to persons skilled in the art to which it appertains, within the limits of the appended claims.

It is claimed and desired to secure by Letters Patent:

1. In a device for impinging jets of fluid against the peripheral surfaces of logs, timbers or the like, the combination comprising a conveyor having a substantially horizontal trough-forming element, fixed supports flanking a portion of said trough-forming element and having a plurality of fixed portions substantially equiangularly spaced about the mean path of objects moving longitudinally on said trough-forming element, a corresponding plurality of nozzles operably connected with said support portions for oscillation in planes substantially perpendicular to said mean path, nozzle oscillating means connected with said nozzles and operable to simultaneously oscillate said nozzles through substantially equal angles, and control means having a conveyed object diameter sensitive element operably connected with said nozzle oscillating means and responsive to changes in conveyed object diameter to vary the mean directions and angles of oscillation of said nozzles in proportion to the diameter changes sensed.

2. In a barker and cleaner for generally cylindrical logs, timbers and the like, of the type in which such an elongated generally cylindrical object is translated longitudinally along a substantially horizontal trough-like bed with lower peripheral surface portions of each object resting thereupon, the combination comprising supports adjacent said bed having a plurality of fixed portions substantially equiangularly spaced about the mean path of translation of such objects determined by said bed, a corresponding plurality of nozzles pivotally connected with said fixed support portions for oscillation in planes substantially perpendicular to said path, nozzle moving means connected with said supports and operable to oscillate said nozzles simultaneously through substantially equal angles and control means for said nozzle moving means and having an object diameter sensing element operably connected with said nozzle oscillating means and responsive to changes in conveyed object diameter to vary the mean directions and angles of oscillation of said nozzles in proportion to sensed object diameter changes.

3. In a mechanism for directing a plurality of fluid jets against the peripheral surfaces of generally cylindrical objects of varying diameters being longitudinally translated past a fixed jetting station, guide members forming predetermined laterally spaced paths for a pair of longitudinal peripheral surface elements of such objects, a plurality of nozzle supporting elements at said jetting station substantially equiangularly

spaced about and equally radially spaced from the center path for a cylinder the diameter of which is a mean between the largest and smallest object diameters to be handled by said guide members, a corresponding plurality of fluid jet producing nozzles pivotally mounted on said nozzle supporting elements on pivot axes substantially parallel to said path and capable of directing jets toward and perpendicular to the center paths of cylindrical objects of varying sizes on said guide members, nozzle moving means operably connected with said nozzles for oscillating said nozzles through substantially equal angles, and a control mechanism having an object diameter sensing element operably connected with said nozzle moving means to simultaneously vary the mean directions and angles of oscillation of said jets in proportion to sensed object diameter changes.

4. In a mechanism for directing fluid jets against peripheral surfaces of objects of generally round cross section and various diameters, the combination comprising a rest for an arcuate portion of the peripheral surface of such object, a plurality of fixed nozzle supports substantially equiangularly and equiradially spaced from a point coincident with the center of the cross section of an object of a mean diameter between the predetermined limits of object diameters to be handled and resting on said rest, a corresponding plurality of nozzles pivotally connected with said supports for oscillation on parallel pivot axes perpendicular to the plane of the circular cross section of objects to be handled and capable of directing jets in directions toward and in the plane of such circular cross section, nozzle moving means operably connected with said nozzles to simultaneously oscillate said nozzles through substantially equal angles, and nozzle motion control means operably connected with said nozzle moving means and having an object diameter sensing element movable in response to changes in object cross sectional diameter to vary the mean directions and angles of oscillation of said nozzles in proportion to changes in the circular cross sectional diameters of objects being handled.

5. In a mechanism for directing fluid jets toward the periphery of an object of circular cross section, a rest establishing position for a pair of chordally spaced points of the circular periphery of such object, a plurality of fixed nozzle stations substantially equiarcuately spaced about a circle encompassing said rest established chordally spaced points, a corresponding plurality of nozzle elements pivotally mounted at said stations on parallel pivot axes and having fluid jet directing passages with their longitudinal axes in planes substantially perpendicular to said pivot axes, a linkage connecting points of said nozzle elements eccentric to said pivot axes with a reciprocable element for simultaneously oscillating said nozzle elements through equal angles of sweep, and linkage control means operably connected with said linkage and having a movable member selectively positionable throughout a limited range to vary the angles swept by said fluid passages in such a manner that lines bisecting the swept angles intersect substantially at a point, said point being movable during such variation of the swept angle in a line perpendicular to the chord between said chordally spaced points and through the center of said encompassing circle, and said angles increasing as said point of intersection recedes from said chord.

6. In a mechanical movement for controlling the motion of a pair of pivotally mounted nozzle elements having parallel laterally spaced pivot axes and jet directing passages with their longitudinal axes in planes perpendicular to said pivot axes, crank arms on said nozzle elements, a link connecting equally eccentric points of said crank arms, link means connecting a crank arm of at least one of said nozzles with an eccentric point of a bell crank lever mounted on a variably positionable pivot axis, linkage means connecting an eccentric point of said bell crank lever with a variable length crank arm of a second pivotally mounted bell crank lever, a rotatable crank, a connecting rod connecting said crank with an eccentric point on said second bell crank lever for imparting oscillating movement to said second bell crank lever as a result of rotation of said rotatable crank, and movable control means associated with said variable length crank arm and said variably positionable pivot axis for simultaneously adjusting the length of said variable length crank arm and laterally moving the pivot of said first bell crank proportionally, whereby the angle of oscillation of said nozzle elements is varied in proportion to an angular change in mean jet direction.

7. In a device for hydraulically treating the peripheral surfaces of logs or the like, a plurality of nozzles pivoted for oscillation in parallel or coincident planes on parallel pivot axes at points equiarcuately spaced in a circle, a linkage having a number of links and levers connecting equally eccentric points on said nozzles and having its parts proportioned to movably position said nozzles substantially at equal small angles with reference to lines joining the pivot points with a common point of reference within said circle, reciprocating means connected with said linkage means to oscillate said nozzles simultaneously substantially through equal angles bisected by said lines of reference and adjustable means operable on said linkage means to shift said common point of reference substantially in a straight line within said circle.

8. In the device of claim 7, said linkage means comprising a pair of links of fixed length connecting equally eccentric points of respective pairs of said nozzles; said links being equally laterally displaced from and substantially on lines parallel to, the lines joining the pivot axes of such pairs of said nozzles, when said nozzles are directed along said lines of reference; a pair of oscillatable bell cranks, substantially in the plane of oscillation of said nozzles, a second pair of links of fixed length connecting equally eccentric points of said pair of bell cranks with equally eccentric points of said respective pairs of said nozzles and a third link connecting equally eccentric points of said bell cranks and substantially perpendicular to said second pair of links, said adjustable means comprising means for shifting the centers of oscillation of said bell cranks equally in directions substantially parallel to said second pair of links.

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