

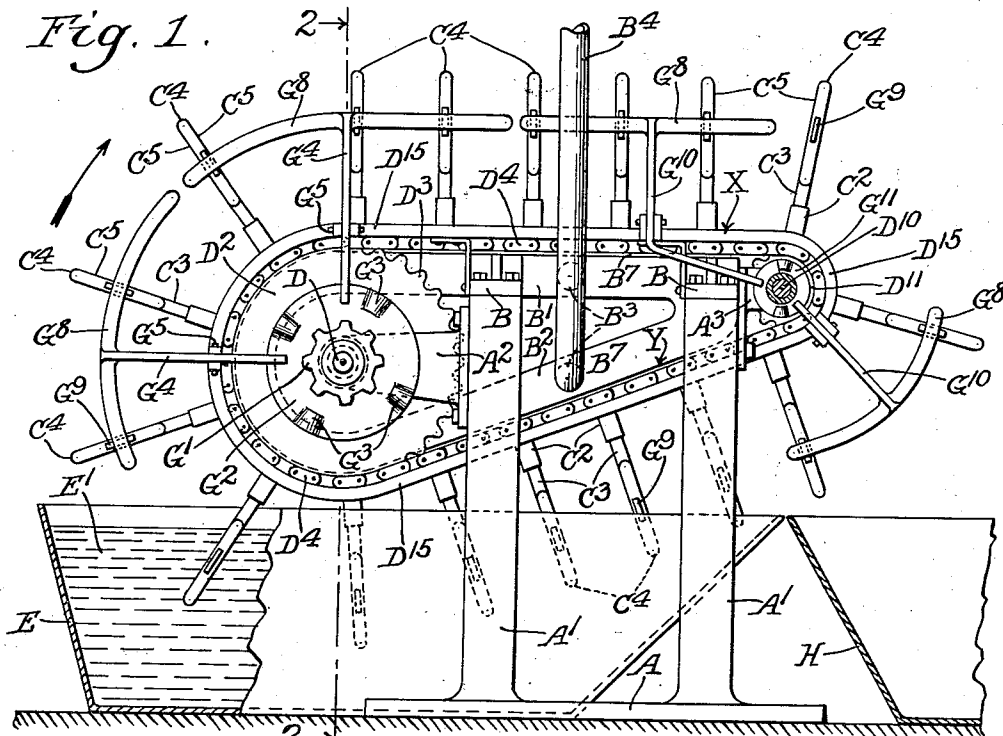
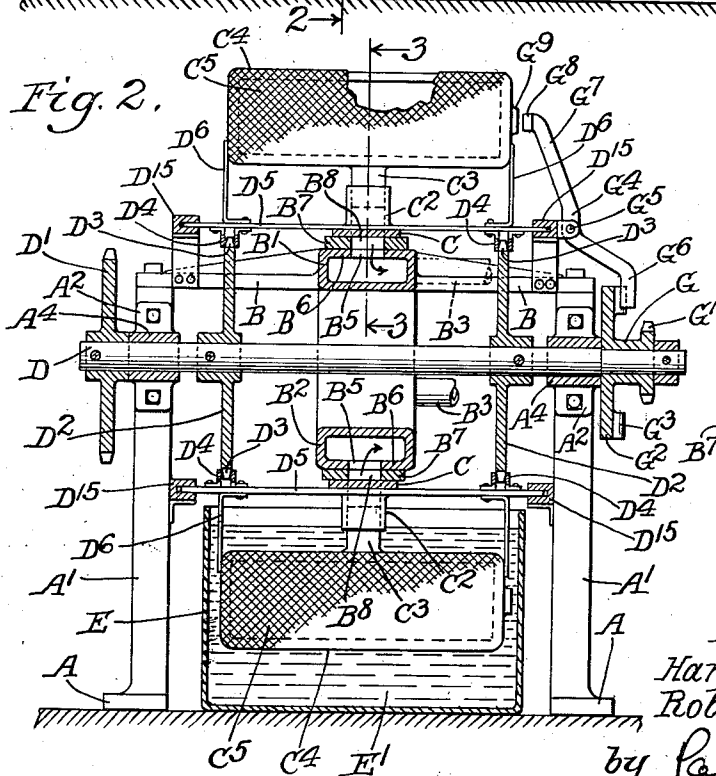
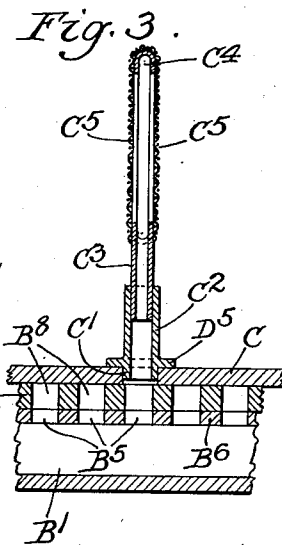
Nov. 6, 1934.

