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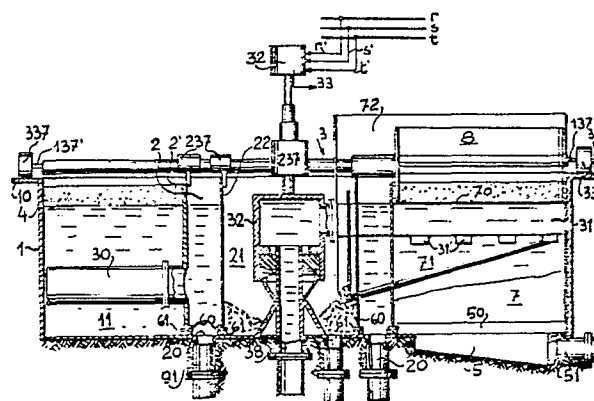
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54 Flotation plant for stock recovering and liquid clarification, particularly for paper mill effluents.

57 In a flotation plant for stock recovering and liquid clarification particularly for paper mill effluents, the rotatable equipment (3) is mounted on a hollow central column (38) and is provided with a annular concentric walls (2', 22) fastened thereto, a blade (7), inlet means (31-32) for the liquid (11) to be treated connected to the central column (38), outlet means (30, 30') connected to the outer wall (2'), means (71) for receiving and dropping the floating stock (4) and for bridging it to the space 22 between the inner wall (22) and the column (38) and possibly a bladed wheel (8) to increase the dropping collection of stock 4.



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Flotation plant for stock recovering and liquid clarification, particularly for paper mill effluents

The invention relates to flotation plants for stock recovering and liquid clarification. Particularly the invention relates to flotation plants for recovering fresh fibers
5 and water clarification from paper mill effluents. More particularly the present invention relates to flotation plants wherein in an annular tank containing the liquid to be treated operates a rotatable pick-up equipment. Such equipment is mounted
10 on a column axial to the tank. The plant includes also means for delivering of recovered stock, means for delivering of clarified liquid, and means for delivering sediment.

A known plant of the aforesaid kind is disclosed e. g.
15 in Italian Patent No. 704,314, filed 7th September 1963, by Milos Krofta: "Process and device for depurating non-clarified water waste particularly from paper and cellulose mills".

In such known plant the collection of stock, which is
20 caused to float by chemical flotation process, is provided by a rotatable equipment comprising substantially a radial arm

provided with a scoop extending radially and formed in cross-section as an Archimedean spiral. Such scoop is rotatable around its axis and is caused to operate in the floating stock layer. Of course, the operation of such scoop subjected to a movement of revolution around the tank axes and a movement of rotation around its axis is not even. In fact, during each tour of 360° only a rotation of scoop of about 120° is effective to collect the floating stock. The arrangement is such that if the effective angle is increased the scoop soaks deeply and collects also the clarified liquid, whereas if the effective angle is reduced the stock collection is scarce. Such scoop has, of course, the effect to rise the collected stock which is caused to drop inwardly for disposition.

Such incomplete collection of floating stock involves long processing time, partial clarification liquids and stock recovery.

An object of the invention is to obviate the abovementioned disadvantages.

With this object in view the present invention provides a plant as defined by the appended claims.

According with the arrangement provided by the present invention the rotatable equipment is provided with a radial blade to bring about a rise in the liquid whose upper stock floating layer is caused to drop inwardly. Bridging an annular space for receiving the clarified

liquid. Such arrangement involves that the central space is divided in two sections by two annular walls and that such walls are fastened and caused to rotate together with the rotatable equipment. Such equipment provided
5 with a blade, two annular walls, bridging drop means, comprises also radial feeding means which are connected by a rotatable coupling to a central hollow column which is fed with liquid to be treated.

With such arrangement the stock collection is a mere hydraulic continuous process which can be adjusted to op-
10 timum by adjusting the system variables to provide a rise at sill of stock dropping duct means equal to the thickness of stock floating layer.

According to a preferred embodiment of the present invention the rotatable equipment may be provided with a bladed
15 wheel adapted to engage the layer stock to help its collection.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a diametral vertical cross-section view of a plant according to the present invention.

