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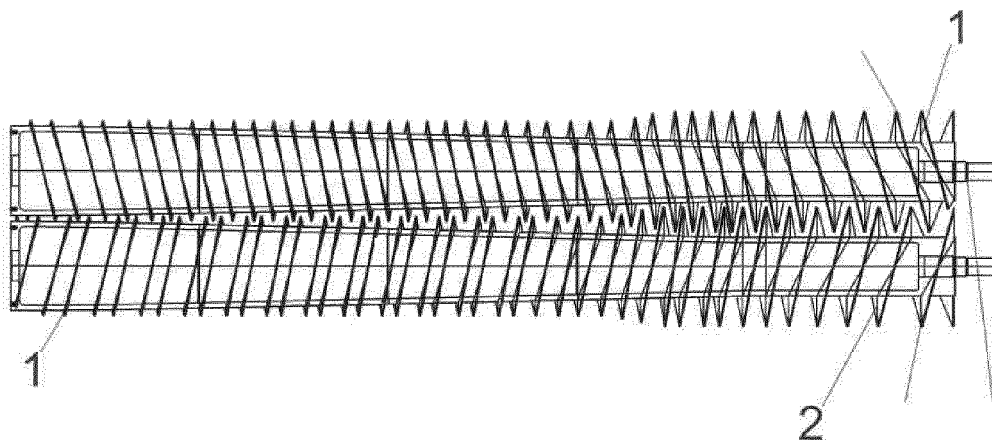
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(54) **DOUBLE-FLIGHTED THREAD PULP PRESS SCREWS**

(57) Double-flighted thread pulp press screws, for use in horizontal volumetric presses having two parallel horizontal sub-screws (3) introduced inside a longitudinal cage or envelope, commonly used in the sugar industry, wherein the sub-screws (3) have a double-flighted thread (1,2) of equal distance to the filtering cage (4), housed

such as to prevent the existence of collision with each other and the use of which provides, combined with the incorporation of a scraping/cleaning edge (5) on the outer end of the threads that form the two sub-screws of the press, a substantial enhancement in the performance of the assembly.

Figure 1



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Description

OBJECT OF THE INVENTION

[0001] The present invention, as expressed in the title of this specification, relates to a double-flight thread sub-screw system for use in horizontal volumetric presses having two parallel horizontal sub-screws.

[0002] The field of application of the present invention is the manufacture of press machines commonly used in the sugar industry, enhancing the performance of the aforementioned presses, based on the optimisation of the cleaning of the accumulated pulp that blocks the filtering surface, preventing the dewatering, mixing and crushing thereof, as well as a greater labyrinth effect of the path travelled by the pulp through the press. That is, a geometric seal that prevents the backward movement of the product when compressed.

BACKGROUND ART

[0003] By way of introduction, horizontal volumetric presses having two parallel screws were invented by the Norwegian company STORD for pressing fish waste for the subsequent production of fishmeal. Over time, these were given new applications including, namely, their use to date for pressing exhausted sugar beet pulp at sugar factories.

[0004] Thus, in the 70s the companies STORD, BABBINI & C SAS FLLI and MERCIER itself, associated with the present invention, supplied these machines to sugar factories worldwide, without incorporating any major innovations to their design over time: use of cone-shaped rather than bicylindrical screws, use of perforated/filtering cores in the screws and installation of small threads in the pressure zone, mainly.

[0005] At present, the yield from the pressing of exhausted sugar beet pulp in the aforementioned presses conditions the subsequent final thermal drying processes, with the ensuing savings in fuel. This thermal drying is frequently carried out at drying plants/rotary ovens where the product is dried until reaching approximately 90 % of dry matter, whereupon it undergoes final pressing into pellets, prior to being marketed as cattle feed.

[0006] Likewise, mention should also be made of the fact that the aforementioned horizontal volumetric presses having two parallel screws are also used for other waste generated at sugar factories, such as sugar beet leaves and stems, chicory pulp, fish waste, meat waste, agricultural by-products such as soy, starch, orange peel, alfalfa, potato, etc., treatment of waste and, in general, all types of products to which value is added by the pressing process carried out.

