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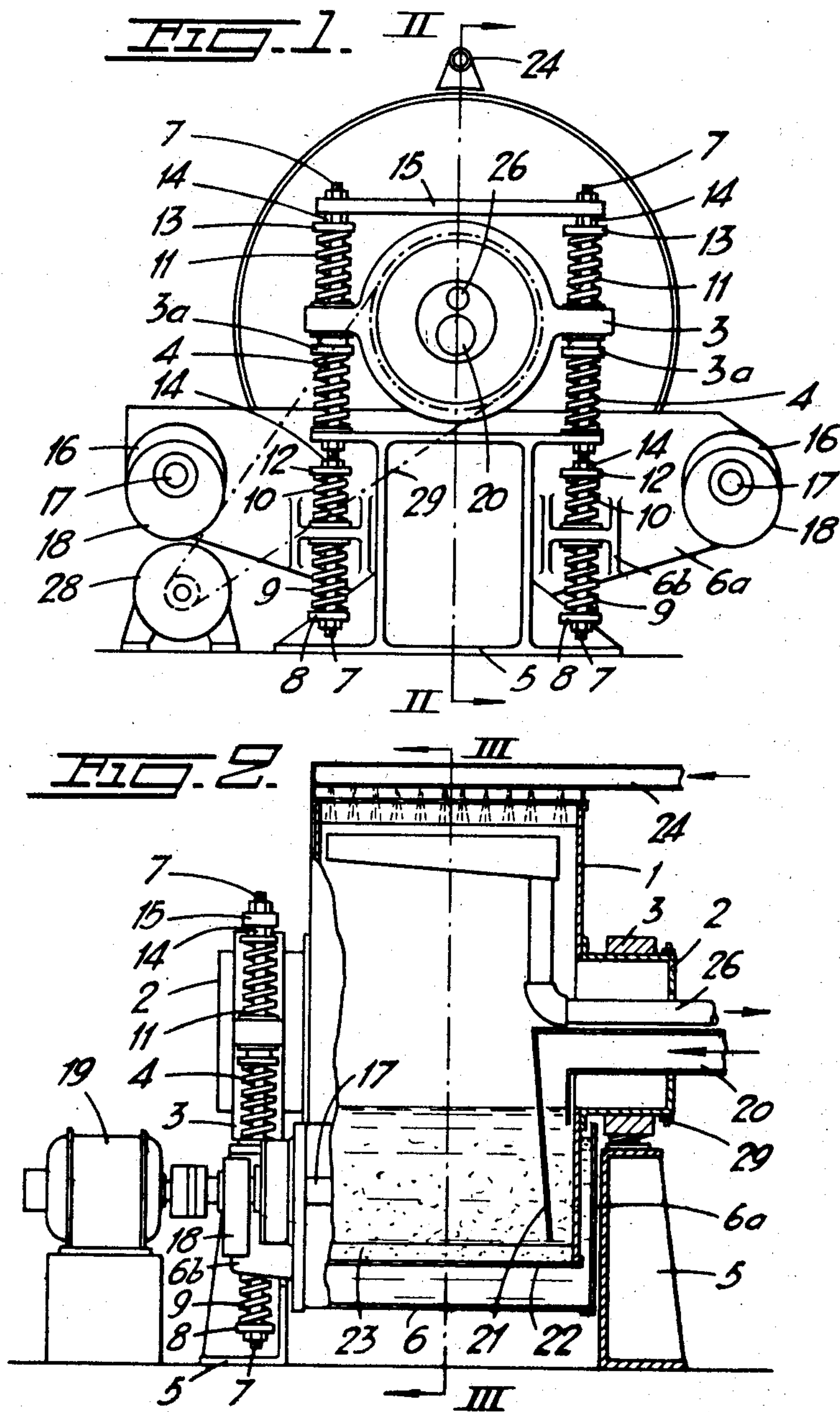
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APPARATUS FOR WET-TREATING FIBROUS MATTERS