5 Figura 2 is a plan view of the plant of figure 1.

Figure 3 illustrates a cross section view, made on the line III-III of figure 2, of the radial unit.

Figure 4 is a detail of figure 1 in an enlarged scale.

Referring now to the drawing, a plant for recovering the
10 stock from effluents containing black liquors (pulp mills) comprises substantially an effluent circular tank 1 having a lip 10. Within tank 1 is provided a central circular coaxial pool which contains control means for driving the stock pick-up rotating unit 3 as well as the
15 system for collecting fresh fibers, the system for feeding the effluent feed and system for collecting the clarified water. The stock pick-up rotating unit 3 comprises one or more tubes 30 for collecting the clarified water and at least a feeding tube 31. For driving the
20 stock pick-up rotating unit 3 the arrangement is as follow: to a power source r, s, t, are connected lines r', s', t', which lead to a manifold 52 which is connected with a motorgear 34. From motorgear 34 extends the driving end 35 of motogear shaft 34 on which gears
25 36 and 37 are provided. Gear 36 drives a chain 36, bending thereon, which, in turn, drives a gear 36' fast

5 ended to the rotating member of the fiber pick up unit
to be described hereafter. Gear 37 drives a chain 37'
bending thereon which, in turn, drives a gear 37" faste
ned to a shaft 137 extending radially from unit 3 i.e.
from inner edge of tank 1. Shaft 137 is connected,
10 with its end opposed to the end connected to gear 37", to
a shaft 137' extending radially therefrom, by means of
reversing gear device 237. Preferably, the shafts are more
than one e.g. three. Fastened to the outer end of each
shaft 137 and 137' there is a wheel 337 which engages
15 the upper edge 10 of tank 1 and provides the rotation
of unit 3. Through an inlet coaxial vertical line 38
the feeding flow is delivered to a line 31 through rotat
table coupling 32. From the bottom of tank 1 there is
a radial pit 5, which is suitable to receive the de-
20 cantation matters which precipitate in it, the collec-
tion being improved by rotating a doctor 50. Such de-
cantation sludge flows outwardly e.g. through a tube 51.

The preceding description of the drawing is applicable
even to known systems. In known systems the liquid
25 surface is quite even and a spiral scoop skimmed the up-
per layer collecting and raising the floating fresh fi-
bers providing the upper layer. The operation of such
known spiral scoops is cyclic i.e. the collection of fil
bers is perfect only in one point of each round of spil
30 ral scoop. Elsewhere the collection of fibers is either
scarce or a quantity of water is collected together
with fibers. As the fresh fibers are lifted by the
spiral scoop upon the bath level no problem is involved
by movement of unit 3 bridging the pool edge. According

5 to the present invention at the upper layer of the bath
level 6 a rise h is created. Suitably such rise h is
as high as the thickness of fresh fiber layer 4 so that
said fresh fibers 4 may be collected by gravity at a low
er level i.e. in pool 2. The sealing is obtained by
10 providing unit 3 with sealing members 60 which cooper-
ates with a resilient sealing member, the coupling pro-
viding a safe seal. Provision of rise h is brought a-
bout by a radial barrier 7 which affect the whole height
of the bath. Vice versa it may be said that the liquid
15 level in tank 1 is maintained at the same level as the
upper edge 70 of barrier 7. Close thereafter consid-
ering the direction of rotation of unit 3
which is, with reference to figure 2 anti-clock-
wise, there is a duct 31 parallel to the upper edge 70.
20 The upper edge of duct 31 is coplanar to edge 70.
Thereafter, considering the direction of rotation of unit
3, there is a trough 71 which too extends radially and
is provided with bottom wall sloping down towards the
central pool 2. Its outer wall extends upwardly to
25 provide an apron 72 to be described hereafter. From
the base 73 of barrier 7 extending in a direction con-
trary to the rotation direction of same there is a bot-
tom wall 74 with an edge 75 which provides in cooperation
with the trough 71 a siphon-like way for the feed flow.
30 In fact duct 31 is provided with outlet opening extending
downwardly, consequently the feeding flow passing there
trough follow the way indicated by the arrows at 76.
As can be seen from figure 3 the feed flow follows there
after an horizontal way contrary to the direction of
35 rotation of unit 3. The feed fraction coping with bar-
rier 7 is controlled by controlling the rotation speed

