

1 574 017

- (21) Application No. 406/77 (22) Filed 6 Jan. 1977
 (31) Convention Application No. 51/001737 (32) Filed 7 Jan. 1976 in
 (33) Japan (JP)
 (44) Complete Specification published 3 Sept. 1980
 (51) INT. CL.³ B01D 25/32 25/12
 (52) Index at acceptance
 B1D 1603 1604 1606 1607 2101 2103 2106 EA



(54) A METHOD OF POSITIONING A FILTER CAKE
 DISCHARGE DEVICE FOR A FILTER PRESS

(71) We, NIPPON GAISHI KABUSHIKI KAISHA of No. 2-56, Suda-Cho, Mizuho-ku, Nagoya City, Japan, a company organized according to the laws of Japan, do hereby
 5 declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to a filter press and more particularly to a method of positioning a filter cake discharge device for a filter press.

15 In order to discharge filter cakes of a filter press, heretofore, when filter plates are separately opened one by one after completion of squeeze, a filter cake discharge device is moved above the filter plates in closing and opening direction
 20 thereof until it reaches the mid portion of a filter cloth or plates to remove the cakes therefrom by vibrating the filter cloth or jetting cleaning liquid thereagainst. With this arrangement the filter plates often
 25 assume a tilted position due to an old or worn filter cloth, clogged cakes at the bottom of the filter plates if they have been used for many years, or due to wear in the shifting mechanism for the filter plates.
 30 If a cake discharging operation is effected with the tilted filter plate, there is a risk of damage to the filter cloth or plate and a complete discharge of filter cakes cannot be accomplished because the filter cake
 35 discharge device is not in the best position for discharging the cakes.

40 Particularly, with heretofore known filter press wherein filter plates and filter cake discharge device are connected with each other by a chain in order to drive these members by a single driving means, there is a tendency for open positions of the filter plates to be shifted owing to an elongation of the chain. It is evident that such an
 45 incorrect positioning of the filter plates will

obstruct the complete discharge of the filter cakes.

The present invention provides a method for detecting whether opened filter plates are in a correct position and orientation to
 55 be treated by a filter press filter cake discharge device which in use travels above filter plates in a moving direction of said filter plates, comprising detecting a relative position of said filter cake discharge device
 60 with respect to said opened filter plates by utilizing each signal from position detecting switches provided on said discharge device for detecting a position of said filter cake
 65 discharge device and a pair of condition detecting switches provided on said discharge device for detecting an orientation of said filter plates, wherein said switches are operated by protrusions provided on the top end of said filter plates.

70 The method may further comprise controlling operation of said filter cake discharge device by utilizing the signal from said pair of condition detecting switches for detecting the orientation of the filter plates.

75 The method may also comprise positioning and operating said filter cake discharge device only when the switches for detecting the position of the discharge device are actuated and in a closed condition and both of the pair of condition detecting switches for detecting the orientation of the filter plates are not actuated and are in their normally closed condition.

80 It is a primary object of this invention to provide a method of positioning a filter cake discharge device enabling a filter press to effect complete discharge of filter cakes.

85 It is another object of this invention to avoid filter plates and cloth from being damaged by a filter cake discharge device.

90 It is a further object of this invention to provide a method of operating a filter cake discharge device only when the device is in a proper position relative to filter

plates to a filter press.

For a better understanding of the present invention, reference may be made to the accompanying drawings, in which:

5 Fig. 1 is a side elevation of a part of a filter press for carrying out the method of the invention;

Fig. 2 is a sectional view taken along the lines II-II in Fig. 1;

10 Fig. 3 is a fragmentary view of the filter press in Fig. 1 showing arrangements of limit switches;

Fig. 4 is an operating circuit for the cake discharge device in Fig. 1;

15 Fig. 5 is a side elevation of a part of another filter press for carrying out the method of the invention;

Fig. 6 is an operating circuit for the cake discharge device in Fig. 5; and

20 Fig. 7 is another circuit for the cake discharge device in Fig. 5.

The term "filter cake discharge device" used herein is intended to include all means for discharging filter cakes such as vibrating means or vibrator for vibrating filter cloths and cleaning means for jetting cleaning liquid against filtering cloths or plates. The term "forward" used therein means a forward or closing direction of the filter plate, which is indicated by "A" and the term "rearward" means a rearward direction of the plate opposite to the "forward", which is indicated by "B" in Figs. 1 and 5.

35 The preferred embodiment of the invention will be explained in detail with reference to the attached drawings hereinafter.

