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54 Cleaning apparatus.

57 Cleaning apparatus for cleaning e.g. beer kegs 10 comprises an elongate tank 11 containing a cleaning liquid up to a level 12. Kegs are lowered into the liquid along a rollway by rollers 15 mounted on driven endless chains 17, and are then pushed along the tank by the rollers. Bars 24a, 24b, 24c extend along the tank above the liquid level and cause the kegs to become immersed to an extent such that as the kegs rotate, their whole surface passes through the liquid. Rotation of the kegs is caused by friction material or the undersides of the bars (24a,24b,24c). Ultrasonic transducers (28) secured to the sides of the tank emit ultrasonic sound waves through the liquid and produce a vigorous cleansing action on the kegs. At the other end of the tank the kegs are driven up an inclined rollway by the rollers and are rinsed by water jets.

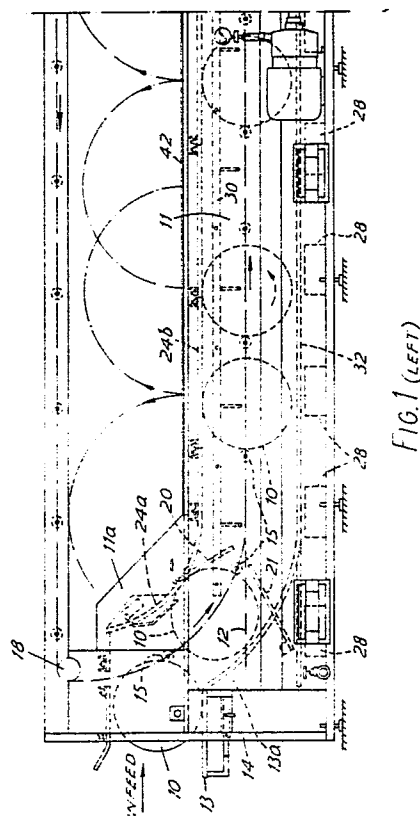


FIG. 1 (LEFT)

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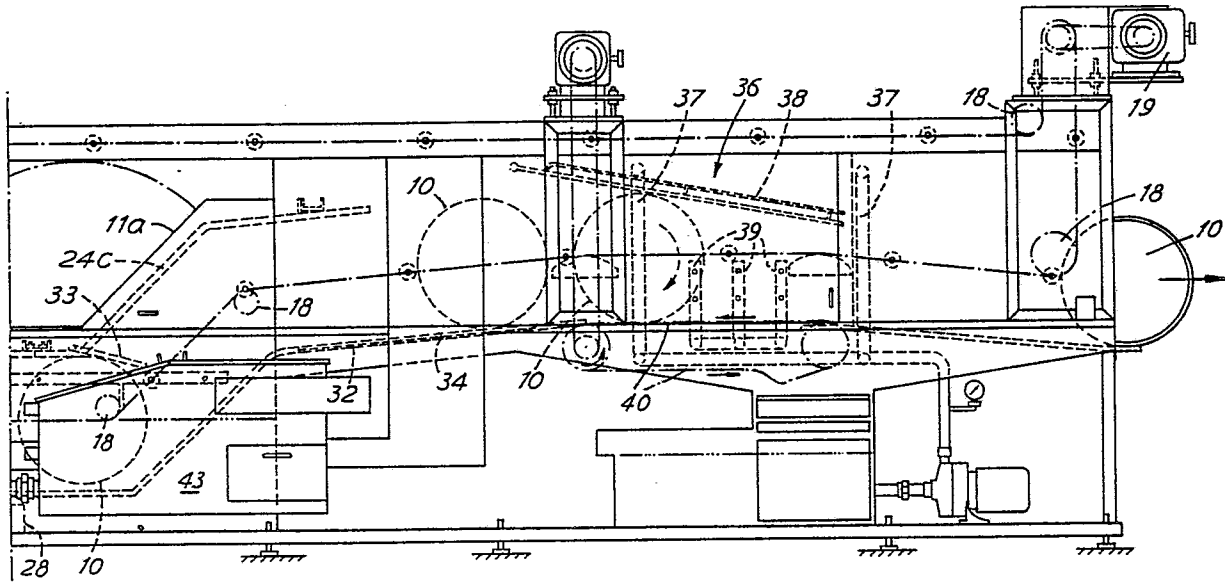


FIG. 1 (RIGHT)

CLEANING APPARATUS

This invention relates to cleaning apparatus and has a particularly useful but not exclusive application in cleaning the external surfaces of metal barrels such as beer kegs.

According to the invention there is provided cleaning apparatus comprising a tank for a cleaning liquid, means for emitting sound waves of ultrasonic frequency into the liquid in the tank, and means in the tank for supporting and rotating an article such that the whole or substantially the whole of the external surface of the article is, or passes, below the level of the liquid and is subjected to a cleaning action.