Filed Nov. 4, 1946

3 Sheets-Sheet 1



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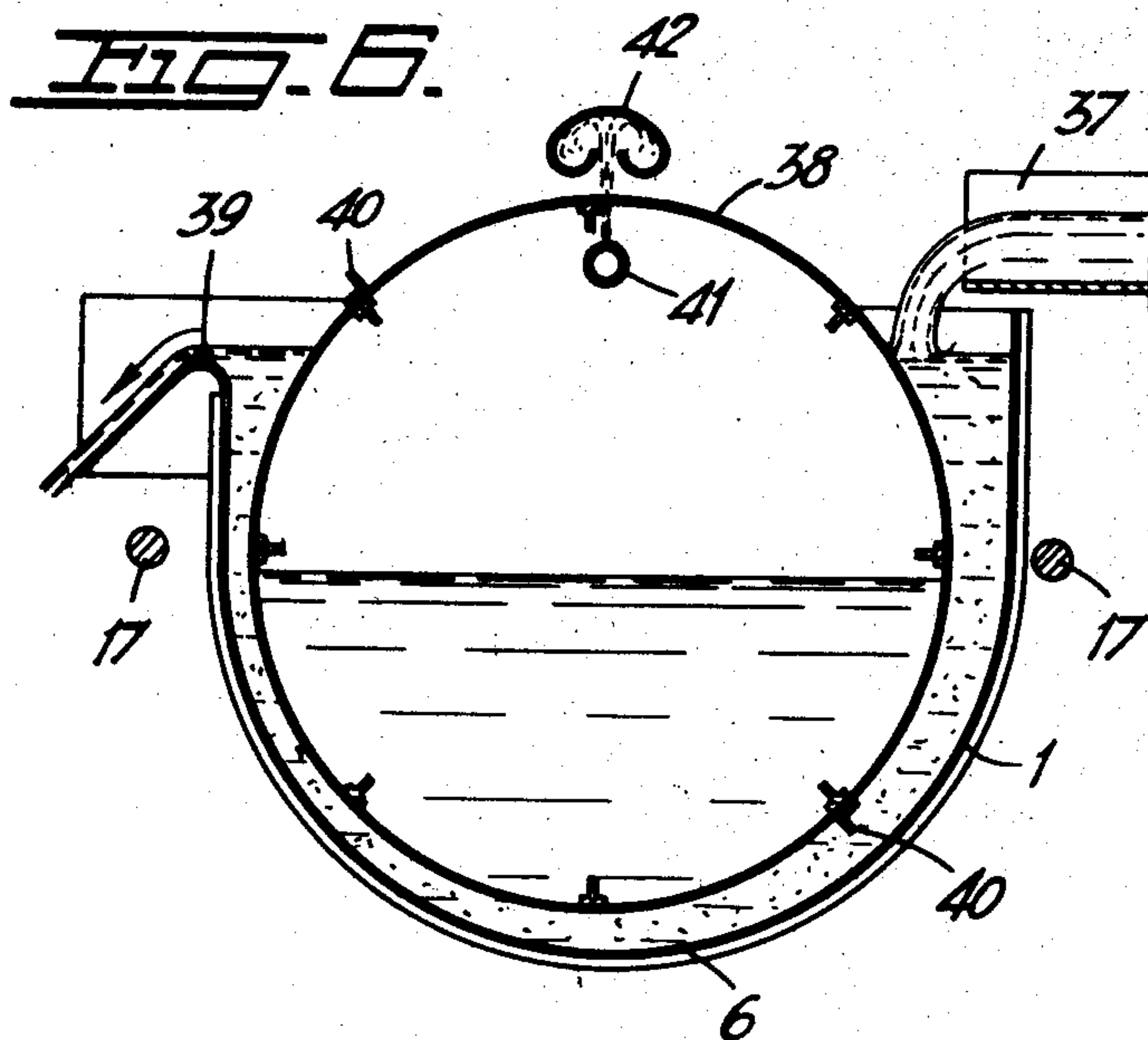
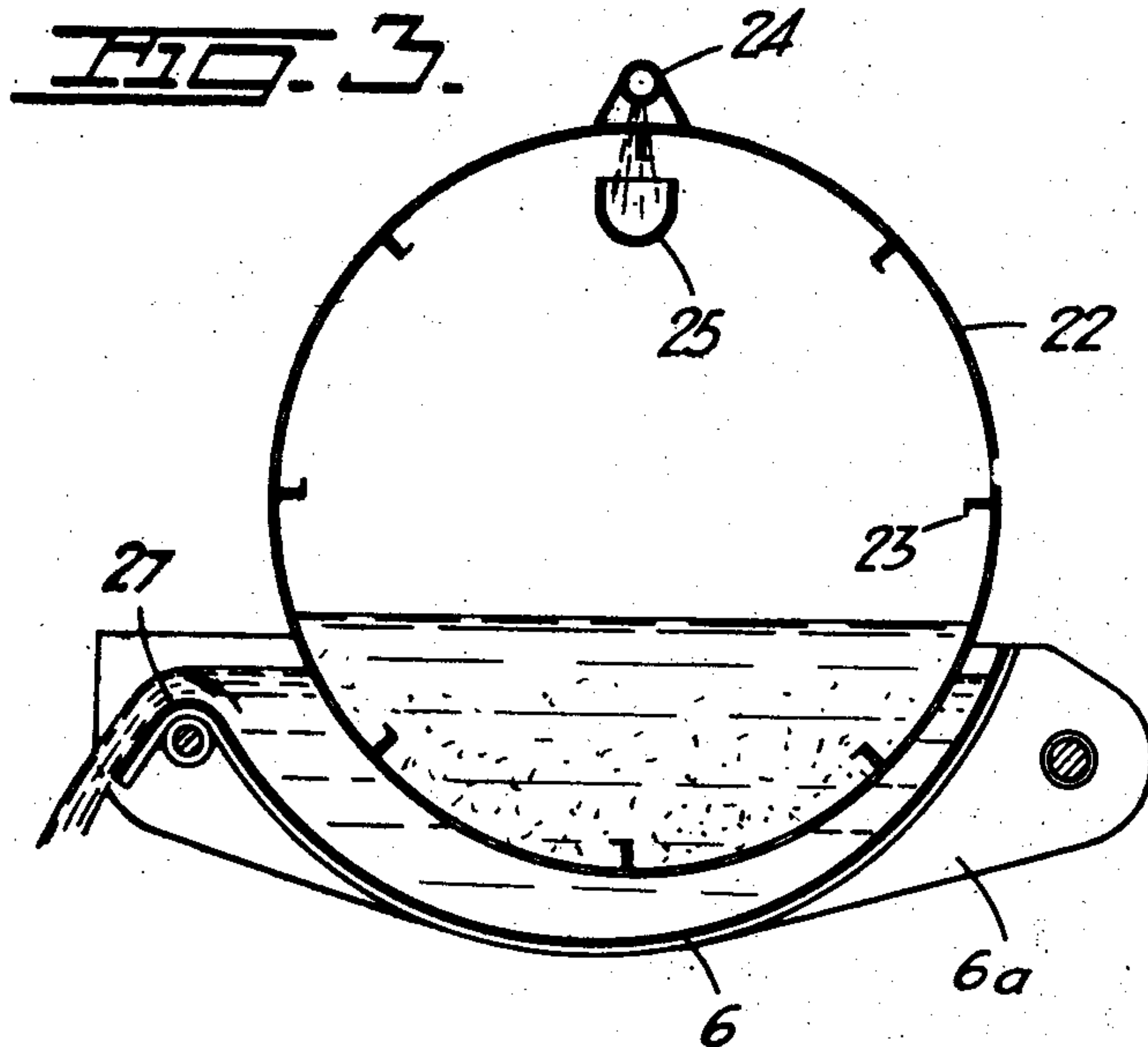
