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71 Applicant: **A. Ahlström Corporation**
SF-29600 Noormarkku (FI)

72 Inventor: **Haakana, Matti**
Keskustie 44
SF-57210 Savonlinna (FI)

Heino, Jukka
Juusniementie 41
SF-57600 Savonlinna (FI)

Lindroos, Kai
Kirkkokatu 2 A 8
SF-57100 Savonlinna (FI)

Kohonen, Raimo
Päiväkummunkaari 3A
SF-57230 Savonlinna (FI)

74 Representative: **Gilmour, David Cedric Franklyn et al**
POTTS, KERR & CO. 15 Hamilton Square
Birkenhead Merseyside L41 6BR (GB)

54 Sealing apparatus for a filter press.

57 The present invention relates to a sealing apparatus preferably for sealing of the sides of the pressing zone of filter presses used in the pulp and paper industry.

Previously known sealing apparatuses have been complicated. Most commonly they have been composed of sheet-formed rubber and supporting metal rods attached to each other with bolts. The users have not, however, been satisfied with such arrangement because the bolt attachment has not facilitated the structure of the sealing apparatus remaining unchanged along the whole length of the press, and the sealing apparatus has had to be left unsupported at the narrow end of the pressing zone, whereby it has often failed, letting pulp be discharged to the press side. Furthermore, earlier sealings have worn down very quickly.

The sealing apparatus according to the present invention solves the problems mentioned above because the sealing apparatus has been cast into a unit, which comprises a back (11), lips (13 and 14) with a space (15) therebetween and a support member (12) in the depth direction of the space, said support member allowing the sealing apparatus to bend in conformance with the movements of the press wires but eliminating the tendency of the sealing apparatus to bend under the press of the pulp.

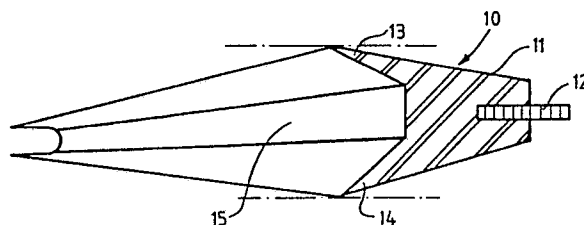


FIG. 2

Description

Sealing apparatus for a filter press

The present invention relates to a sealing apparatus for filter presses or the like in which the material to be treated is led in between two wires, whereby the sealing apparatus prevents the material from being discharged sideways from between the wires. The sealing apparatus according to the invention is especially suitable for filter presses used for thickening of pulp or sludge.

The sealing apparatus of the present invention will be described below in connection with a filter press which comprises a top wire unit and a bottom wire unit, and the pulp to be thickened is fed in between these units. The wires are supported by a plurality of successive rolls in such a manner that the distance between the wires becomes narrower in the longitudinal direction of the machine and the direction of movement of the pulp or sludge. The wire-supporting rolls are preferably so disposed that the pressing zone includes several press nips which contribute to the thickening of pulp i.e. by liquid being pressed out of the pulp through the wires. As a result of being pressed in such a narrowing space, the pulp is naturally itself prone to discharge crosswise relative to the direction of extension of the machine, in which case a side sealing arrangement is necessary for the pulp which is to be thickened uniformly and, what is most important, which is not to be discharged from the sides of the press out of the pressing zone.

Finnish patent application 840841 discloses a typical prior art sealing apparatus for a wedge section i.e. for a pressing zone of dewatering machines. The sealing apparatus is disposed between said wires in the edge zone of the press wires. The sealing apparatus itself comprises one or two sealing arms or ledges having the same thickness from one side to the other, which sealing ledge/ledges is/are either angled or bent between the wires or attached in a U-shape between the wires by means of specific members. In both types of apparatuses the ledges used are entirely of the same thickness from one side to the other and their outermost part are fixed between metal or equivalent frames, said frames being attached to one another with bolts. These arrangements have been possible, however, only at the wider end of the filter section where the distance between the wires is several centimeters. However, for a large part of the pressing zone, the distance between the wires is less than 20 mm, and in the area close to the end even less than 10 mm. In these areas, the sealing apparatus has no space between the wires for metal frames or a bolt to connect the frames, and the sealing ledge has to be left free and curved having the same thickness from one side to the other, the pressure on which ledge easily bends it outwards so as to widen the efficient area between the wires towards the rear end of press, whereby the pressing/thickening effect of the edge sections will no longer be the same as in the center-line of the press. In the worst case, the sealing apparatus will break and the pulp will be

freely discharged to the sides of the machine.