of same. Its volume is kept so as to exceed the volume of the inlet feed 76 less the volume of the outlet flow discharging through tubes 30. More particularly such exceeding volume is kept constantly equal to the
5 volume of fresh fibers collected at 71. Consequently, the inlet and outlet volumes are in balance and the driving energy of the barrier brings about a "wave" 4 i.e. a rise of fibers in front of fiber collecting trough 71.

According to a preferred embodiment of the present invention to provide an easy collection of fresh fibers,
10 which being picked up according to this invention water free are rather compact and sticky, a collecting wheel 8 is provided which is driven by chain 36". As such collecting wheel is a member of unit 3 in operation
15 is subjected to a movement of revolution and to a movement of rotation. Collecting wheel 8 comprises a tube 80 having a plurality of spokes 81, e.g. six. On each spoke 81 is adjustably mounted a blade 82. The arrangement is such that the distance between the wheel axis may
20 be adjusted so as to regulate the effect of each blade in operation. For adjusting the process variables two ways are available: 1) controlling the speed of revolution of pick up unit 3 and correlatively the inlet and outlet flow of the liquids involved; 2) adjusting the
25 blades 82 and particularly the rim level of barrier relative to the liquid surface 6. Of course, the wheel 8 with its blades 82 improves the collection of fresh fibers urging them into duct 71 to be ducted to the pool 2. From pool 2 they can be removed through tube 83.

As described previously the outlet of clarified liquid take place through outlet holes 31, provided in tubes 30, and flowing therethrough reaches the pool 2 and more particularly an annular space 21 thereof which is hydraulically
5 sealed off both from the inner space 22 and from the tank bath 11. In fact, the inner and outer walls providing the annular space 21, are arranged at the bottom with sealing coupling 60-61 of the kind shown at figure 4.

Operation of plant is as follow: initially tank 1 is
10 empty and the pick-up unit is steady.. The liquid to be treated is fed through tube 38. It flows through manifold 31 and openings 31'. As soon as the liquid in the tank 1 has reached a quote close to level 6, the pick-up unit is started and valves (not shown) are op-
15 ened to provide a way for the clarified water from the bottom layers of the bath to reach the annular pool 21 and to leave the plant through lines 91 and 92. By combined effect of inlet of feeding of effluent liquid, and of outlet clarified liquids as well as by rotation
20 of barrier 7, a dinamic balance is established which brings about arise of layer h of fresh fibers before the wheel 8 and a counter-current movement of flow 76. The arrangement is such that when unit 3 is revolved also the wheel 8 and the latter i.e. its blades urge the fresh
25 fibers into duct 71 through which they reach the cen-
tral section 22 of pool 2 to be ducted cutwardly through tube 83. On the tank bottom precipitate the heaviest matters which provide a sludge which is collected by doctor 50 and urged into pit 5 to which is connected on indefinitely. For necessary adjustments it is advisable

to control the inlet and outlet flows instead of adjusting mechanical members which are difficult to regulate.

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Patent claims

1. Flotation plant for stock recovering and liquid clarification particularly for paper mill effluents, wherein in an annular tank (1, 11) operates a rotatable stock
5 pick-up equipment (3), such equipment being axial to the annular tank (1) within the inner wall (2') of the tank, the plant including also means for feeding the liquid to be treated, means for delivering of recovered stock, means for delivering of clarified liquid, and means for delivering sediment,
10 characterized in that the inner wall (2') of annular tank (1) is comprised with the rotatable equipment (3) mounted on an axial hollow column (38), which equipment comprises also a second wall (22) inner to the first (2'), the annular space (2) between the first inner wall (2') and
15 the second inner wall (22) receiving the clarified liquids, the annular space (21) between the second inner wall receiving the recovered stock and the hollow column (38) providing an inlet duct for the liquid to be treated,
20 ed, the rotatable equipment (3) comprising further means (31-32) for feeding the liquid to be treated from the inlet duct (38), dropping duct means to receive the recovering stock (4) from the main tank (1) to bridge them to the space (21) between the second inner wall (22)
25 and the central column 38, radial blade means (7) acting in the liquid (11) of the annular tank (1) to provide at least at the sill (70) of dropping duct means (71) a gradient or rise of height (h) substantially equal to the thickness of flotated floating stock (4) to be recovered
30 and scraping means (50) to collect sediments.