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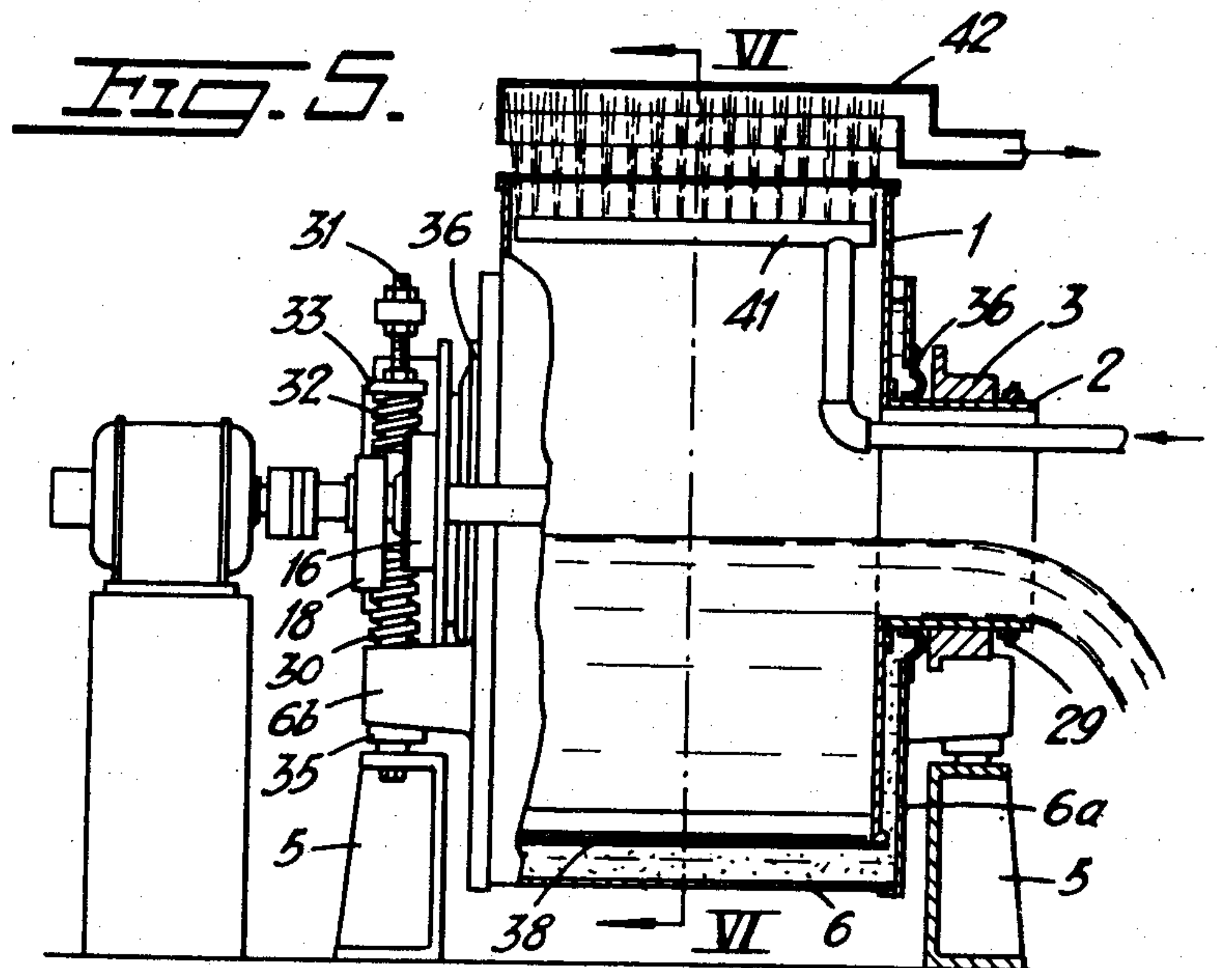
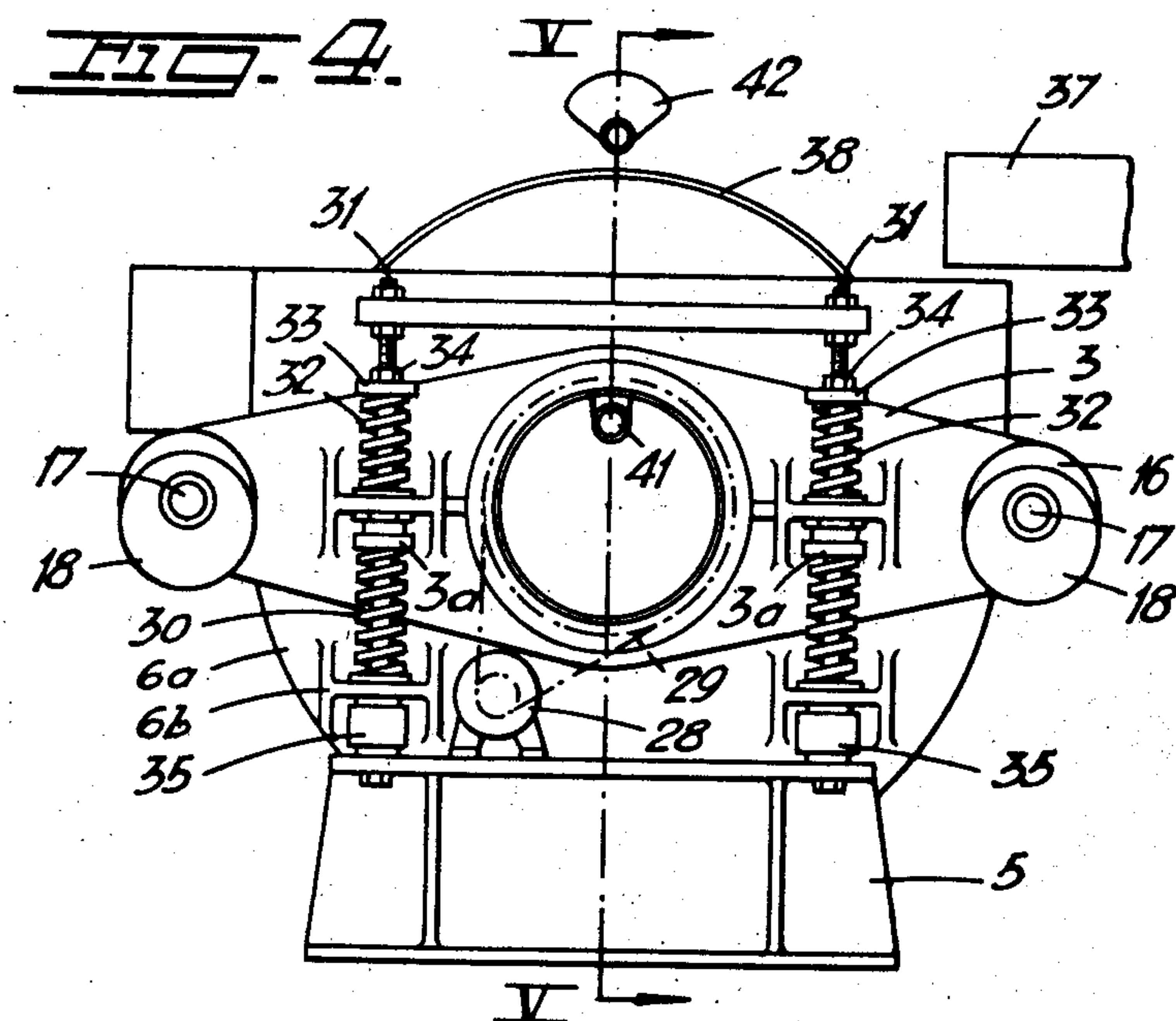
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UNITED STATES PATENT OFFICE