One of the drawbacks of prior art sealing means is, for example, their short lifetime of approximately two weeks. A material that would endure friction and other strains has not been found. On the other hand, no company with strong enough product development potential has been interested in developing material suitable for this very purpose because the market, with respect to product development costs, is very limited. Such sealing means are complicated in structure since they have a great number of separate parts. Their lateral stiffness is poor, in other words they have to be very well supported which means that support members must be disposed very close together. Furthermore, since the above-mentioned sealing means are plates with the same thickness from one side to the other, their sealing characteristic is not as good as it should be because the tip of the sealing tip is as stiff as the rest of the sealing ledge and therefore the tip does not readily respond to the movements of the wire surface. On the other hand, a sealing ledge having the same thickness from one side to the other and which bends for as wide part as possible under the pulp pressure against the wire surfaces, results in a greater wearing of the sealing ledge.

The sealing apparatus according to the present invention eliminates or minimizes the drawbacks of the prior art means in being much more durable, cheaper to manufacture and easier to replace than the earlier arrangements.

The sealing apparatus of the invention is characterized in that it comprises channel-like sealing means having back part or portion and two lips extending therefrom to define a space between the lips with the width of said space changing in the longitudinal direction of the sealing apparatus, and a support member disposed on the back part or portion of the sealing means.

The sealing apparatus according to the invention is further described, by way of example, in the following with reference to the accompanying drawings, in which

Fig. 1 is a schematic overall elevational view of a filter press including a sealing apparatus according to the invention;

Fig. 2 is a perspective view of a sealing apparatus according to the invention; and

Figs. 3a and b are cross-sectional views of the opposite ends of the sealing apparatus according to the invention.

In accordance with Fig. 1, a filter press including a sealing apparatus of the invention comprises a frame 1 provided with two wire units or sections, i.e. a bottom wire 2 and a top wire 3. The bottom wire 2 is supported in the pressing zone 4 by rolls 5, which rolls are disposed relatively close to each other successively in the longitudinal direction of the press. The tension regulation of the bottom wire 2 is effected by adjusting the position of a wire turning roll 6 in a substantially horizontal direction. The top

wire 3 is supported in the pressing zone 4 by a group of rolls 7 which group is substantially vertically adjustable and its pulp inlet end (on the right-hand side of the figure) is pivoted to the frame 1 in the arrangement of Fig. 1, and the group is arranged to be vertically adjustably displaceable by means of adjusting means 8 at its opposite end. The tension regulation of the wire 3 is effected by adjustment of the position of a wire turning roll 9. The distance between the top and bottom wires is substantially constant at the pulp inlet end but adjustable at the opposite end. The pressing zone is preferably arranged so as to become narrower like a wedge so that, at the pulp inlet end the distance between the wires is approximately 60 mm whilst at the opposite end is approximately 8 to 10 mm. Both sides of this pressing zone are provided with a sealing apparatus according to the invention.

Fig. 2 is a perspective of a sealing apparatus, which comprises sealing channel means 10 comprising a back portion 11 having a support member 12 arranged therewith, and two lips 13 and 14 disposed on the opposite side of the back with respect to the side of said support member with a space 15 being defined between said lips. Substantially in the direction of the support member 12 is the "depth direction" of the space 15 i.e. also the direction of the pulp web plane. Furthermore, a dash line indicates the route of the wires 2 and 3 with respect to the sealing apparatus. The sealing apparatus is further characterized in that it becomes narrower in the longitudinal direction, its dimensions naturally substantially conforming to the vertical dimension of the pressing zone 4. The lips 13 and 14 of the sealing apparatus are preferably very thin at their tips, thus being able to better respond to the movements of the wires, but they become thicker towards their point of connection with the back, whereby their elasticity decreases on their side facing or proximating the back. As a result of this construction, only a narrow section of the lips 13 and 14 is in contact with the wires 2 and 3 at a time and, consequently, the frictional forces on the attaching members of the sealing apparatuses are substantially reduced in comparison with the prior art. On the other hand, the tip of the lip stays thin all the time because, while wearing it shortens evenly and does not wear uniformly across its whole width as in earlier arrangements, in which arrangements the structure of the sealing ledge facilitated a wide contact surface whereby the apparatus wore across the whole width of the sealing part.