2. Flotation plant, as claimed in claim 1,
characterized in that considering the direction of ro-
tation of equipment (3), the radial blade means 7 is
followed by the radial means (31) for feeding the liq-
uid to be treated having interspaced inlet openings (31')
therealong, by the dropping radial duct means (71) slop-
ping down centripetally and by an overflow dam (75)
the arrangement being such that a siphon-like counter-
current flow (76) of liquid to be treated is provided.
- 10 3. Flotation plant, as claimed in claim 1,
characterized in that the radial inlet means (31) for
feeding the liquid to be treated comprises a radial
duct (31) whose bottom is provided with inlet openings
(31') which direct the flow (76) downwardly.
- 15 4. Flotation plant, as claimed in claim 1,
characterized by a bladed wheel (8, 80, 81, 82) rota-
tably mounted on the rotatable unit 3 parallel to radi-
al blade means (7) so as to engage with its blades (82)
the recovering stock layer (4) brushing the sill (70)
of dropping duct means (71), the direction of rotation
20 of such wheel (8, 80, 81, 82) being contrary to the di-
rection of revolution of blade (7).
5. Flotation plant, as claimed in one or more of claims
1 to 4 characterized in that within the flotation tank
25 (1) at least four annular sections are provided viz.:
an outer flotation tank 11, an inner annular space (2)
for clarified water reception, an innermost annular space
(21) for recovered stock collection and a central vertical

tube (38) to feed the liquid to be treated.

6. Flotation plant as claimed in any of claims 1 to 5, characterized in that to at least the upper section of walls 2 and 22 including the bridging duct 71 is movable
5 together with rotatable unit 3 and sealed to the bottom by at least two seals, such seals (61) being "U"-shaped so as to provide sealing on both inner and outer surface of each wall (60).