According to this invention there is provided cleaning apparatus comprising a tank containing a cleaning liquid, means for emitting sound waves of ultrasonic frequency below the level of the liquid in the tank and means for rotating an article partly immersed in the liquid, so that the whole external surface of the article passes below the level of the liquid.

The invention also provides cleaning apparatus comprising a tank containing a cleaning liquid, means in the liquid for emitting ultrasonic waves, and means for rotating an article partly immersed in the liquid and for simultaneously moving the article along the tank.

Preferably said means for emitting sound waves is so disposed that the whole of the external surface of the article is, or comes into, direct "view" of the emitting means.

According to a preferred feature of the invention said means for rotating the article and for simultaneously moving the article operates continuously to convey a succession of the articles along the tank.

In one preferred construction the means for simultaneously rotating and moving the articles along the tank comprises a plurality of pusher elements moving in an endless path which includes a run generally parallel to the surface of the cleaning liquid and a fixed surface extending lengthwise of the tank with which surface the articles move in direct rolling contact.

Where the articles are hollow and empty so that the articles tend to float, said fixed surface is conveniently disposed above the surface of the liquid so that the buoyancy of the articles causes them to be pressed against said fixed surface.

The pusher elements may conveniently be rollers arranged for rolling engagement with a circumferential surface of the articles.

According to another preferred feature of the invention there is further provided a filter tank containing a filtering apparatus and having in a side

wall thereof a weir through which liquid from the first said (main) tank enters the filter tank, and means for adjusting the height of the weir so as to maintain the vertical distance between the weir and the level of the liquid in the filter tank constant.

One embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 shows a side elevation of a cleaning apparatus according to the invention,

Figure 2 shows the apparatus of Figure 1 in plan,

Figure 3 shows in side elevation a filtering apparatus, and

Figure 4 is a sectional view on the line 4-4 of Figure 3, but showing a preferred modification.

The apparatus shown is designed to clean the external surfaces of empty beer kegs. Referring to the drawings, the kegs 10 are passed in succession along an elongate tank 11 containing a cleaning fluid, usually hot water, up to a level 12. The kegs are passed from an apparatus which is described in British Patent Application No. 8613963 and which serves to tip the kegs into a rolling attitude. The kegs roll along a guideway 13 which extends over one end wall 14 of the tank and is then inclined downward to lower the kegs into the water. The kegs are prevented from rolling freely into the water by pairs of drive rollers 15 which move between the kegs and by hinged weighted stabiliser bars 20, 21 which engage the kegs from above and below respectively to steady the kegs and prevent them from tilting or turning during their downward movement. The drive rollers 15 are mounted on shafts 16 opposite ends of which are attached to parallel endless chains 17 extending about sprockets 18 and driven by a variable speed motor 19. The pairs of rollers 15 move between the kegs at the upper end of the downwardly inclined section 13a of the guideway to separate the kegs, and then push the kegs along the tank. The buoyancy of the kegs is considerable and in order to ensure that the whole of the external surface of the kegs is treated, a pair of upper bars is mounted on the tank structure and includes a downwardly-inclined inlet section 24a, a horizontal section 24b disposed above the water and an upwardly inclined outlet section 24c. The inlet section 24a extends in a curve leading smoothly into the horizontal section 24b, the underside of which has a friction material secured to it. The horizontal section 24b is spaced above the water surface 12 by a distance such that the axis of the keg is substantially coincident with the water surface. Once engaged under the horizontal section 24b of the bars by the transport

rollers 15, the kegs are held steady by their buoyancy. As each keg is pushed along the tank by the rollers 15, the buoyancy of the keg presses it against the friction material on the horizontal section, which causes the keg to spin, and the length of the tank and the friction material is made sufficient to ensure that the whole of the external surface of each keg passes through the water as the keg moves along the tank. The rollers 15 are in low-friction contact with the kegs.

Mounted in the bottom of the tank at intervals along its length are a series of ultrasonic transducers 28, which operate to produce high cavitation in the water directly between the transducer and the part of the surface of the keg facing the transducer as the keg passes over each transducer, producing a highly effective cleaning action on that part of the surface. The activated length of the tank, the rotation of the keg as it moves along the tank and the close proximity of the keg to transducers thus ensure that the whole circumference of the keg is cleaned. In order to clean the external end faces of the kegs similar transducers may be mounted on the side walls of the tank. A manifold pipe 30 extends along each side wall of the tank and has a series of jets along its length through which hot water from the tank is sprayed on to the end walls of the kegs.