H. W. NEWTON ET AL

1,979,991

METHOD AND APPARATUS FOR FORMING, COMPACTING, AND DISCHARGING FILTER CAKE

Filed Sept. 19, 1931



Inventors
 Harry W. Newton
 Robert Stuart Butler
 by *Paul H. Carter*
 Attorneys.

UNITED STATES PATENT OFFICE

1,979,991

METHOD AND APPARATUS FOR FORMING,
COMPACTING, AND DISCHARGING FILTER
CAKE

Harry W. Newton, Chicago, Ill., and Robert S. Butler, Los Angeles, Calif., assignors to Nordberg Manufacturing Co., Milwaukee, Wis., a corporation of Wisconsin

Application September 19, 1931, Serial No. 563,724

1 Claim. (Cl. 210—198)

Our invention relates to a method of and apparatus for forming and discharging filter cakes. One object is the provision of improved means and method for discharging said cake by mechanical vibration. Other objects will appear from time to time in the course of the specification and claim.

We illustrate our invention more or less diagrammatically in the accompanying drawing, wherein—

Figure 1 is a side elevation;

Figure 2 is a section on the line 2—2 of Figure 1; and

Figure 3 is a section on the line 3—3 of Figure 2.

Like parts are indicated by like symbols throughout the specification and drawing.

Referring to the drawing, A indicates any suitable base from which upwardly extend supports A¹ upon which are indicated brackets A² A³. The brackets A² support bearing sleeves A⁴ and the brackets A³ support corresponding bearing sleeves.

Mounted in any suitable manner on the supports A¹, as by the cross members B, is a vacuum chamber having an upper portion B¹ and a lower portion B². B³ B³ indicate one or more passages in communication with said vacuum chambers and B⁴ indicates a line extending to any suitable exhausting means, not herein shown, whereby a suction may be maintained in the chambers B¹ B². The chambers are ported as at B⁵. As will be seen in Figure 2, the upper surface of the chamber B¹ and the lower surface of the chamber B² is formed by the wall B⁶ in which are the ports B⁵. This wall may be covered by a flat rubber valve seat B⁷ ported as at B⁸ in communication with the ports B⁵. The wall B⁶ and the valve seat B⁷ include upper and lower rectilinear portions connected at the ends by arcuate portions as shown in Figure 1. Preferably the ports B⁵ and B⁸ are omitted from that portion of the wall B⁶ and valve seat B⁷ which connect the right hand ends of the rectilinear portions of said walls, referring to the position of the parts as shown in Figure 1. In other words the ports B⁵ B⁸ extend throughout most of the length of the valve seat so formed, but are interrupted at the right hand end of the device.

Passing about the valve seat so formed, and conforming to it, is the endless rubber valve band C. This band may be apertured as at C¹ to receive an upstanding coupling C² penetrated by a tube C³ in communication with the interior

of the filter leaf structure C⁴, the walls of which are closed by the septum C⁵. It will be understood that any desired number of these valve leaves may be mounted on the rubber valve band and that they move with the band, in a closed path across the valve seat B⁷. It will further be understood that the coupling C² is aligned with the apertures B⁵ B⁸ whereby, as the rubber valve band C is moved, suction is maintained in the interior of the filter leaf C⁴. In other words, air is drawn through the septum C⁵, the passage C³, the coupling C² and the aperture C¹ to the chamber B¹ or B², whence it may be exhausted through the line B⁴. The suction may be intermittent but preferably the parts are so proportioned that a constant suction is maintained, the diameter of the passage C¹ having such relation to the apertures B⁸ B⁵ that it is always in communication with at least one of them.

We may employ any suitable means for moving the valve band and the leaves. We illustrate for example the drive shaft D mounted for rotation in the bearings A⁴ and provided with a sprocket D¹ whence the shaft may be rotated from any suitable power source not herein shown. The shaft D also carries sprockets D² having the teeth D³ meshing with chains D⁴ which are connected by cross-pieces D⁵ from which extend arms D⁶ to which the filter leaves C⁴ are secured. The cross-pieces D⁵ may also communicate with or support or be in connection with the couplings C² and are also secured to the rubber valve band C. Therefore, when the shaft D is rotated the chains D⁴ travel around the sprockets D² and carry with them the filter leaves C⁴ and the rubber valve band C. D¹⁰ is any suitable shaft mounted at the opposite end of the device on the bracket A³, which carries smaller sprockets D¹¹ about which pass the chains D⁴.