[0007] According to the state of the art, only the patent of invention identified by its publication number and title, respectively, EP0773100B1 "Screw press for dehydrating fibrous materials," owned by BABBINI & C SAS FLLI, provides a press provided with a pair of parallel screws,

with double-flighted threads, wherein the height of one of the threads is significantly lower than that of the other. That is, they are double-thread screws wherein use is made of a second thread having a height comprised between 50 and 60 mm, substantially lower than the height of the first thread. Additionally, neither do the threads have a constant total height.

[0008] In conclusion, the "Double-start thread pulp press screws" provide, with respect to the general state of the art and, in particular, with respect to the aforementioned invention of BABBINI & C SAS FLLI, a horizontal double-screw press wherein the screws have a double thread with the same height, housed such as to prevent them from colliding with each other and the use of which provides, in combination with the incorporation of a scraping/cleaning edge on the outer end of the threads that form the press screws, the following advantages or effects that result in an enhancement of total press performance.

A. Cleaning effect: This effect is improved through the use of an edge having appropriate geometry and which endows it with high scraping and cleaning capacity. In addition, the length of the effective edge of the threads on the filtering cage is duplicated. This implies the duplication of the cleaning of the perforation of the filtering cage, which may become blocked by the pulp during the pressing operation and which is cleaned or unblocked when the screw scrapes the pulp accumulated on the surface.

B. Mixing effect. The capacity of the pulp mixing machine to mix the pulp that reaches the intersection zone between the screws wherein the threads of both screws break up the pulp "packets" or volumes intercepted in this zone on attempting to share the same space. In this zone, the threads of both screws attack the pulp "packets", breaking them up and thereby mixing the pulp. This mixing and reordering of the pulp prevents the particles from advancing in blocks from the beginning to the end of the machine without exposing the particles in its interior to the filtering cage, thereby evacuating the water they contain therethrough.

C. Crushing effect: The crushing and twisting capacity of the pulp fibres is increased considerably due to the larger number of threads and the fact they are disposed closer to each other. This effect occurs in the central zone between the two screws. In said zone, the crushing, twisting and pressing of pulp fibres which is very beneficial for evacuating the water in its interior occurs between the flanks of the threads of different screws, on rotating in an anticlockwise direction very close together and with the product trapped therebetween.

D. Labyrinth effect: The blocking of travel paths along which the product can move backwards due to the difference in pressure during compression of the product increases significantly. Thus, in the zone lo-

cated between the two screws, the threads are so close together that any movement of the pulp between the thread flights or compartments is limited.

EXPLANATION OF THE INVENTION

[0009] By way of explanation of the invention of the "Double-flighted thread pulp press screws", it consists of a system of double-flighted thread sub-screws intended for being installed in horizontal volumetric presses having two parallel horizontal sub-screws, wherein each sub-screw includes the following specifications:

[0010] As mentioned earlier, a second thread flight or edge identical to a first thread flight or edge, wherein both thread flights are introduced in a longitudinal cage or envelope and disposed such as not to collide during the free travel of the threads in the zone in which the two sub-screws are closest. Therefore, each sub-screw is formed according to two thread flights or edges at the same distance to the filtering cage, which is constant and, once mounted on the volumetric press, said distance is comprised between one and two millimetres from the filtering cage or envelope that contains the pulp.

[0011] Additionally, both the first-flight and second-flight thread edge have a thread extension or scraping/cleaning in the manner of abrasion-resistant hardfacing provided by overlay welding with a blade effect along its travel path through the interior of the filtering cage, based on its end, which forms an obtuse angle with the filtering cage itself, having a scraping/cleaning effect that forms the lead edge of all the threads of each of the two sub-screws, on the side carrying out the compression of the pulp, maintaining a constant distance throughout its outer perimeter. Therefore, such that along the travel path of each thread through the interior of the filtering cage there is a minimum distance to the filtering cage itself comprised between one and two millimetres, optimising the scraping/cleaning and unblocking effect, essential for the water to be evacuated through the filtering cage itself, usually limited by the obstruction of its bore holes on retaining the pressed pulp itself.