Rails 32 forming a continuation of rails 13a extend horizontally between the kegs and the ultrasonic transducers in order to protect the latter and at the outlet end of the tank the rails 32 and the outlet section 24c of the bars are inclined upward and the kegs are thus released from the holding down action of the bars, but are restrained from rapid movement resulting from the buoyancy forces by the rollers 15 and by hinged weighted stabilising bars 33 which rest against the upper surface of each keg as it rises out of the water.

At the upper end of the upwardly inclined section of the rails and the bars, the rails 32 continue generally horizontally and then down a shallow incline, along which the kegs are driven by the rollers 15. During this movement inwardly inclined track elements 34 act against peripheral beads on the keg to centralise it. The rollers 15 drive the kegs to a rinsing station 36 at which hot clarified water is sprayed onto the kegs from manifolds 37 to remove the detergent film and any loose foreign matter still on the kegs. At the same time hot clean water from high pressure pumps is sprayed at high velocity from manifolds 39 on to the neck or end other areas of the kegs from which labels are to be removed. At the rinsing station, a weighted lever 38 hinged at its upstream end to the frame of the apparatus and having a low-friction material 38a on its lower surface is arranged to press down on each passing keg to press the keg into engage-

ment with a high-friction surface of twin belts 40 the upper runs of which are moving in the opposite direction to the keg, so as to cause the keg to spin. The length of the rinsing station is less than the circumferential length of the kegs and this arrangement ensures that each keg rotates through substantially one full revolution while passing the manifolds 39 without the need to lengthen the rinsing station and to increase the number of rinsing jets. All debris at this station is removed by a driven transverse horizontal filter belt 41 which is continuously washed clean by cold water spray jets. The kegs are finally returned to an upright attitude by a turning device as described in Patent Application No. 8613963.

The tank is provided with removable hinged covers 11a, and a protective canopy 42 extends over the full length of the cleaning apparatus.

Drain valves 44 are provided for draining the various tanks and sludge doors 45 enable accumulated debris to be removed from the tanks when they have been drained.

Side guide bars for the kegs may be provided to extend along the tank if desired.

The illustrated apparatus has been found to provide a very effective cleaning action on the external surfaces of beer kegs which have been returned for re-filling. It has been found that it is important that metal surfaces which are to be cleaned by ultrasonic action should have a direct 'view' of the ultrasonic transducers. The apparatus also deals effectively with the problem of buoyancy forces, which may amount to 300lb. on a fully immersed keg.

It will be apparent that by using underneath support rails, solid articles can be cleaned in the apparatus. Also, if an article lacks surfaces which would enable it to roll, the article can be secured axially between two circular carriers which run on the rails and which are engaged by the rollers 15 to convey the article through the apparatus.

The illustrated apparatus includes an automatic filtering device mounted in a side tank 43 into which water from the main tank 11 flows for cleaning and subsequent return to the main tank.

Referring now to Figure 3 of the drawings, the tank 43 has one of its side walls formed with a horizontally elongate slot 46 through which the water to be filtered enters from the main tank 11. The bottom edge of the slot constitutes a weir.

An endless filter belt 47 extending across the full width of tank 43 and driven by a motor 48 extends generally in the form of an inverted V, one arm 49 of which is disposed in the tank 43, the other arm 50 overhanging a receptacle 51 for debris washed off the belt. The arm 49 has its upper run 52 disposed generally below the weir. The belt 47 and the two side walls of the tank define a filter

chest 53 from which water which has flowed through the runs of the arm 49 is drawn out of the chest by a circulating pump and returned to the manifolds 30 in the main washing tank 11 through a pipe 54. The debris deposited on the belt is carried over to the other arm 50 where fresh water from a nozzle 56 disposed above the lower run washes the debris off the belt into the receptacle 51 where a sieve 57 traps larger elements of debris, the remainder being passed to waste through an outlet 58.

Referring now to Figure 4, a modified form of the weir is shown which is automatically adjusted in height to maintain the vertical distance between the weir and the water level in the tank 43 substantially constant. For this purpose the weir is in the form of a curved plate 60 hinged along one horizontal edge to the side wall of the tank; plate 60 is connected to a float 61 which is disposed under the plate so as to prevent debris from falling directly on to the float. Thus, since the quantity of clean water drawn from the filter chest 53 is constant, any increase in the amount of water flowing over the weir causes a rise in the water level in the tank 45 and causes the float to raise the weir plate 60 to return the flow to its former value. The water flowing towards the weir entrains debris with it and the maintenance of a flow over the weir into the tank assists in maintaining uniform entrainment of debris and in maintaining a constant velocity of flow of the water on to the filter belt and efficient removal of the debris from the cleaning tank 11.