Figures 3a and b illustrate the cross section of the sealing means of the sealing apparatus as opposite ends thereof. The figures, which have been drawn on a rough scale, indicate that the dimension of the sealing apparatus across the machine, i.e. its width, remains unchanged along the whole length, but the vertical dimension decreases as stated hereinabove. Correspondingly, the dimensions of the support member 12 let or sunk into the back remain unchanged along the whole length of the sealing apparatus.

The object of the support member 12 in itself is to provide the sealing apparatus with necessary lateral

stiffness which is very important in order that the width of the pulp web to be thickened remains constant along the whole length of the pressing zone and in order that the sealing apparatus need not be supported by support means to be installed very close together, the number of which support means being directly proportional to the amount of work needed for the change of the sealing apparatus. On the other hand, the support member shown in the figures allows vertical bending of the sealing apparatus, which may in some cases occur as the direction of the wires changes slightly. Such bendings have not been allowed by prior art sealing means because attachment members made of metal or equivalent material used in them have been positioned so as to resist bending or deflection of the wire out of said direction.

A preferable material for the main component (10) of the sealing apparatus according to the invention is cast plastics material with appropriate friction properties and it has been found that polyurethane-based plastic is a most suitable material, and provided with suitable additives, it has desired characteristics of slide, endurance and elasticity as well as features required by the manufacturing technique. The support member is preferably a flat metal bar, which is easy to provide with attachment and support means for the sealing apparatus which means in the test examples were special quick-disconnect elements by means of which changing of the sealing apparatus was rapid. The sealing apparatus is manufactured by casting the plastics material channel member in a mold in a way such that the support member simultaneously becomes tightly fixed or bonded to the back of the main channel component of the sealing apparatus. Thus, the whole sealing apparatus is comprised of a one-piece unit, which may be rapidly locked in place in the press by a quick-disconnect element.

An arrangement that slightly deviates from the embodiment described above is, for example, a sealing structure where the sealing material has been changed somewhat, whereby it is possible to form the sealing of one and the same material, of either metal or synthetic material. Thus, the sealing preferably comprises two bent plates which have been riveted, glued, washed or in some other suitable manner attached to one another at their backs. In this case, a doubled back of the sealing element functions in a manner corresponding to the support member of the previous embodiment. Between the bent plate parts there remains a space, which completely corresponds to the space of the previous embodiment. Also in this embodiment, the sealing part is the tip of the plate-formed lip. The sealing elements on the opposite sides of the press are preferably so disposed that their distance slightly increases in the direction of movement of the wire. In this case, friction between the material to be thickened and the sealing will decrease and the contact surface between the sealing and the wire will become wider, whereby the friction stress by the sealing on the wire will considerably diminish per unit area. At the same time, the life-time of the sealing can also be considered to be increased because the

sealing can never become subject to a perpendicular force component pressing the lip.

As can be seen from the above description, a completely new sealing apparatus has been developed for such points of operation where a sealing is needed which is variable in dimensions, stays in place and can be disposed between two moving surfaces. The sealing apparatus according to the invention eliminates or minimizes the weaknesses of prior art arrangements by considerably simplifying the apparatus, whereby it is quick to manufacture and change. The manufacture of the sealing apparatus itself need not necessarily be given to a plastic making specialist who would require a large production series until the manufacture would be profitable. The sealing apparatuses can be manufactured in small series by, for example, filter press manufactures or small workshops of subsuppliers.