Referring to Figs. 1-4 wherein two filter cloths are exposed at two different portions in an inverted V-shaped form to discharge the cakes at the portions of the cloths, the vibrating means 1 is movable along a rail 4 arranged in the forward and rearward directions of the filter plates with the aid of rollers 5 rolling on the rail 4 and is driven by an endless chain 6 attached at its ends to the vibrating means 1. The vibrating means 1 comprises a hammer 7 vertically or circularly movable to vibrate the filter cloth 3. In the embodiment, a pair of vibrating means 1 are provided (only one shown in Fig. 2) and moved in synchronism with each other and two rails 4 for respective vibrating means arranged one on each side of a filter press. The filter plates 2 are adapted to be opened by means of a suitable shifting mechanism, for example, shifting pawls adapted to engage projections on the filter plates 2 and secured to driving chains extending in parallel with side bar of the filter press. Each of the filter plates 2 is provided at both ends of its upper surface with inverted L-shaped frames 8 (only one shown in Fig. 2) from which are hung springs 9 for holding iron rods 13

somewhat longer than the width of the cloth 3.

The vibrating means or vibrator 1 on one side is provided with a mounting member 10 having a position limit switch 1₁LS (switch for detecting a relative position of the vibrating means to the filter plates) at the mid portion of the underside of the member and condition limit switches (2LS, 3LS) (switches for detecting orientations of the filter plates) at both ends of the underside of the member. The vibrating means on the other side is similarly provided with a mounting member 10 having a position limit switch 1₂LS at the mid portion of the underside. On the other hand, each of the frames 8 is provided on its top with a protrusion 11 for actuating levers of the respective limit switches 1₁LS, 1₂LS, 2LS and 3LS (Figs. 1 and 2).

Referring to Fig. 4 showing an operating circuit for the method according to the invention, when the limit switches 1₁LS and 1₂LS are actuated, electromagnetic relay coils 1₁LX and 1₂LX are energized to close normal open contacts 1₁XS and 1₂XS, respectively. When the limit switches 2LS and 3LS are actuated, electromagnetic relay coils 2LX and 3LX are energized to open normal closed contacts 2XS and 3XS, respectively. If both the normal open contacts 1₁XS and 1₂XS are closed while the normal closed contacts 2XS and 3XS remain normally closed, an electromagnetic relay coil XS for starting vibration is energized to produce a signal for starting vibration of the hammers 7. It is preferable to provide a lamp or alarm which is actuated when the coils 2LX and 3LX are energized.

In order to discharge the cakes with the above arrangement, the rearmost filter plate of the gathered filter plates 2 is opened rearwardly by means of the shifting mechanism and the second rearward plate is then opened such that the distances between the rearmost and second filter plates and between the second and third filter plates are equal. In this manner, the filter cloth is pulled by the forward and rearward springs 9 so that the filter cloths are oblique or tilted between the adjacent spaced apart filter plates and the upper portion extends horizontally in an inverted V-shaped form as shown in Fig. 1. On the other hand, the vibrating means 1 which have been located at the rearward position of the filter plates are advanced simultaneously with the rearward movement of the filter plates 2 until they reach a position intermediate the rearmost and third filter plates that is above the second filter plate as shown in Fig. 1. In this case so long as the second plate is vertically positioned or at right angles to the closing direction of the plates and the vibrating means 1 are immediately

above the second plate as shown in Fig. 1, the limit switches 1_1LS and 1_2LS are actuated to energize the coil XS for starting the vibration of the hammers 7 of the vibrating means. If the second filter plate 2A were inclined as shown in Fig. 3, the vibration would not start because the limit switch 2LS is actuated to open the contacts 2XS so that the coil XS is not energized.

In order to detect the inclined filter plate, it is preferable to provide an alarm adapted to be actuated when the coil 2LX is energized. When detected the inclined plate 2A (Fig. 3) by the alarm, the vibration may be started after the second plate has been returned to its vertical position. In the event that the second plate was inclined to actuate the limit switch 3LS, or in the event that the vibrating means 1 did not stop at the proper position immediately above the second plate to actuate the limit switch 2LS or 3LS, it makes the contact 3XS open so that the coil XS is not energized and the vibration do not start in the same manner as the above.

After the parts of the filter cloth between the rearmost, second and third filter plates have been cleaned, these plates are retracted in succession in the rearward position and then the fourth filter plate is opened and the vibrating means 1 are further advanced to effect the same operation for cleaning next parts of the filter cloth between the third, fourth and fifth filter plates and repeat the operation for the remaining parts of the filter cloth.

In the case that cleaning means for jetting cleaning liquid is used, the control and operation of the device are the same as those of the vibrating means although the constructions of these discharging devices are quite different from each other. Dot-dash lines 12 in Figs. 1 and 2 indicate jet nozzles of the cleaning means.