Seals are preferably provided between the side edges of the plate and the side walls of the tank, so as to prevent leakage past the weir. Such seals may be in the form of concertina-like strips of rubber, plastics material, foil or other suitable material. A further seal may be provided which enables the weir plate 60 to close off and seal the slot 46 if desired.

Claims

1. Cleaning apparatus comprising a tank for a cleaning liquid, means for emitting sound waves of ultrasonic frequency into the liquid in the tank, and means in the tank for supporting and rotating an article such that the whole or substantially the whole of the external surface of the article is, or passes, below the level of the liquid and is subjected to a cleaning action.

2. Cleaning apparatus comprising a tank containing a cleaning liquid, means for emitting sound waves of ultrasonic frequency below the level of the liquid in the tank and means for rotating an

article partly immersed in the liquid, so that the whole external surface of the article passes below the level of the liquid.

3. Cleaning apparatus comprising a tank containing a cleaning liquid, means in the liquid for emitting ultrasonic waves, and means for rotating an article partly immersed in the liquid and for simultaneously moving the article along the tank.

4. Apparatus as claimed in claim 2, wherein said means for rotating the article and for simultaneously moving the article operates continuously to convey a succession of the articles along the tank.

5. Apparatus as claimed in claim 3 or claim 4, wherein means for simultaneously rotating and moving the articles along the tank comprises a plurality of pusher elements moving in an endless path which includes a run generally parallel to the surface of the cleaning liquid and a fixed surface extending lengthwise of the tank with which surface the articles move in direct rolling contact.

6. Apparatus as claimed in claim 5, wherein the articles are hollow and empty so that the articles tend to float, said fixed surface being disposed above the surface of the liquid so that the buoyancy of the articles causes them to be pressed against said fixed surface.

7. Apparatus as claimed in claim 5 or claim 6, wherein the pusher elements are rollers arranged for rolling engagement with a circumferential surface of the articles.

8. Apparatus as claimed in any one of claims 5 to 6, wherein said fixed surface has its surface arranged for contact with the article covered with a friction material.

9. Apparatus as claimed in any one of the preceding claims, wherein said means for emitting sound waves is so disposed that the whole of the external surface of the article is, or comes into, direct "view" of the emitting means.

10. Apparatus as claimed in any one of the preceding claims, wherein an inclined rollway is provided down which articles can roll into the tank, and wherein one or more weighted levers are arranged to engage the periphery of the article to slow articles rolling down the rollway.

11. A claim as claimed in any one of the preceding claims further comprising a filter tank containing a filtering apparatus and having in a side wall thereof a weir through which liquid from the first said (main) tank enters the filter tank, and means for adjusting the height of the weir so as to maintain the vertical distance between the weir and the level of the liquid in the filter tank constant.

12. Apparatus as claimed in claim 11, wherein the weir comprises a plate element hinged to the side wall of the tank about a horizontal axis.

13. Apparatus as claimed in claim 11 or claim 12, wherein said adjusting means comprises a float responsive to the level of the liquid in the tank, said float being connected to the weir to adjust the height thereof.

