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SUSPENDED BAG FILTERS

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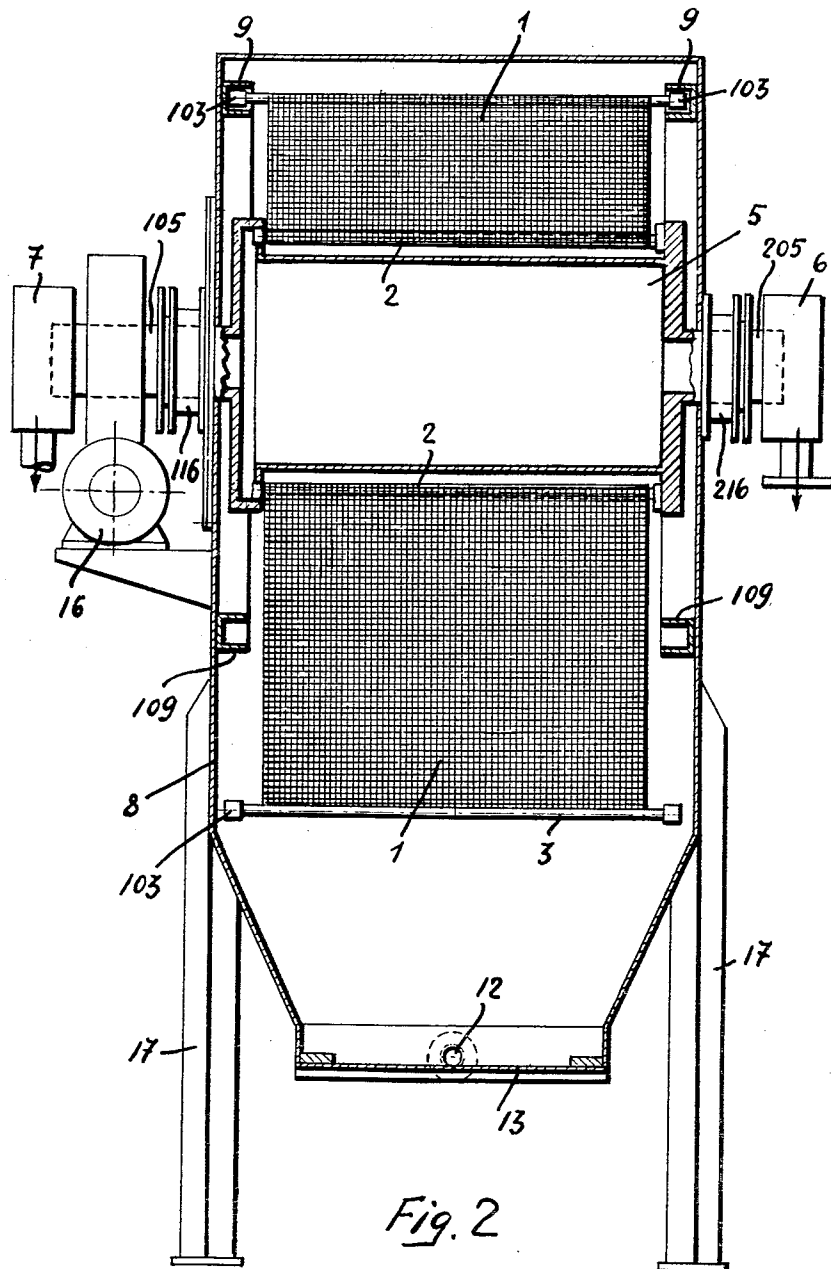


Fig. 2

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SUSPENDED BAG FILTERS

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This invention relates to industrial filters comprising a number of suspended bags of cloth or the like arranged in a closed container for the liquor or sludge to be filtered and aims to provide means for allowing the cakes of solid material adhering to the outside of the cloth bags to be readily detached from the bags.

It is known that bag filters are used in many industries, as they present a large filtering surface, without occupying too much factory space but the cleaning of the filter bags clogged with a layer or cake of solid material is generally not easy.

According to the invention, the filter bags may be easily freed from the layer or cake of solid material sticking thereto by subjecting said bags to deformations which break the solid layer and promote its detachment from the bag.

The invention will be better understood from the following specification by reference to the attached drawings showing one of the many possible constructive forms of bag filters according to the invention.

In the drawings:

FIGURE 1 shows diagrammatically a vertical cross section through a bag filter embodying the principles of the invention, with some of the filter bags (the lower ones) show in cake-detaching position.

FIGURE 2 is a vertical longitudinal section through the same filter shown in FIGURE 1.

FIGURE 3 is a perspective view of one of the filter bags mounted at one end on a tubular rod and carrying at its opposite end a bag-distending rod provided with guide rollers.

FIGURE 4 is a vertical cross section in enlarged scale through the bag unit shown in FIGURE 3, showing diagrammatically some distance members, the central section of the bag being broken away.

FIGURE 5 is a view similar to that of FIGURE 1 but showing the rail section 10 in the closed position.

The bag filters according to the invention comprise a number of filter (see FIGS. 3 and 4) bag units each composed of a bag 1 of cloth or other soft or flexible porous filtering sheet material, the walls of which are kept apart by conventional distance members 4, shown diagrammatically and somewhat exaggerated in FIGURE 4. These distance members should be so chosen and arranged as to permit the bending or folding of the bags 1 at least in a lengthwise direction while permitting the free flow of the filtrate in upward direction. Each bag is suspended by one of their ends to a tubular rod 2 provided with perforations 102 and carries at its opposite end a spreading and tenting rod 3 which, in the case as shown, is provided at its ends with guide rollers 103.