E indicates diagrammatically any suitable container or means for maintaining or providing a supply of the liquid to be filtered. The device is driven in the direction of the arrow of Figure 1 with individual filter leaves passing through the liquid E¹ in the container E. As suction is maintained, the liquid is drawn against the septum walls C⁵. The water or liquid content is drawn through the septum, whereas the solids are caught on the outer faces of the septum and form a filter cake. Such a cake, as it forms, contains a very substantial liquid content. As the rotation of the device continues, the individual filter leaves are with-

drawn from the liquid E¹ and suction is maintained, holding the cake in place on the septum. An important phase of our invention is the consolidation of such cake, after the filter leaf has
5 been withdrawn from the liquid being filtered. We find it highly effective to vibrate the individual filter leaves, while maintaining them under suction to hold the cake in place. As an example of means for vibrating the leaves we
10 illustrate the sleeve G which is shown as loose on the shaft D and driven from any suitable power source by the sprocket G¹. The sleeve G includes a cam G² having camming irregularities G³ of any suitable shape, size and number. G⁴
15 generally indicates an impact delivering lever which is pivoted intermediate its ends as at G⁵. The lower arm G⁶ is contacted by the cam members G³. The upper arm G⁷ includes a contact portion G⁸ adapted to tap an opposed
20 contact portion G⁹ associated with the side of the individual filter leaves C⁴. The contact portions G⁸ are herein indicated as in the form of laterally extending members which bridge the
25 space between several individual filter leaves, whereby two or more of the said leaves may be simultaneously vibrated by the vibration of an individual lever G⁴. We may employ several of the vibrating levers G⁴ actuated by the disc G² and extending radially from it. We may also
30 employ an additional lever or levers G¹⁰ vibrated from a corresponding disc G¹¹ adjacent the opposite end of the device.

It will be understood that the suction is maintained on the leaves up to the time they reach
35 the point indicated as X in Figure 1. The suction is then broken and is not resumed until the leaf reaches the point marked Y in Figure 1. As the individual leaves pass beyond the last of the contact members G⁸ extending above the
40 upper portion of the filter the vibration ceases and at the same time or shortly thereafter the suction is cut off. The leaves then pass about the arc at the right hand end of the device until they come in contact with the lower vibrating
45 member G³, which engages them after the suction is cut off and at a time when the leaves are downwardly inclined. The vibration delivered thereby is for the purpose of freeing or discharging the now compacted cake and we find
50 that the cake readily drops from the leaf and may be received in any suitable manner for example in the container generally indicated as H. Then the individual filter leaf, freed from the cake, again enters the suction zone and passes
55 beneath the surface of the liquid E¹, to gather another filter cake which, in turn, is first compacted by vibration, under suction, is then relieved from the suction, and finally, is again freed by renewed vibration.

60 It will be realized that whereas we have described and shown a practical and operative device, nevertheless many changes may be made

in size, shape, number and disposition of parts without departing from the spirit of our invention. We therefore wish our description and drawing to be taken as in a broad sense illustrative and diagrammatic rather than as limiting us to our specific showing. 80

The use and operation of our invention are as follows:

In the formation and removal of filter cakes various means have been employed for removing
85 the cake after its formation, and for reducing the water content. In our method and mechanism we provide means for first forming a cake on a septum or pervious member. Then the cake, which may be a very thin cake, is compacted by vibration of the members G⁸
90 which impart their vibration to the leaves. Then, after the individual leaves pass the point X, as an example, the suction is cut off. As the leaves continue their movement further they
95 enter a second zone of vibration. In the device as herein shown this second zone does not begin until the leaves are downwardly inclined. Hence the cake as it is freed from the septum will drop down into the container H. We find that
100 after the cake is compacted as above described and after the suction is taken off, the rapid vibration of the individual filter leaves very readily and completely frees the cake. The cake so produced is thin and dry. However, the
105 thickness of the cake may be greatly varied, depending upon the liquid treated, the speed of the belt, the length of time the individual leaves are in the liquid, etc. However, we can form and discharge a very thin and very
110 dry cake. The cake, when discharged, leaves the septum clean as contrasted for example to the methods and apparatus wherein a relatively wet cake is scraped from a septum. Furthermore, since there is no scraping or physical impact
115 against the face of the septum itself, the wear of the filter leaves is greatly reduced.

We claim:

The method of forming and discharging a filter cake, which includes subjecting a septum
120 to the liquid to be filtered and forming the cake upon said septum, removing septum and cake from contact with the liquid, maintaining a suction through cake and septum after the removal from the liquid, subjecting cake and septum as
125 a whole, after such removal and during such suction, to positive bodily oscillation of an amplitude and frequency sufficient to cause a substantial regrouping of the solid particles of the cake, terminating said suction, and thereafter
130 subjecting the cake and septum to further positive bodily oscillation, and thereby discharging the cake from the septum, the positive bodily oscillation being propagated generally in the plane of the septum. 135

HARRY W. NEWTON.
ROBERT S. BUTLER.