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14. Cleaning apparatus substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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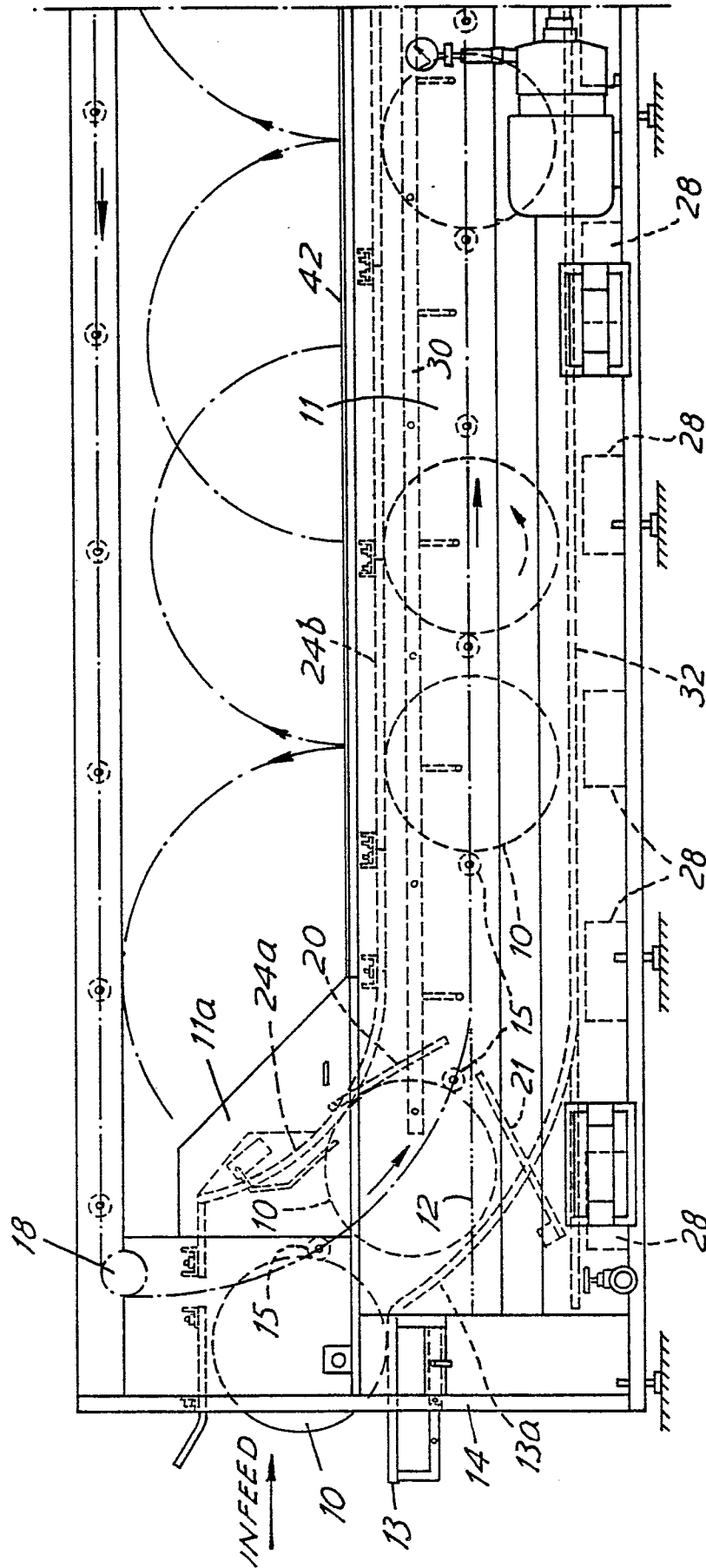


FIG. 1 (LEFT)

