June 21, 1955 V. E. F. C. G. ALLARD 2,711,254

VIBRATORY MEANS FOR VACUUM FILTER

Filed Oct. 11, 1952

Fig.1

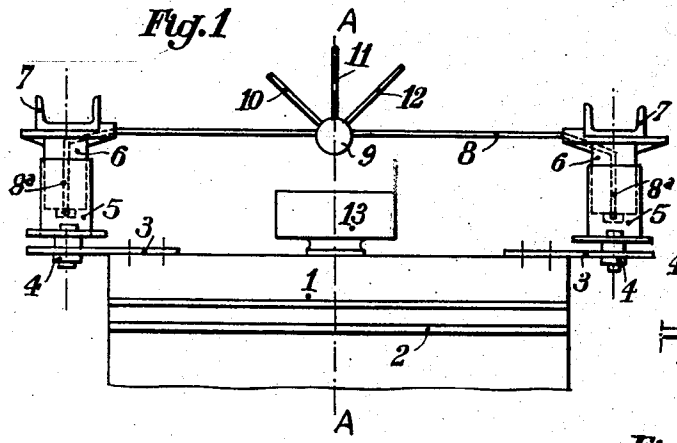


Fig.2

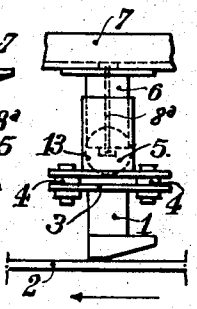


Fig.3

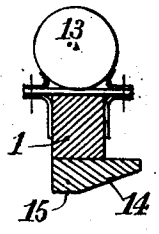


Fig.4

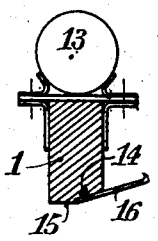


Fig.6

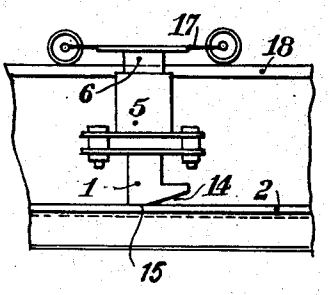
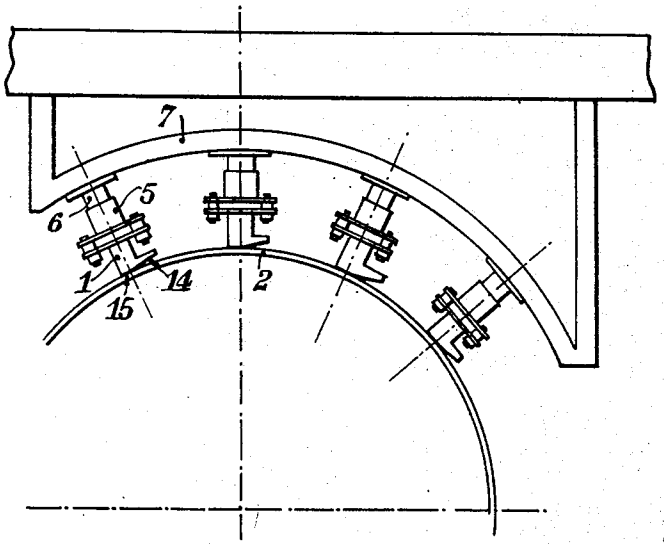


Fig.5



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United States Patent Office 2,711,254 Patented June 21, 1955

2,711,254

VIBRATORY MEANS FOR VACUUM FILTER

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Application October 11, 1952, Serial No. 314,262

Claims priority, application France December 3, 1951

8 Claims. (Cl. 210—199)

The present invention relates to vacuum filters, and more particularly to an improved device for applying vibratory compacting and smoothing to the cakes used in such filters.

It is well known that in such cakes as are formed on vacuum filters during the suction period, cracks of greater or less depth will sooner or later develop consequent to the decrease in the liquid content of the cake, which decrease is governed by the character and size of the solid particles as well as by the character of the liquid in which said particles are suspended.

It is likewise well known, in order to speed up the draining of such cakes, to subject same to vibrations the frequency and amplitude of which are adapted to the character of the substance treated. The aforesaid vibrations are intended to upset the equilibrium which tends to obtain between the solid particles and the impregnating liquid and thereby to facilitate the removal of the latter from the former by suction; effectively, the liquid-sucking action is assisted owing to the fact that such a vibration will lessen the vacuum losses by eliminating such cracks as may tend to form in the cake.

Various devices have already been proposed to vibrate the cake.

However, none of them has brought about satisfactory results, which is ascribable both to the way said cake-vibrating means are supported and to the way the cake-vibrating members proper are designed.

It is common knowledge that filtering surfaces are not always perfectly uniform. More particularly, continuous rotary filters generally comprise a large-sized drum which in the long run will lose its initially cylindrical shape.

It has been discovered, according to this invention, that instead of securing the cake-engaging members of the vibrating device directly to fixed supports, it is more advantageous to connect them therewith by resilient means whereby the pressure exerted by said members upon the cake can be adjusted as desired in dependency on the character and behaviour of the substance treated or in order to level out such irregularities as may occur on the surface of the cake.

Moreover, the invention extends to the design of the cake-engaging member itself and includes cake-compacting and smoothing means, whereby no chopping action will be exerted upon the cake, and the cake-compacting and smoothing means is relieved at its leading portion in order that the superficial layer of the cake can more easily be caught under the tail portion of said means.