DESCRIPTION OF THE DRAWINGS

[0012] As a complement to the description being made, and for the purpose of helping to make the characteristics of the invention more readily understandable, in accordance with various preferred practical embodiments thereof, said description is accompanied by a set of drawings constituting an integral part thereof, which, by way of illustration and not limitation, represent the following:

Figure 1 - shows a principal cross-sectional view of "Double-flighted thread pulp press screws";

Figure 2 - shows a principal cross-sectional view of "Double-flighted thread pulp press screws" in the interior of a horizontal volumetric press having two parallel horizontal sub-screws;

Figure 3 - shows a detailed view of the scraping/cleaning edge of "Double-flighted thread pulp press screws" along the thread's travel path through the interior of the filtering cage.

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[0013] The following constituent elements can be highlighted in the aforementioned figures:

1. First-flight threads
2. Second-flight threads
3. Parallel horizontal shafts
4. Filtering cage
5. Thread edge with scraping/cleaning effect
6. Pulp
7. Area of the filtering cage with reduced dewatering
8. Area of the filtering cage with high dewatering

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EXAMPLE OF A PREFERRED EMBODIMENT

[0014] By way of example of a preferred embodiment of the "Double-flighted thread pulp press screws", in view of figures 1 and 2, it can be observed that use has been made of a system of sub-screws having double-flighted threads, for installation in a horizontal volumetric press having two parallel horizontal sub-screws (3) wherein, additionally, each sub-screw contains a second thread flight or edge (2) identical to the first thread flight or edge (1). In other words, each sub-screw is formed according to two thread flights (1, 2) introduced inside a longitudinal cage (4) or envelope, of equal constant distance in relation to the interior of the longitudinal cage (4) itself, for positioning in its sweep through the interior of the filtering cage (4). Said minimum distance is comprised between one and two millimetres.

[0015] Likewise, figure 3 shows the thread edge (1) with an abrasion-resistant scraper/cleaner (5) having identical configuration for the second-flight threads (2).

[0016] In their natural advancement motion, the thread flights or edges (1, 2) move the pulp (6) with the scraper/cleaner (5), consequently cleaning the pulp layer (6) that blocks the perforated surface of the filtering cage (4) and differentiating between a prior area of the filtering cage (4) along its travel path where dewatering is reduced (7), followed by another, subsequent area where dewatering is high (8).

[0017] In order to evaluate the results, the yields obtained in the same horizontal volumetric press having two parallel horizontal screws are compared by means of certified trials at a sugar factory, making use of two single-flighted screws, with the use of the screws object of the present invention, showing an increase in dry matter comprised between 2 % and 2.5 %.

[0018] In order to fully analyse the results obtained, it must be taken into account that a pulp press under sub-optimal operating conditions yields between 20 % and 24 % of dry matter, while under optimal conditions it would yield between 30 % and 34 % of dry matter, showing an increase in dry matter obtained of between 2 % and 2.5

% of dry matter. This is a very relevant increase, + 18 % in pressing performance, taking into account that the pressing performance range is comprised between 20 % and 34 %.

[0019] Therefore, by way of conclusion, a significant increase in performance of the mechanical pressing and drying process of exhausted sugar beet pulp has been observed, which implies significant savings for processors in terms of the fuel required to carry out the final thermal drying of the pressed pulp.

[0020] In an alternative embodiment, it is also possible to design the double flighted threads (2) in only one section of each of the two sub-screws, being, at the same time, identical to the first thread flight (1) for positioning in its sweep through the interior of the filtering cage (4) at a minimum distance therefrom comprised between one and two millimetres.

[0021] Likewise, in another alternative embodiment, use could be made of the enhancement described in the present invention, incorporating it to horizontal volumetric presses having three or, in general, more than two parallel sub-screws.