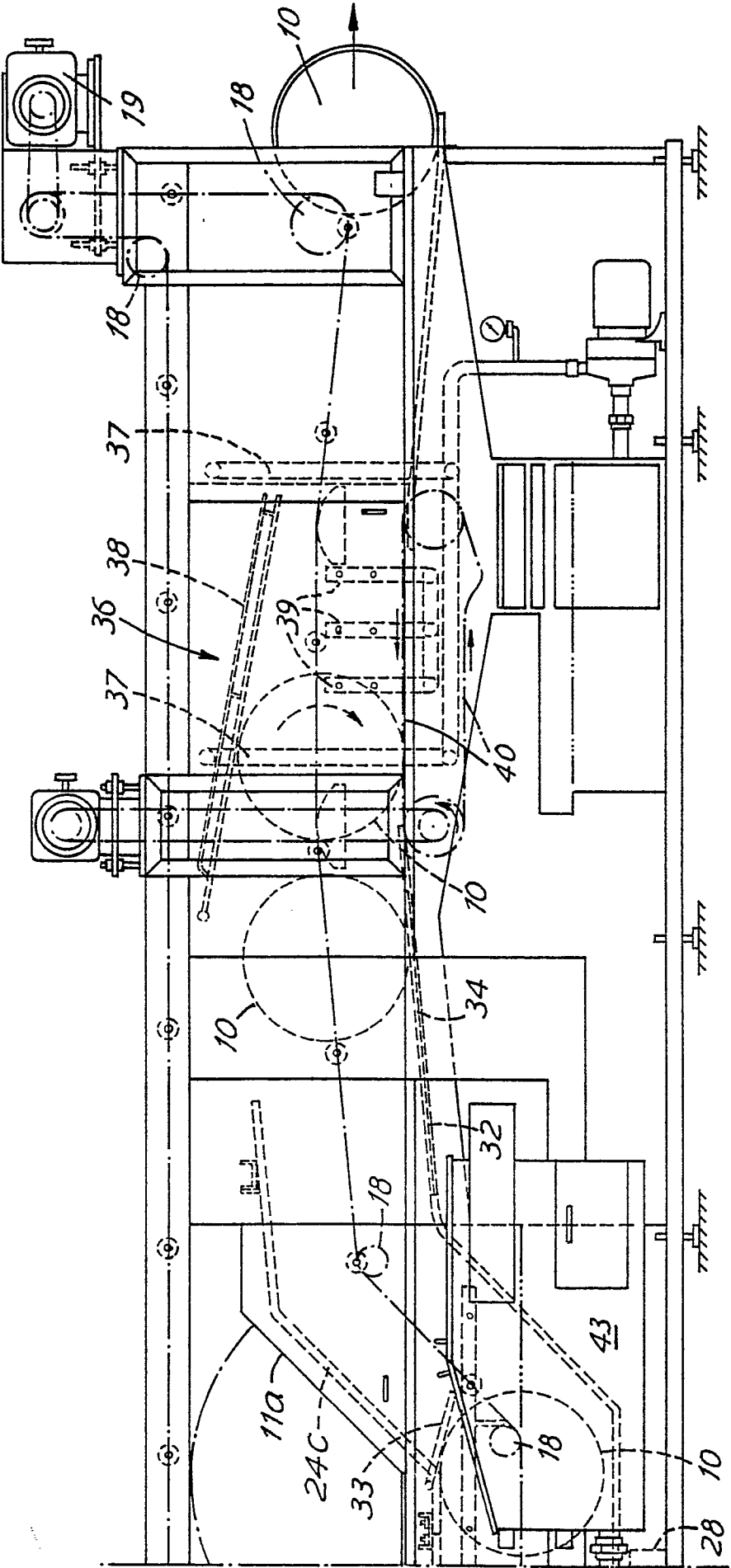


FIG. 1 (RIGHT)

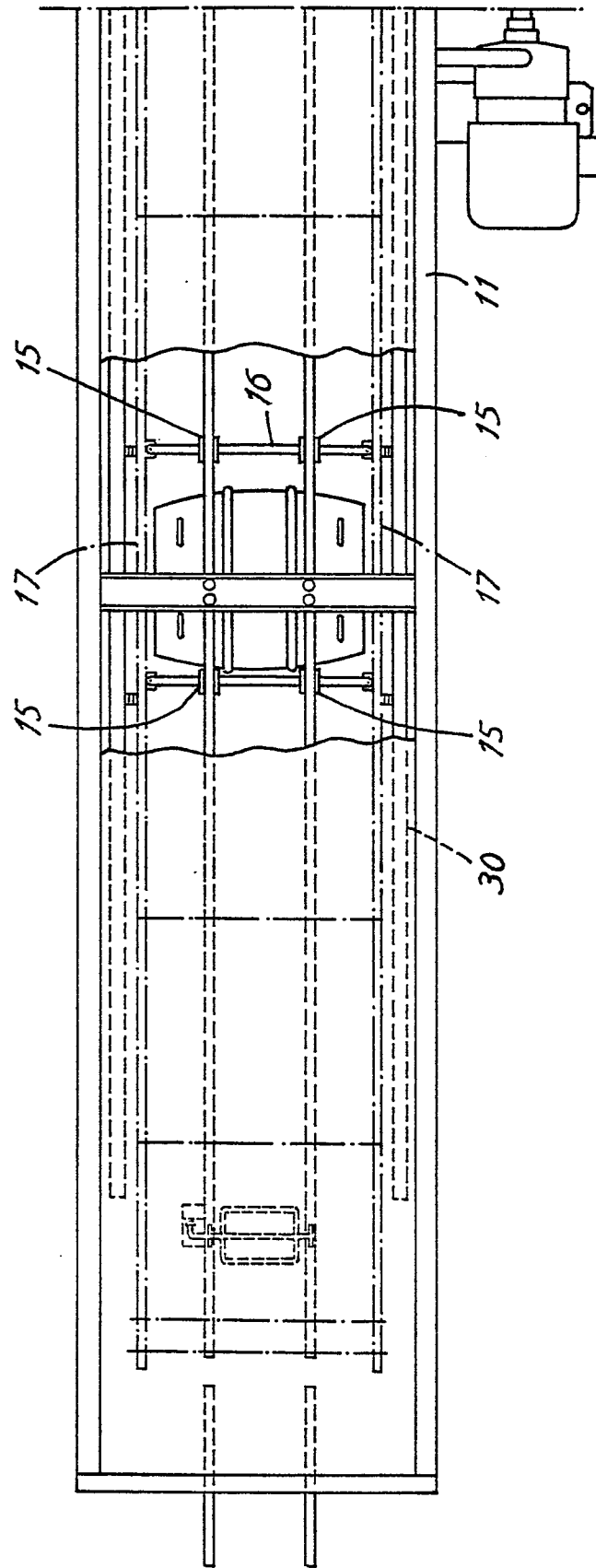


FIG.2 (LEFT)