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APPARATUS FOR WET-TREATING FIBROUS MATTERS

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7 Claims. (Cl. 92—36)

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This invention relates to wet-treating of fibrous substances, particularly to straining, classifying, dewatering, washing and similar treatments of liquid suspensions of fibres, such as paper pulp.

One of its objects is to provide an improved vibratory apparatus of increased output for practising such wet-treatments comprising a resiliently supported drum rotating within a container likewise resiliently supported.

Another object of the invention is to provide such a vibratory apparatus of maximum output without incurring the risk of subjecting said apparatus to excessive strains and stresses during operation.

Still another object of the invention is to provide simple and efficient means for controlling the pressure and suction impulses produced in the suspension undergoing treatment, to suit different characteristics of such suspension, as well as varying conditions of operation.

Still another object of the invention is to provide a vibratory strainer apparatus which in operation subjects its associated supporting foundation to vibratory stresses to the smallest degree possible.

The invention consists in the construction and novel combination and arrangement of elements hereinafter fully described, illustrated on the accompanying drawings and pointed out in the claims hereunto appended.

On said drawings:

Fig. 1 is a side elevation of one embodiment of my invention.

Fig. 2 is a front view of said embodiment partly in vertical section substantially along line II—II in Fig. 1.

Fig. 3 is a vertical section substantially along line III—III in Fig. 2.

Fig. 4 is a side elevation of another embodiment of my invention.

Fig. 5 is a front elevation of said embodiment partly in vertical section substantially along line V—V in Fig. 4.

Fig. 6 is a vertical section substantially along line VI—VI in Fig. 5.

Like reference characters are used for corresponding elements throughout said drawings.

In the form of my invention illustrated in Figs. 1-3, 1 denotes a strainer drum provided with studs 2 journaled for rotation in bearings formed by bridge members 3 resting on coil springs 4 by means of interposed supporting members 3a, said springs in turn resting on a framework generally denoted by 5. The bottom

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portion of drum 1 is received within a strainer vat 6 the end walls 6a of which are provided with shelves 6b resting on coil springs 9 in turn resting on supporting members 8 carried by vertical bolts 7 clamped between their ends to framework 5 and interconnected at their upper ends by irons 15. Although not specifically shown on the drawing bolts 7 extend with sufficient lateral play through shelves 6b and members 3, 3a, to permit vibration of drum 1 and vat 6 in the manner hereinafter set forth in greater details.

By means of the elements above described drum 1 and vat 6 are both resiliently supported from framework 5 to permit the desired vibration thereof in the operation of the strainer hereinbelow described. The tension of springs 4 and 9 resiliently supporting drum 1 and vat 6 is variable at will by means of nuts 14 threaded on bolts 7, washers 13 and 12 and coil springs 11 and 10 respectively, said springs resting against bridge members 3 and shelves 6b respectively.

Mounted on the end walls 6a of vat 6 are bearings 16 for rotary shafts 17 each carrying unbalanced or eccentrically arranged masses 18, said shafts being actuated over resilient couplings from electric motors 19, preferably synchronized.

At 28 there is indicated a motor for rotating drum 1 by means of a chain indicated at 29.

In the embodiment above described the fibrous suspension to be treated may be supplied through one of the hollow studs 2 by means of a tube 20, and distributed in drum 1 by the aid of shield 21. The liquid of suspension and accompanying solids passing through the strainer plates 22 of drum 1 are continuously discharged at 27 into any suitable receiver (not shown) a suitable difference being maintained between the levels of liquid in drum 1 and vat 6 whereby the liquid and solids referred to are caused to pass radially outwards and downwards through strainer plates 22 into vat 6. Any solids rejected by strainer plates 22 are lifted out of the liquid of suspension within drum 1 by ribs 23 mounted at the internal circumferential face of drum 1, and finally removed from such ribs in the top position thereof by means of jets of water projected downwardly from an apertured stationary sprinkle tube 24 fed by water under proper pressure from any suitable supply (not shown). The water of the jets sweeping clean not only ribs 23 but also the parts of strainer plates 22 successively passing under tube

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24 in the continuous rotation of drum 1 by means of motor 28 is received in launder 25 situated below tube 24 and removed therefrom together with the accompanying solids by means of tube 26.

During the straining operation above described vat 6 is continuously vibrated by means of the rotating unbalanced masses 18 whereas strainer drum 1 is continuously vibrated indirectly from vat 6 by means of the mass of liquid between the opposed arcuate circumferential portions of vat 6 and drum 1. Obviously the vibration of drum 1 will take place at a considerably smaller amplitude than that of vat 6, due to the relatively loose coupling through the liquid referred to, the inertia of drum 1 and the damping produced by springs 4 and 11 the force and thus the damping characteristics of which may be adjusted at will according to the foregoing for the purpose of controlling the difference of amplitude between vat 6 and drum 1 and thus the pulsating pressure produced in the liquid between vat 6 and drum 1.

The embodiment shown in Figs. 4—6 differs from that above described firstly therein that drum 1 is resiliently supported from vat 6 by means of coil springs 30 resting on shelves 6b mounted on the end walls 6a of vat 6. To this end bridge members 3 by means of members 3a vertically displaceable therein rest against coil springs 30. Clamped to shelves 6b at their bottom ends are vertical bolts 31, passing with lateral play through members 3a and interconnected at their upper ends just as in the embodiment first described. Surrounding bolts 31 are upper coil springs 32 resting on the top face of members 3a and adjustable by means of washers 33 with associated nuts 34 so as to permit an easy and effective control of the elastic characteristics of the resilient suspension for drum 1.