[0022] It is not considered necessary to further extend this description for any person skilled in the art to understand the scope of the invention and the advantages arising therefrom. The elements included therein, their dimensions, shapes or implementation techniques, will be susceptible to variation provided that it does not imply an alteration of the essentiality of the invention.

Claims

1. Double-flight thread pulp press screws, intended for installation in horizontal volumetric presses, comprising two parallel horizontal sub-screws, **characterised in that** each sub-screw is formed taking into account the following specifications:

Each sub-screw has a complete second thread flight or edge identical to a first thread flight or edge in the same sub-screw, both sub-screws being introduced in a longitudinal cage or envelope and disposed such as to prevent the existence of collision during the free travel of the threads in the zone where they are closest to the two sub-screws; therefore, each sub-screw is formed by two thread flights or edges having the same distance to the filtering cage, said distance being constant and wherein the distance, once mounted on the corresponding volumetric press, is comprised between one and two millimetres to the filtering cage or envelope that contains the pulp.

2. The double-flight thread pulp press screws intended for installation in horizontal volumetric presses, according to claim 1, **characterised in that** both the

first-flight and second-flight thread edge has a thread extension or scraper/cleaner in the manner of hard-facing by means of overlay welding and with a blade effect along its travel path through the interior of the filtering cage and with scraping or cleaning effect capacity that forms the cutting edge of all the threads of each one of the two sub-screws, based on its end, which forms an obtuse angle with the filtering cage itself on the side that carries out the compression of the pulp, maintaining a constant distance to the filtering cage throughout its outer perimeter of between one to two millimetres.