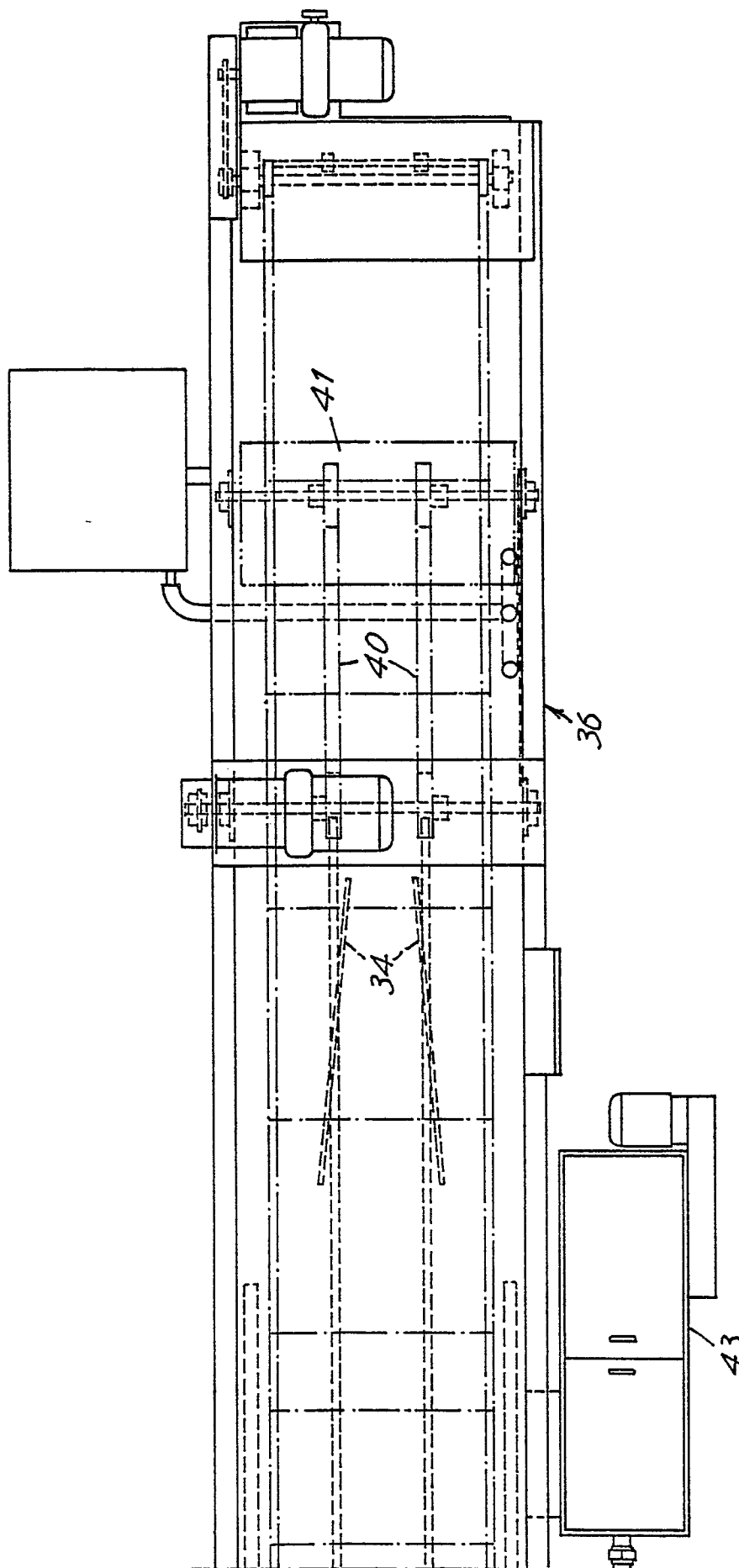
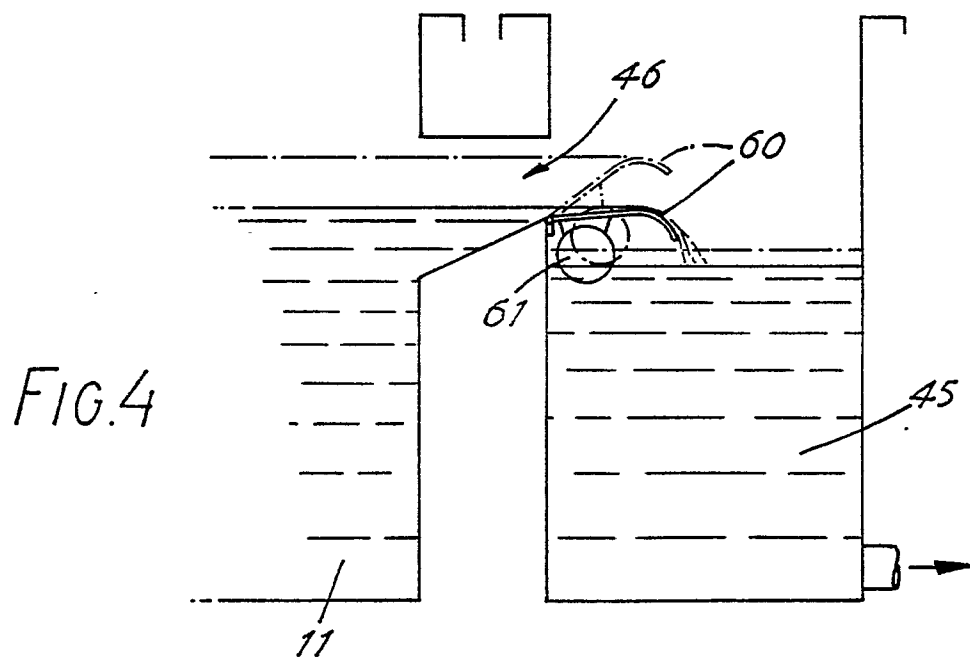
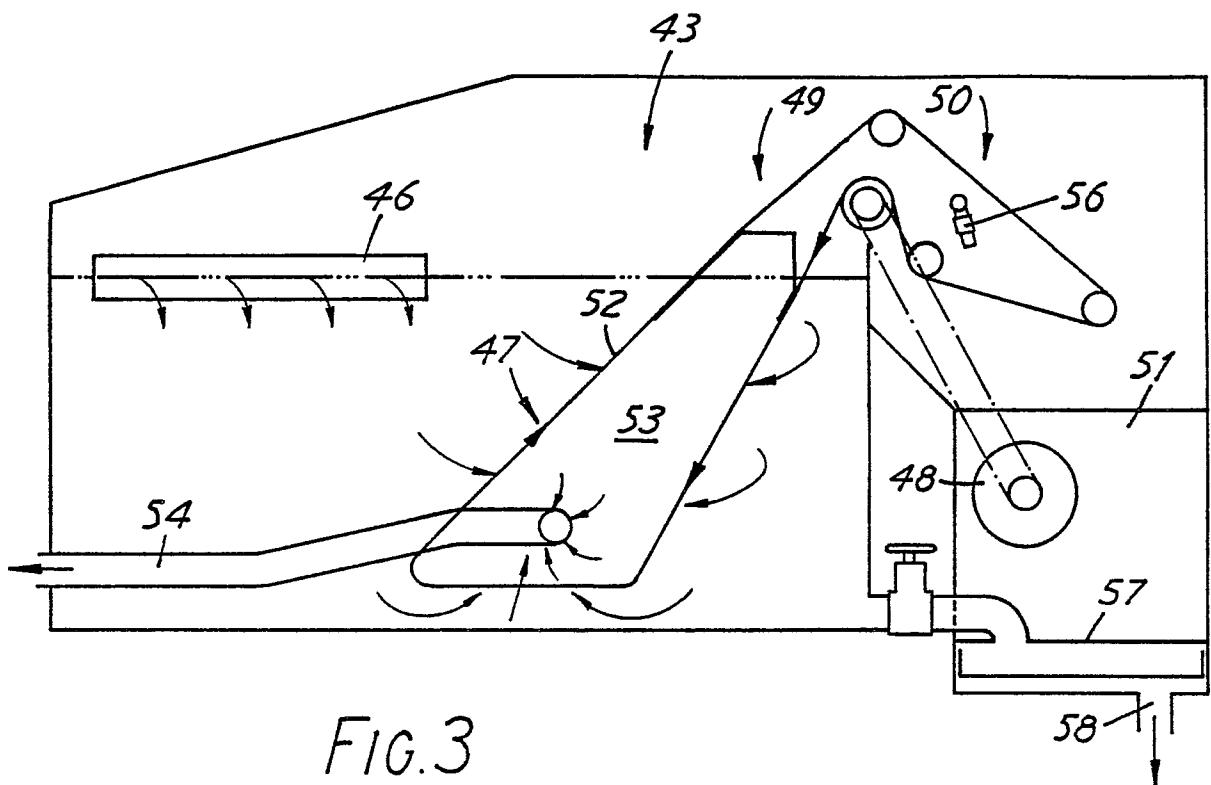


FIG. 2(RIGHT)





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	DE-A-3 340 509 (TILL) * Page 13, line 11 - page 14, line 6; figure 3 *	1-5,9, 10	B 08 B 9/12 B 08 B 3/12
Y	----	6	
Y	GB-A-2 124 598 (LEA) * Whole document *	6	
A	----	1-5,10	
A	EP-A-0 125 054 (TECHNO PACK LTD) * Whole document *	11	
A	US-A-3 352 723 (SMULL) ----		
A	GB-A-2 154 973 (TECHNO PACK LTD) -----		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			B 08 B
Place of search THE HAGUE		Date of completion of the search 12-08-1988	Examiner VOLLERING J.P.G.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			