The invention is illustrated by way of example in the appended drawings in which:

Figure 1 is a diagrammatical side elevational view illustrating the main features of the device.

Figure 2 is a corresponding front elevational view.

Figure 3 is a cross sectional view of a cake-smoothing member taken on line A—A in Figure 1.

Figure 4 is a cross-sectional view of a modification of the embodiment of the cake-smoothing member shown in Figure 3.

Figure 5 is a diagrammatical side elevational view of the device as applied to a drum filter.

Figure 6 diagrammatically illustrates the application of the same device to a gravity filter.

The smoothing members which act upon the cake **2** consist each of a cross bar **1** connected at either end thereof by a bracket **3** and a damper **4** to one end of a fluid pressure mechanism comprising a cylinder **5** and a co-operating piston **6** the other end of which is fixed to a frame **7**. A pipe **8** the end **8***a* of which projects through the piston **6** into the inside of the cylinder **5** can be connected by means of the three-way cock **9** with any suitable pressure fluid source through tail pipe **10**, or with the outside through tail pipe **11** or with any suitable vacuum source through tail pipe **12**.

As shown in the drawings, the three-way cock **9** may be arranged to act jointly upon the cylinder-piston devices provided at either end of each cake-smoothing member, but this does not exclude the possibility of having the cock **9** act upon the same separately.

Each cake-smoothing member **1** is equipped with a vibrator **13** of any suitable kind, which may be actuated electro-magnetically, or by an eccentric flywheel, or by means of a pressure fluid.

In this manner, it is possible to vary the pressure exerted upon the cake-smoothing member as desired in dependency on the character of the substance treated, or even, by creating a vacuum within the cylinders **5**, to pull the cake-smoothing member clear of the cake so that it can be cleaned more easily.

The cake-smoothing member **1** is formed or provided with a shoe-like bottom portion the leading end of which is relieved at **14** so that the material treated can more easily pass under said shoe the trailing portion of which is parallel to the surface of the cake where the same is flat or tangent to the cylindrical surface of the cake where a rotary filter is involved.

In the modification illustrated in Figure 4 the relieved leading end portion **14** is extended by a thin metal strip **16**. Owing to the resiliency of said strip, the latter is subjected to additional vibrations of its own, as a result of which, notably where the substances treated are rather sticky, the disaggregation of such clots as may happen to form is facilitated and can be overcome more easily by the cake-smoothing member.

The cake, which is vibrated as soon as it is engaged by the beveled leading edge of the smoothing member, is softened while the liquid therein is sucked off. Thereafter, the cake is compressed and smoothed by the trailing portion **15** of the shoe, whereby the cracks are ironed out and the vacuum losses are reduced to a minimum.

The cake is drained and compacted progressively in proportion as it is caught by the smoothing or flattening shoes, which are located at greater or less distances from one another according to the character and behaviour of the substance.

Figure 5 illustrates the application of the device to a continuous drum filter. The same arrangement is likewise applicable to other kinds of filters, e. g. disc, endless belt, rotary table, or like filters where the cake is moved in contact with cake-smoothing shoes.

Figure 6 shows the application of the invention to a fixed filter of the so-called "Nutsche" type. In this case, each cake-smoothing member together with the related cylinder-piston device adapted to adjust the pressure exerted by said member upon the cake depend from a trolley **17** which can be moved to and fro along a rail **18** so that the whole surface of the cake can be subjected to vibration.

I claim:

1. In a vacuum filter including means for vibrating the filtering cake in use, the combination comprising a frame mounted adjacent to said vacuum filter, at least one pair

of parallel telescoping mechanisms each comprising a cylinder element and a piston element slidable in the cylinder element, one of the elements of each mechanism being fixed to the frame and the other element being movable relatively thereto, a cross bar connected to the movable elements, friction shoes mounted on the cross bar to contact the filtering cake, fluid pressure control means for causing reciprocation of the piston elements in the cylinder elements and varying the distance between the cross bar and the filtering cake, and a vibrator mounted on the cross bar to impart vibratory motion thereto in a direction parallel to the axes of the cylinders.

2. The invention as in claim 1 wherein the friction shoes define a chamfered rubbing surface parallel to the cross bar.

3. The invention as in claim 1 wherein the fluid pressure control means comprise a source of fluid pressure, a source of relative vacuum, and distributor means including a valve for selectively establishing a communication between either of said sources and the cylinder elements.

4. The invention as in claim 3 wherein the distributor means comprise a distributor valve body, branch ducts connecting the valve body respectively to the source of fluid pressure, the source of relative vacuum, the atmosphere and the cylinder elements, and a valve member for selectively establishing a communication between the cylinder elements of a pair of mechanisms with either source or with the atmosphere.

5. The invention as in claim 1 wherein the friction shoes comprise means defining a chamfered rubbing surface parallel to the cross bar and spring blades extending from and continuing said surface and having a predetermined natural frequency of vibration.

6. The invention as in claim 1 wherein the cross bar extends at right angles to the direction of movement of a continuous movable filtering cake.

7. The invention as in claim 1 wherein the cross bar extends parallel to a generating line of a drum-shaped filtering cake.

8. The invention as in claim 1 wherein the frame is mounted for movement relatively to a stationary filtering cake along a path parallel to the surface of the cake.

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