Claims

1. A sealing apparatus intended for use between two plane surfaces which surfaces move relative to said sealing apparatus and the distance between changes in the longitudinal direction of the sealing apparatus; **characterized** in that the sealing apparatus comprises channel-like sealing means (10) having a back part or portion (11) and two lips (13, 14) extending therefrom to define a space (15) between the lips with the width of said space changing in the longitudinal direction of the sealing apparatus, and a support member (12) disposed on the back part or portion (11) of the sealing means (10).

2. A sealing apparatus as claimed in claim 1, **characterized** in that the lips (13 and 14) are tapered, being thin at their tips and becoming evenly thicker towards the point of connection to or merger with the back part or portion (11).

3. A sealing apparatus as claimed in claim 1 or 2, **characterized** in that the support member (12) is sunk into or embedded in the back part or portion (11) of the sealing means (10).

4. A sealing apparatus as claimed in any of claims 1 to 3, **characterized** in that the back part or portion (11) of the sealing means (10) becomes narrower in the longitudinal direction of the sealing apparatus.

5. A sealing apparatus as claimed in any of claims 1 to 4, **characterized** in that the sealing means (10) is formed as a unit by being cast as an integral member from appropriate plastics material with the support member (12) being incorporated in the back portion (11) during casting.

6. A sealing apparatus as claimed in claim 5, **characterized** in that the plastics material used in polyurethane featuring appropriate sliding, durability and elasticity accomplished by means of additives.

7. A sealing apparatus as claimed in any of

claims 1 to 6, **characterized** in that the sealing means comprises two bent plates the backs of which, attached to each other, form a support member supporting the sealing apparatus.

8. A sealing apparatus as claimed in claim 1, **characterized** in that the distance of opposite sealing means of the press increases somewhat in the direction of movement of the operational part of the wire.

9. A sealing apparatus as claimed in claims 1 to 8, **characterized** in that the support member (12) is located on the side of the back portion (11) remote from said lips (13, 14) and lies in the plane of symmetry of the sealing means (10) and extends along the length of the sealing means (10).

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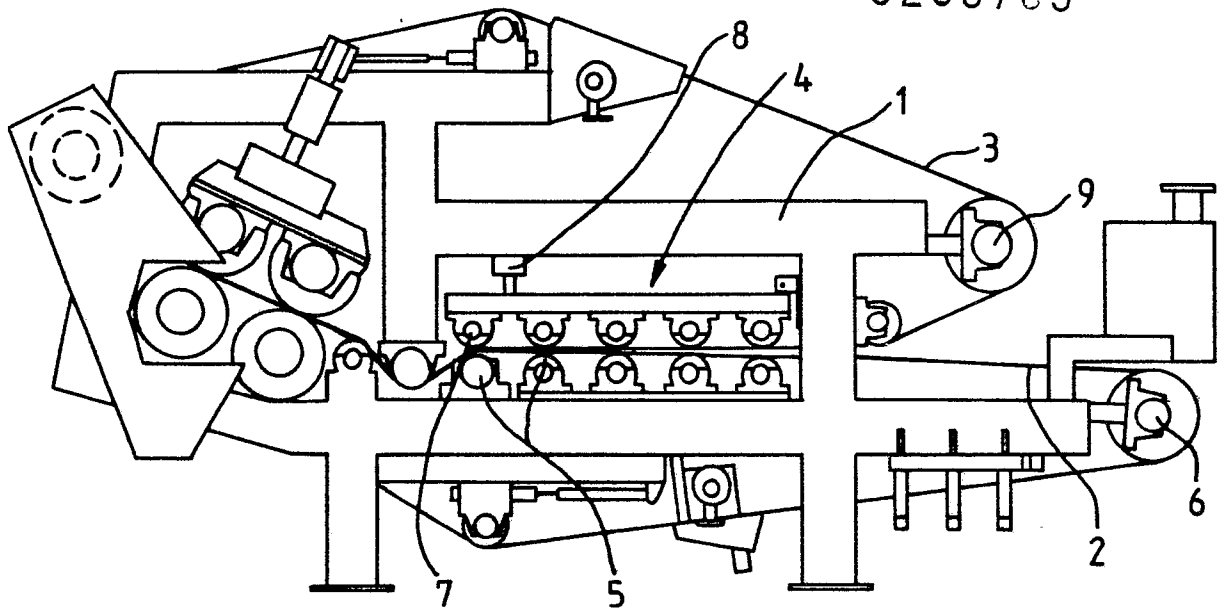