The thus described bag units are suitably suspended in a tightly closed tank 8 provided with an inlet 12 for the liquor to be filtered and with outlet taps 6 and 7, one of which may be also omitted. These taps are connected to a receiver 5 in which one end of each of the tubular rods 2 opens and which, in the example as shown is the same filter bags-supporting member. In the example as shown, the tank 8 is semicylindrical at its upper part and has a hopper-like bottom part provided at its lower end with a hole for the discharge of the solid material. This discharge hole, during the operation of the filter, is tightly closed by a cover 13. Other conventional holes

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for inspection and cleaning are shown closed by covers 14 and 15.

In the filter shown in FIGURES 1 and 2, a number of the said bag units 1—2—3 are suspended from a cylindrical hollow receiver 5 provided with hollow stub shafts 105 and 205 rotatably mounted in conventional bearings 116, 216 supported by a frame or the like 17. Stuffing boxes or other means are provided for ensuring a tight fit of the said stub shafts 105, 205 in the points in which they pass through the tank walls but, as these means are of conventional construction and well known in the art, they are neither shown, nor will be described. The stub shafts 105, 205 open in collecting chambers 6 and 7 provided with outlet taps for the filtered liquid. One of the shafts, 105, may be suitably rotated by conventional driving means indicated by the reference numeral 16.

In the upper part of the tank 8 two pairs of approximately semi-circular guide rails 9—109 are fitted the one above the other so as to constitute together a substantially circular guide member which is interrupted by a small gap 11 at one end and by a larger gap at its diametrically opposite end. This gap may be bridged over by a rail section 10 hinged to the upper rails 9. Said rails 9, 109 and the rail section 10 have inwardly projecting wings on or between which the rollers 103 fitted at the ends of the rods 3 of the bags 1 may be guided.

In operation, the rail section 10 is shifted as to close the gap between 9 and 109, the liquor to be filtered is let into the tank under suitable pressure through the inlet port 12 and the receiver 5 is rotated clockwise, viz in the direction of the arrow F. The suspended bags, when they reach the position of the gap 11, come with their rollers 103 into the guide 9 and when they come in correspondence of the closed rail section 10 they are guided further into the lower rails 109 and the bags, by rotating assume also in correspondence of the lower rails 109, the same configuration as that shown in correspondence of the upper rails 9. When however the filter bags 1 are clogged, the feeding of the liquor is stopped, preferably after emptying the tank 8, and the rail section 10 is opened, as shown in FIGURE 1. Thus, when the rollers come to the end of the rails 9, they are no longer guided and fall down between the rails 109, entraining with them the bags 1, which assume the position shown in the lower half of FIGURES 1 and 3, and the solid material sticking to their surface falls to the bottom of the tank 8. By continuing the rotation, the rollers again come between the upper rails 9 and fall again when they come again to the end of said rail 9. In this manner after a few revolutions of the shafts 105—205, the bags 1 come to be completely cleaned. Then the sludge composed of the cakes fallen from the bags and some liquor may be discharged by opening the bottom cover 13.

It is also possible to discharge substantially dry solid material if, after having discharged the liquor still contained in the tank 8 and before opening the rail section 10, compressed air is fed into the tank which, by passing through the cakes, expresses almost the whole of the liquor which soaks the solids of the cakes.

Of course the invention may be embodied in many other ways, all based on the principle of subjecting the bags clogged with solid material to a number of deformations promoting the detachment of the said solids.

What I claim is:

1. A filter for industrial use comprising a tank having an inlet for the liquor to be filtered and at least one outlet for the filtrate; means in said tank for suspending a plurality of bag units, each filter bag unit comprising a tubular rod and a flexible bag having one end suspended from said rod, and a second rod at the other end of said flexible bag, there being rollers at the ends of said second rod; means for rotating said suspending means, means connect-

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ing the said tubular rod at one end of each bag unit to the outlet for the filtrate, and means in said tank for shifting the said second rod carried by the other end of the filter bag and altering the shape of said bag by bending the bag in its lengthwise direction.

2. A filter for industrial use comprising a tank having an inlet for the liquor to be filtered and at least one outlet for the filtrate; a hollow means in said tank for suspending a plurality of filter bag units; each filter bag unit comprising a tubular rod and a flexible bag having one end suspended from said rod, and a second rod at the other end of said flexible bag, there being rollers at the ends of said second rod; means for rotating said suspending means; means for connecting the said tubular suspending rods of all the filter bags to said outlet for the filtrate; a plurality of part-circular guides forming together a circular path for said second rod rollers, at least one of said guides disposed at the lower end of said path being shiftable so as to interrupt said circular path and permit said rollers to come out of the guides.

3. A filter for industrial use comprising a supporting frame; a tank on said supporting frame having a semi-cylindrical shape at its upper portion and a hopper at its lower end provided with a large opening closed by a cover; an inlet for the liquor to be filtered at the lower end of said tank and at least one outlet for the filtrate near the axis of said semi-cylindrical portion; a hollow means mounted co-axially of said cylindrical tank portion for suspending a plurality of filter bag units, said filter bag

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units opening into said hollow bag-suspending means; each filter bag unit comprising a tubular rod and a flexible bag having one end suspended from said rod, and a second rod at the other end of said flexible bag, there being rollers at the ends of said second rod; hollow stub shafts rotatably mounting said hollow suspending means on said frame traversing with a tight fit the walls of said tank and in communication with the interior of said hollow bag-suspending means on one end and with at least one outlet for said filtrate at the other end; a pair of upper substantially semi-circular guide rails for said bag rollers fastened to the upper part of said tank concentrically of said semi-cylindrical tank portion, and a lower pair of substantially semi-circular rails completing the said circular path and spaced by the upper rail pair by a small gap; said upper rails having at one end a hinged rail section adapted to be shifted out of said circular path and to allow said rollers to come out of said guide rails.

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