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Fig. 1

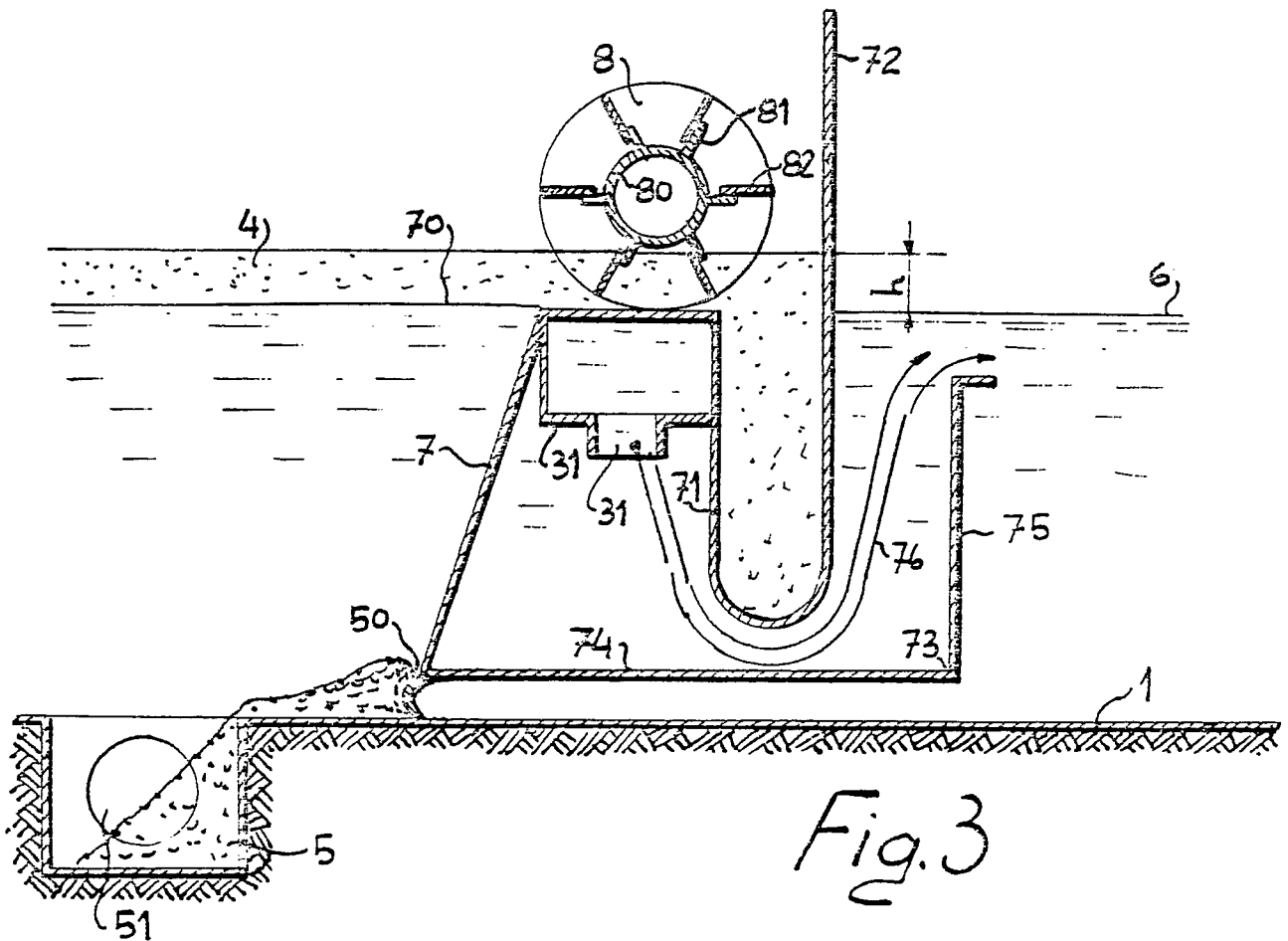
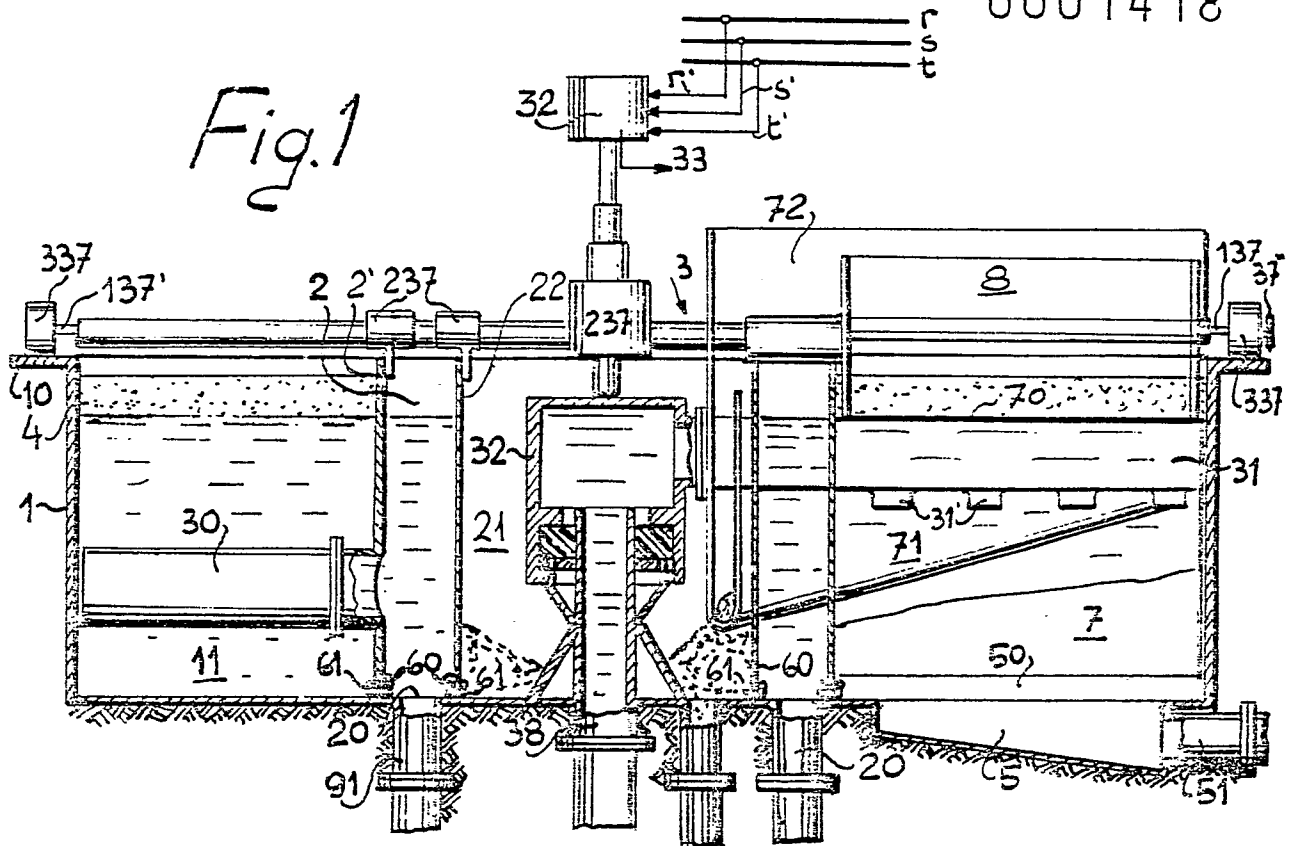