FIG. 1

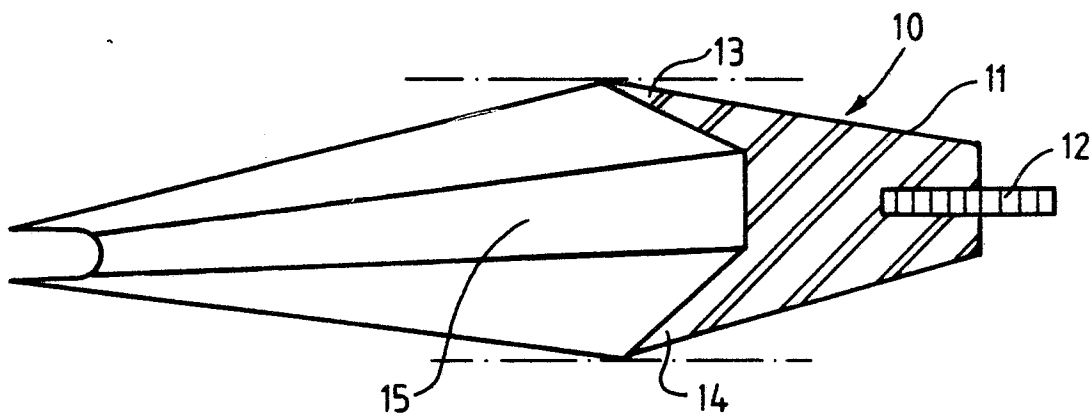


FIG. 2

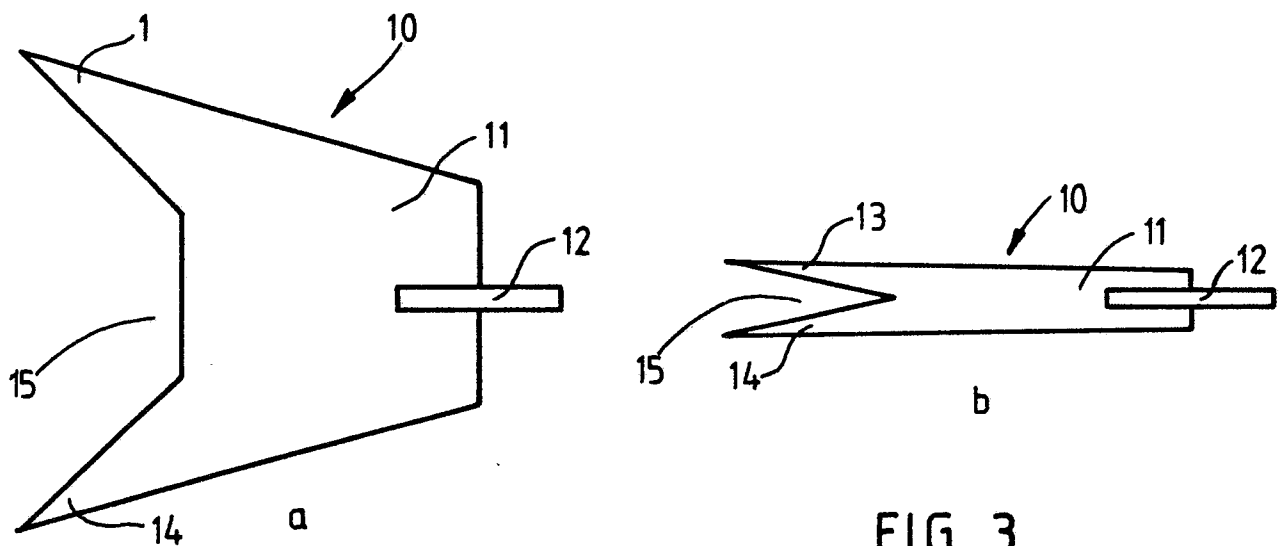


FIG. 3