Figure 1

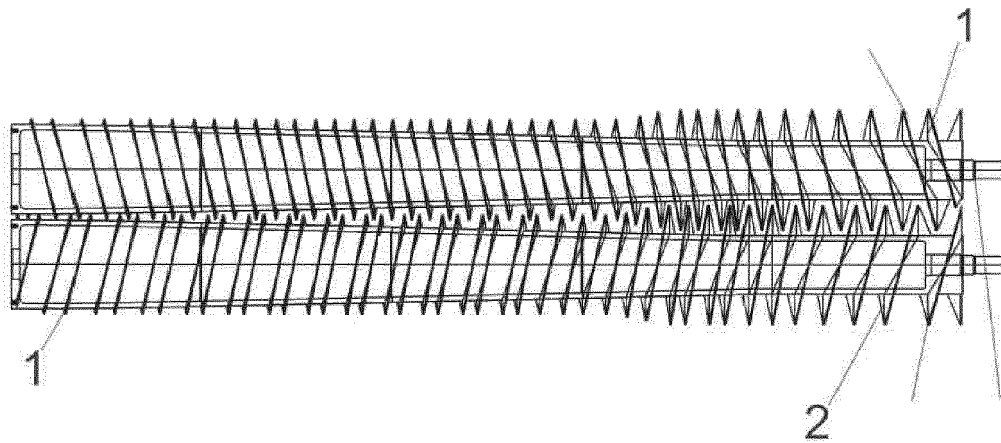


Figure 2

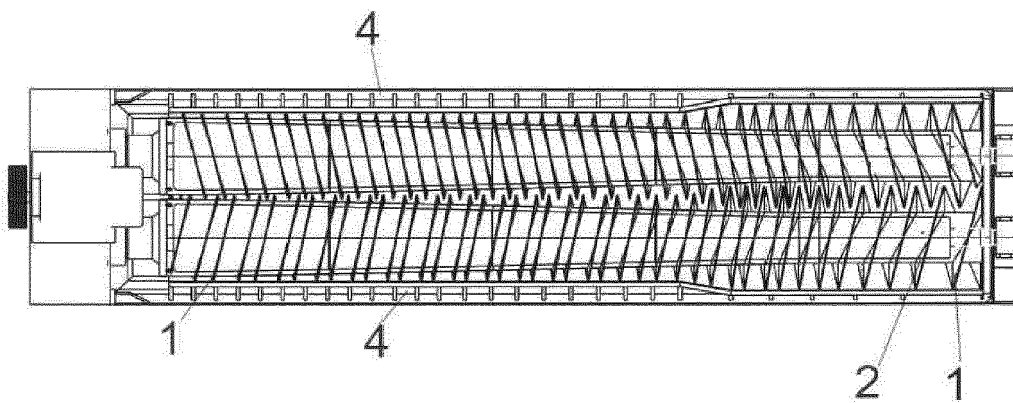
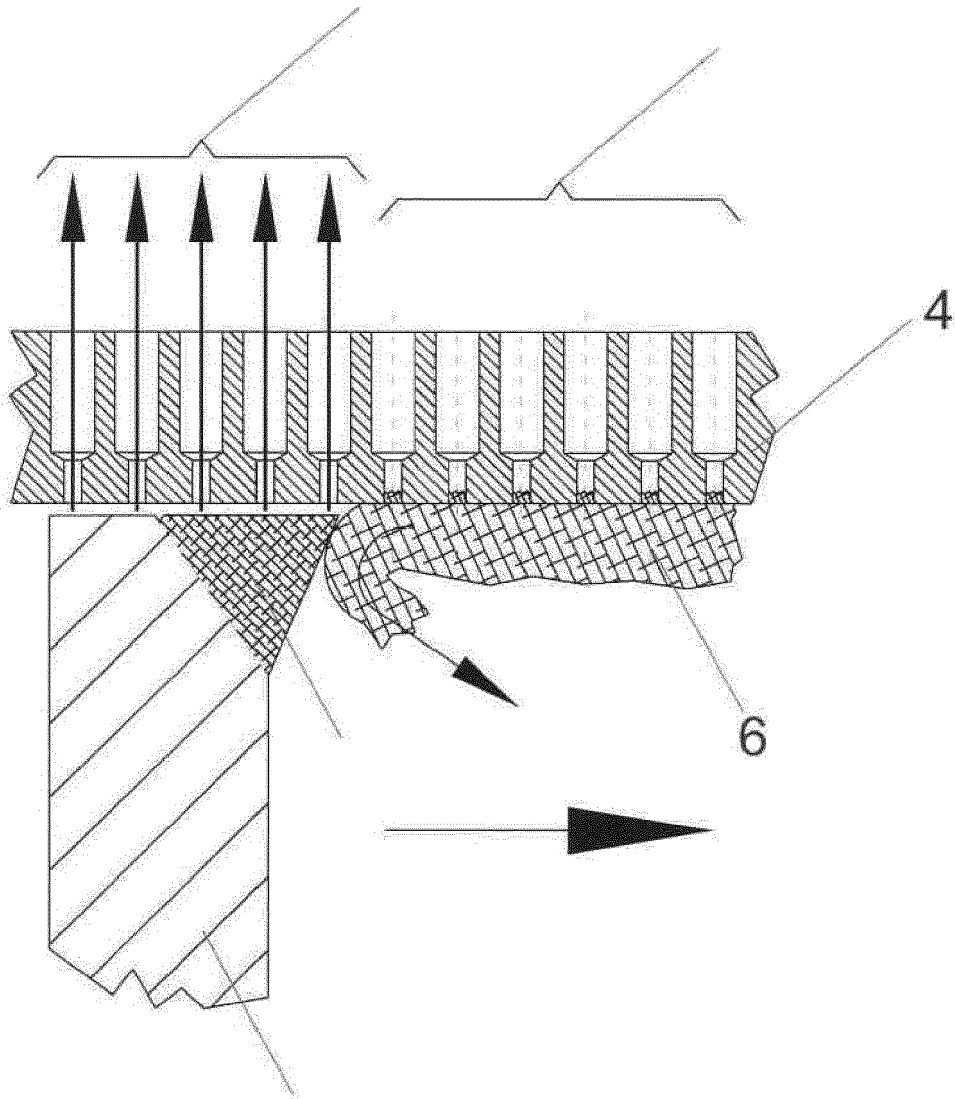


Figure 3





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Application Number
EP 16 38 2139

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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		23 November 2016	Baradat, Jean-Luc
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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