Fig. 3

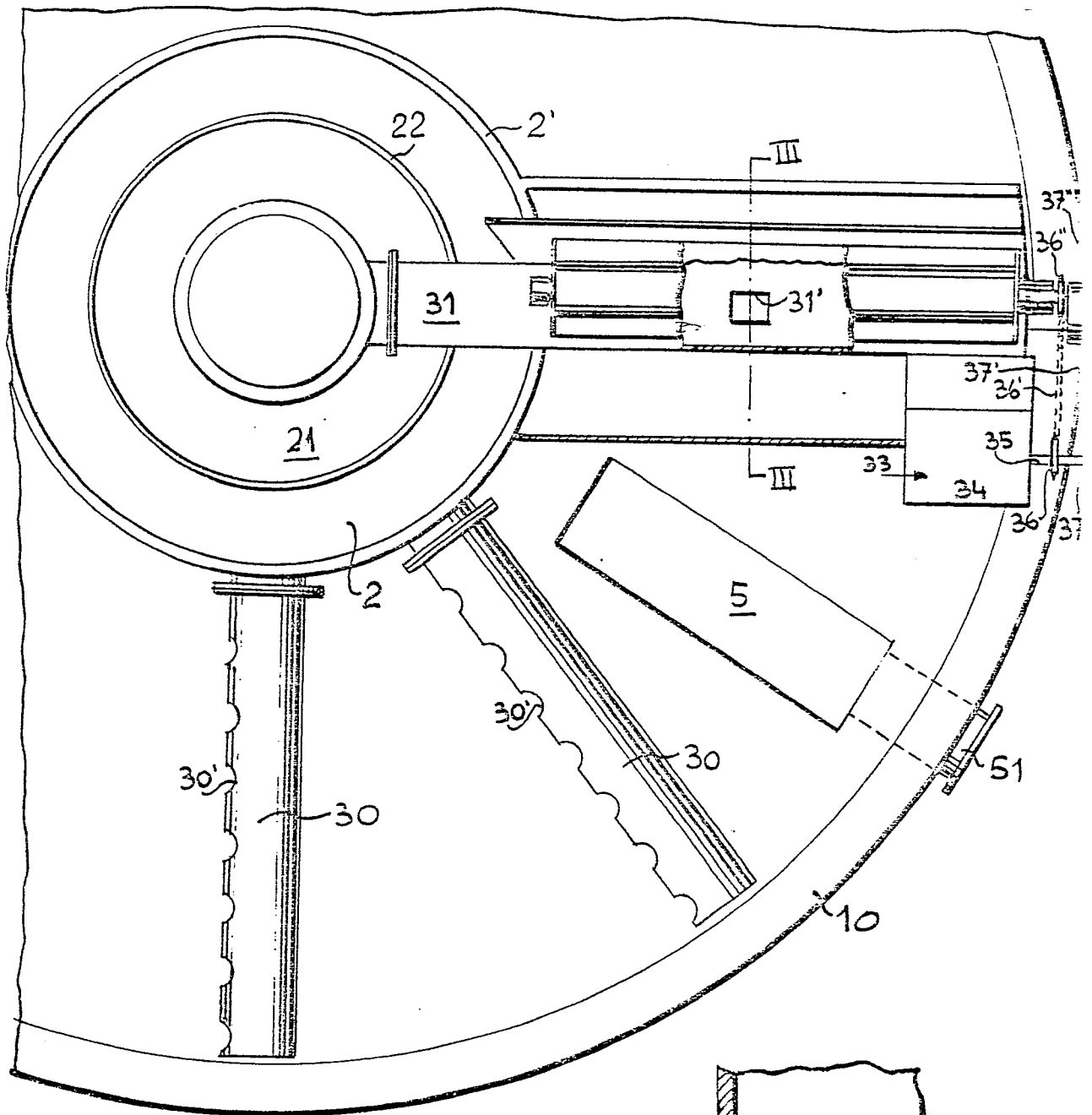


Fig. 2

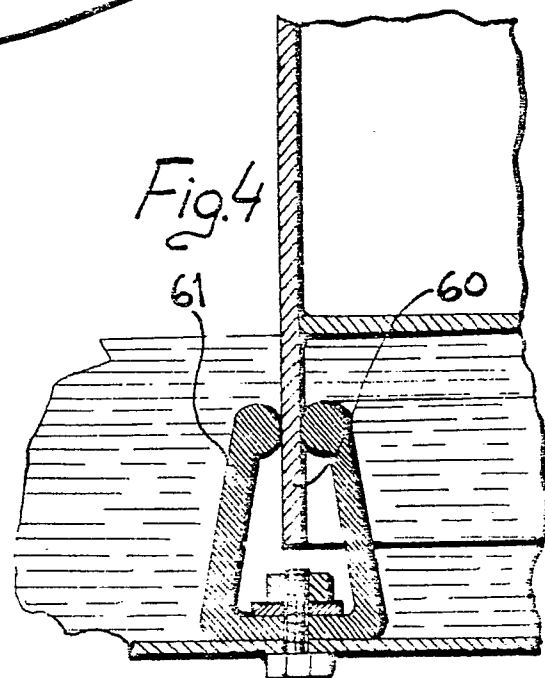


Fig. 4



European Patent
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EUROPEAN SEARCH REPORT

0001418
Application number

EP 78 10 0947

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ²)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
D	<u>IT - A - 704 314 (KROFTA)</u> * From page 3, line 75 to page 4, line 72; figure 1 *	1,5	B 03 D 1/14 B 03 B 5/58 C 02 C 5/00
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	<u>FR - A - 2 296 464 (ST. GOBAIN)</u> * From page 3, line 32 to page 4, line 33; page 5, lines 1-19; page 6, lines 1-21; figures 1-4,6,7,12-14 *	1,4,5,6	
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	<u>FR - A - 651 286 (DAUBAN)</u> * The whole patent *	1,5,6	TECHNICAL FIELDS SEARCHED (Int.Cl. ²) B 03 B 5/00 7/00 B 03 D 3/00 1/00
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	<u>US - A - 2 888 139 (FISCHER)</u> * From column 4, line 62 to column 5, line 33; figures 3,4 *	1,5	CATEGORY OF CITED DOCUMENTS X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
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☒ The present search report has been drawn up for all claims			&: member of the same patent family, corresponding document
Place of search	Date of completion of the search	Examiner	
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