Secondly, in the embodiment now described drum 1 is adapted to be vibrated directly, such as by means of unbalanced masses 18 mounted on shafts 17 journaled for rotation in bearings 16 formed by bridge members 3. Vat 6 on the other hand is adapted to be vibrated indirectly, and to permit such vibration resilient members, such as rubber pads 35 are interposed between shelves 6b and framework 5, said pads being preferably replaceable to secure any desired damping of vat 6 when vibrated.

Thirdly, in the embodiment under consideration vat 6 projects above studs 2 necessitating the provision of packings 36 between studs 2 and the end walls 6a of drum 6, said packings being so constructed as to permit the mutually different vibrations of drum 1 and vat 6 as well as the rotation of drum 1.

As illustrated diagrammatically in Fig. 6 the fibrous suspension to be treated is supplied to vat 6 by means of launder 37 and the liquid of suspension with accompanying solids passing through the apertured shell 38 of drum 1 into the interior thereof are continuously discharged through either stud 2 as illustrated at the right-hand side of Fig. 5 whereas the matter rejected by strainer drum 1 is continuously discharged at overflow outlet 39 as shown diagrammatically at the left-hand side of Fig. 6. To facilitate the movement of solids rejected by strainer drum 1 towards outlet 39 ribs 40 may be secured to the external face of shell 33.

The apertured shell 38 is swept clean from any matters tending to clog therein by means of sprinkle tube 41 projecting jets of water up-

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wardly through the apertured shell 38 at the top thereof, such matters being collected and discharged by launder 42.

In the operation of the strainer, drum 1 is continuously or intermittently rotated by means of motor 28 and chain 29 just as in the embodiment first described.

Although I have shown and described only two embodiments of my invention such embodiments are capable of many alterations and modifications without departing from the basic idea underlying the invention which broadly consists in so constructing the strainer apparatus as to permit the rotary drum and the vat to vibrate mutually differently. Thus, an obvious modification resides in combining the two embodiments shown, that is associating with each of these two elements, drum and vat, a separate vibratory apparatus. Such modification not only permits of greater freedom in choosing the relative amplitudes of the two elements but permits also of vibrating them with mutually different frequencies or in any desired mutual phase relation, such as in opposite phase relation.

Although in the embodiments above described the two elements are assumed to be vibrated by means of rotary shafts supporting unbalanced masses it is, of course, within the scope of any invention to effect the vibration by any other mechanical means, for instance, by eccentrics and pitmans positively vibrating either element, or by hydraulic, pneumatic, electric or magnetic means.

It is also within the scope of my invention to allow either element to vibrate at more or less pronounced resonance to amplify the vibrations as desired.

In the preferred embodiments of my invention the two elements are vibrated with mutually different amplitudes whereby the pulsating pressure acting upon the suspension between said elements may be increased or decreased simply by increasing or decreasing the difference in amplitude between said two elements. By vibrating both elements directly at equal frequency but in opposite phase the intensity of the pressure and suction impulses produced in the suspension between the two elements in response to the vibration thereof may be still more increased. By vibrating the two elements at mutually different frequencies recurrent pulsations of increased amplitude may be obtained according to the well-known phenomenon of beating, such as for automatically cleaning the apertured element from any substances tending to clog therein.

From the foregoing it may be seen that I have invented a new apparatus for wet-treating fibrous substances resulting in many advantages.

Above all the output per unit area of the strainer drum may be materially increased by vibrating the drum and the vat mutually differently. This increased output is due to the fact that both of the vibrating elements (drum and vat) may be effectively utilized to control the pulsating pressure in the suspension undergoing straining.

Another advantage of my improved strainer resides therein that suspensions of relatively high fibrous contents may be continuously treated due to the more intense acting upon of the suspension in differently vibrating both elements.