Fig. 5 illustrates another embodiment of the invention and Fig. 6 shows a control circuit therefor wherein only one filter cloth is exposed in an inverted V-shaped form at a time for discharging the cakes between the two filter plates. In this case, the configuration of a mounting member 10 and positions of limit switches 1LS, 2LS and 3LS are different from those in the embodiment shown in Figs. 1 to 4. The mounting member 10 in this embodiment has a length substantially equal to the distance between opened filter plates 2a and 2b. The limit switch 3LS of vibrating means 1 is so positioned on the mounting member 10 that when the vibrating means 1 is located in the proper position relative to the filter plates the limit switch 3LS is at a location nearer to the vibrating means than a protrusion 11 of the filter plate 2a which is rearwardly spaced from the adja-

cent filter plate 2b. The limit switch 1LS is so arranged on the mounting member as to be in contact with a protrusion 11 of the filter plate 2b which is forwardly spaced from the rearward filter plate 2a. The limit switch 2LS is so located on the mounting member as to be in contact with a protrusion 11 of a filter plate 2c firmly pressed to the filter plate 2b.

The operation circuit shown in Fig. 6 is different from the circuit shown in Fig. 4 in the fact that contacts 2XS are normal open contacts adapted to open and close by means of a coil 2LX energized when the limit switch 2LS is actuated.

With the above arrangement, accordingly, the coil XS is energized to start the vibration only when the vibrating means 1 are just centrally above the filter plates 2a and 2b spaced a determined distance, the filter plates 2b and 2c are in close contact with each other and the filter plates 2a, 2b and 2c assume in their proper positions at right angles to the advancing direction of the plates. When the vibrating means and the filter plates do not fulfil these conditions, the vibration will never be started.

Referring to Fig. 7 showing another operating circuit for the limit switches 1LS, 2LS and 3LS shown in Fig. 5, the circuit including the limit switch 3LS is a self holding circuit having normal open contacts 3XS connected in parallel with the limit switch 3LS and adapted to be closed when the coil 3LX is energized, and normal closed contacts S connected in series with the switch 3LS for releasing the self hold. The contacts S are opened by a signal indicating the start of a motor for driving the shifting mechanism for the filter plates. Normal open contacts 1XS and 3XS adapted to be closed when coils 1LS and 3LS are energized, respectively are connected in series with an electromagnetic relay coil X_1 for detecting the passage of the filter plates. Normal open contacts X_1S adapted to be closed when the coil X_1 is energized and normal open contacts 2XS adapted to be closed when the coil 2LX is energized are connected in series with an electromagnetic relay coil X_2 for starting the vibration.

Accordingly, with this operating circuit, after completion of the cake discharging operation, opening of the forward filter plate, for example, the plate 2b of the adjacent spaced filter plates is detected by the energization of the coil X_1 , and thereafter the energization of the coil X_2 indicates the fact that the vibrating means 1 is in the proper position and the respective filter plates are in the determined location for the discharge of the cakes.

As can be seen from the above description, according to the invention the discharge of cakes is completely accomplished without

any risk of damage to the filter cloths and plates by the detection of the fact that the filter plates and the cake discharging device are in proper position for discharging cakes.

5 cakes.

WHAT WE CLAIM IS:—

1. A method for detecting whether opened filter plates are in a correct position and orientation to be treated by a filter press
10 filter cake discharge device which in use travels above filter plates in a moving direction of said filter plates, comprising detecting a relative position of said filter cake discharge device with respect to said opened
15 filter plates by utilizing each signal from position detecting switches provided on said discharge device for detecting a position of said filter cake discharge device and a pair of condition detecting switches provided on
20 said discharge device for detecting an orientation of said filter plates, wherein said switches are operated by protrusions provided on the top end of said filter plates.

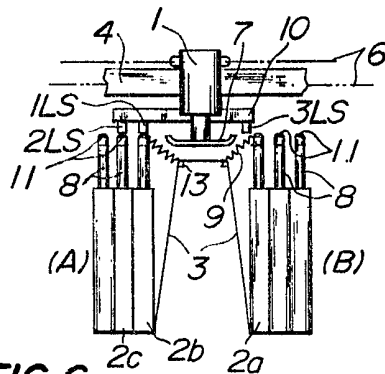
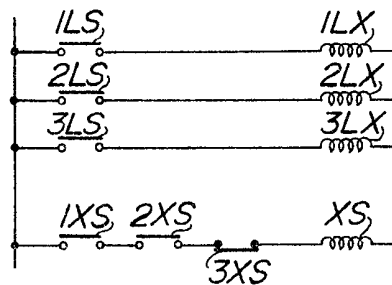
2. A method as set forth in claim 1,

further controlling operation of said filter cake discharge device by utilizing the signal from said pair of condition detecting switches for detecting the orientation of the filter plates.

3. A method as set forth in claim 2, further including positioning and operating said filter cake discharge device only when the switches for detecting the position of the discharge device are actuated and in a closed condition and both of the pair of condition
35 detecting switches for detecting the orientation of the filter plates are not actuated and are in their normally closed condition.

4. A method of positioning a filter cake discharge device which method is substantially as hereinbefore described with reference to the accompanying drawings.

PAGE, WHITE, FARRER,
Chartered Patent Agents,
27 Chancery Lane,
London WC2A 1NT.
Agents for the Applicants.

FIG.5**FIG.6****FIG.7**