Still another advantage of my invention will be clear when considering the dewatering or

pumping effect produced in vibrating a strainer member having apertures presenting unequal flow resistances in opposite directions, such as tapering apertures, such effect being dependent substantially on the amplitude of vibration of the strainer element. According to my invention this effect may be utilized to the best advantage in different treatments of the suspension. Thus, if dewatering to a large extent is desired this result may be secured according to my invention by vibrating the strainer element directly with sufficiently large amplitude and controlling the amplitude of vibration of the second element indirectly vibrated, to avoid excessive pulsating pressures in the suspension. On the other hand, if dewatering to a smaller extent is desired, then the strainer element may be vibrated indirectly with relatively small amplitude and the second element directly with sufficiently large amplitude to secure the required pulsating pressure in the suspension.

Although the invention in the foregoing has been specifically described in connection with straining of fibrous suspensions it may obviously be applied to other wet-treatments of such suspensions, such as to classifying, dewatering or washing. The modifications of the apparatus then necessary are obvious to anyone familiar with the art.

What I claim is:

1. A vibratory apparatus for wet-treating fibrous substances, particularly for straining, classifying, dewatering and washing liquid suspensions of fibers, such as paper pulp, comprising a vessel, an apertured drum mounted for rotation within said vessel, resilient means for supporting said vessel, resilient means for supporting said drum relative to said vessel, and individual vibratory means for imparting vibrations to said drum and said vessel to cause said drum and vessel to vibrate mutually differently with respect to each other.

2. A vibratory apparatus for wet-treating fibrous substances, particularly for straining, classifying, dewatering and washing liquid suspensions of fibers, such as paper pulp, comprising a vessel, an apertured drum mounted for rotation within said vessel, resilient means for supporting said vessel, resilient means for supporting said drum relative to said vessel, and vibratory means to cause said drum and said vessel to vibrate mutually differently with respect to each other, one being directly connected with said vibratory means and the other indirectly therewith through the agency of the liquid of the suspension undergoing treatment in the apparatus.

3. A vibratory apparatus for wet-treating fibrous substances, particularly for straining, classifying, dewatering and washing liquid suspensions of fibers, such as paper pulp, comprising a vessel, an apertured drum mounted for rotation within said vessel, resilient means for supporting said drum and vessel resiliently with respect to each other, and vibratory means connected with said drum and said vessel, said vibratory means comprising rotary shafts having members eccentrically arranged thereon mounted on said vessel and drum respectively and serving to vibrate said

drum and vessel relative to each other by rotation of said shafts.

4. A vibratory apparatus for wet-treating fibrous substances, particularly for straining, classifying, dewatering and washing liquid suspensions of fibers, such as paper pulp, comprising a stationary framework, a vessel, resilient means for supporting said vessel from said framework, an apertured drum mounted for rotation within said surrounding vessel, resilient means for supporting said drum from said vessel, and vibratory means to cause said drum and said vessel to vibrate mutually differently with respect to each other.

5. A vibratory apparatus for wet-treating fibrous substances, particularly for straining, classifying, dewatering and washing liquid suspensions of fibers, such as paper pulp, comprising a vessel element, an apertured drum element mounted for rotation within said vessel element, adjustable resilient means for supporting said vessel element, adjustable resilient means for supporting said drum element with respect to said vessel element and vibratory means connected directly with one of said elements to cause said drum and said vessel element to vibrate mutually differently with respect to each other.

6. A vibratory apparatus for wet-treating fibrous substances, particularly for straining, classifying, dewatering and washing liquid suspensions of fibers, such as paper pulp, comprising a vessel element, a strainer drum element mounted for rotation within said vessel element, said drum element having apertured end walls, bearing studs formed on the end walls of said drum and passing freely through said apertured end walls, packings interposed between said studs and said apertured end walls, resilient means for supporting said drum element and said vessel element relative to each other and vibratory means connected with one of said elements to cause said drum element and said vessel element to vibrate mutually differently with respect to each other.

7. A vibratory apparatus for wet-treating fibrous substances, particularly for straining, classifying, dewatering and washing liquid suspensions of fibres, comprising an apertured drum mounted for rotation within a surrounding vessel and having a substantial portion submerged in the liquid suspension inside said vessel, vertically disposed elastic members for resiliently supporting both said drum and said vessel, and rotatable shafts carrying eccentric weights for vibrating said drum and vessel mutually differently with respect to each other.

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