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(54) SCREENING DEVICE AND SEPARATION SCREEN FOR SCREENING SOLID MATERIALS

(57) A screening device for a separation screen (10) of solid materials comprises a rotary shaft (12), a plurality of screening tools (15) mounted on said rotary shaft (12), adjacent and reciprocally distanced and comprising at least a plate (15a) with a radial development with respect to said rotary shaft (12), and a plurality of tubular sleeves (18), each of which is mounted, free to rotate, on the rotary shaft (12) and interposed between a pair of consecutive screening tools (15). Each of said plates (15a) is provided with a protective lip (15d) protruding so as to overlap, during use, at least one of the end edges (18a) of said tubular sleeves (18).

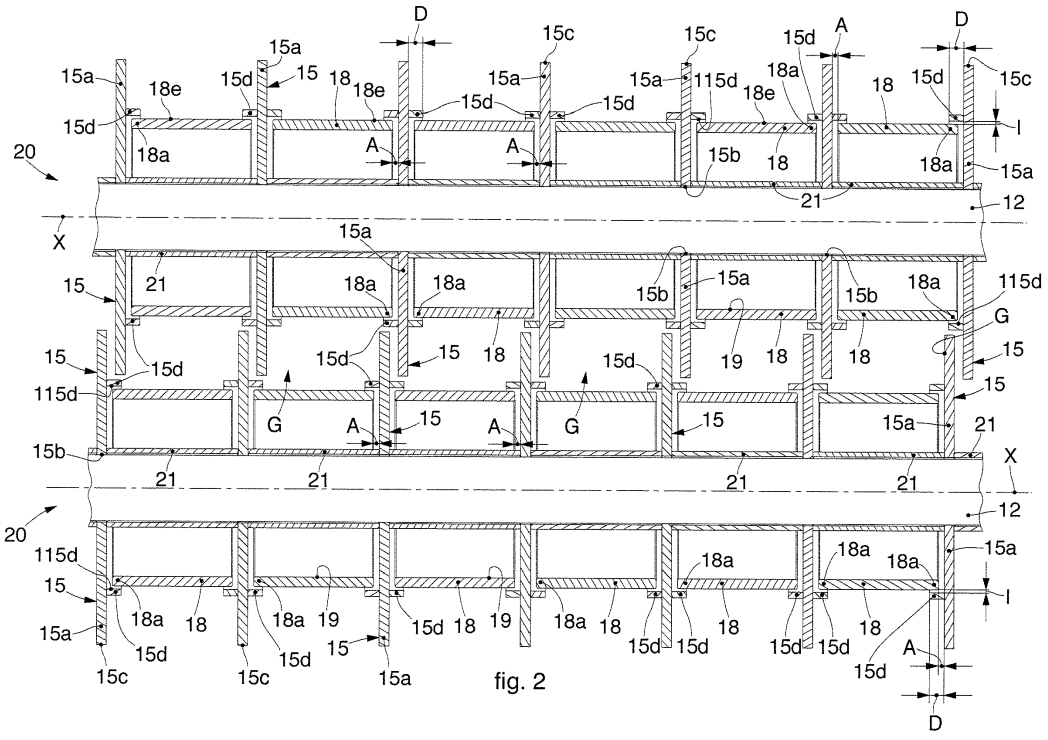


fig. 2

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Description

FIELD OF THE INVENTION

[0001] The present invention concerns a screening device and a separation screen comprising a plurality of such screening devices.

[0002] The present invention can be used for screening solid materials as a function of their sizes, merely by way of example, but not restrictively, in the field of the construction industry, or in the treatment of solid urban or industrial refuse, or also in mining activities.

[0003] In particular, the present invention concerns a separation screen of the disc type, usable for screening, for example, stones or minerals, wood chips, solid industrial refuse, solid urban refuse, or other types of solid loose material for which a separation or division is required on the basis of the different sizes of the pieces, which can also comprise fibrous, filamentous, oblong and flexible materials, or filiform, damp or dry materials of various type, synthetic or natural, such as compost, paper, fabrics, plastic bags or other.

BACKGROUND OF THE INVENTION

[0004] It is known to use separations screens to screen loose solid materials and separate them as a function of the sizes of the constituent parts.

[0005] Screens with discs are known, one of which is described for example in the patent application EP-A-0.173.638, which comprise a support and containing structure inside of which a plurality of screening devices is located, comprising rotary shafts with parallel axes all rotating in the same direction of rotation.

[0006] The rotary shafts are adjacent to each other and define a screening surface or bed, which can be planar, concave, convex, or undulating according to the specific construction or design needs.

[0007] On each of the rotary shafts a plurality of screening discs is attached, reciprocally distanced along the axis of the corresponding shaft and rotating solid with the latter.

[0008] Normally, known screens have a loading zone, in correspondence to which the solid materials are introduced inside the support and containing structure. Generally, the materials are introduced by loading hoppers or other loading or conveying devices, possibly removing the solid materials to be screened from grinding, shredding or crushing systems located upstream of the screens.

[0009] The same-direction rotation of the rotary shafts and the configuration of the screening discs determine the progressive feed of the materials to be screened along the screening bed. Possible inclinations of the screening bed can be provided, to promote the distribution and feed of the materials.

[0010] The screening discs are distanced from each other by a greater distance than the thickness of each screening disc, so that the screening discs of a first rotary shaft are each positioned in the interspace defined between two screening discs of a shaft adjacent to the first rotary shaft.

[0011] The positioning of the screening discs and the interaxis between the rotary shafts define apertures or gaps between each screening disc keyed on a shaft and the adjacent rotary shaft, and between the screening discs of two adjacent rotary shafts, which apertures or gaps are configured to be passed through by the materials to be screened with smaller sizes than the sizes of said apertures.

[0012] A separation is thus obtained of the elements smaller than the size of the gaps from the elements with a larger size. The first elements, in fact, having passed through the gaps between discs and shafts, fall due to gravity into collecting devices positioned below the screening bed, while the second elements advance on the screening bed until they are subsequently discharged or removed.

[0013] It is also known to make screens with discs provided with gaps with increasing sizes along the screening bed, from the loading zone and in a transverse direction to the rotary shafts, that is, in the direction of feed of the materials inside the support and containing structure.

[0014] In this way, the progressive separation is obtained of the elements with progressively bigger sizes, which advance on each occasion along the screening bed until they reach gaps wide enough to cause them to fall.

[0015] Blockage problems are known concerning the screening of solid materials comprising fibrous, filament or filiform elements, or oblong or flexible, which hereafter in the description and claims, for ease of description, will be identified in their entirety by the term "filaments". These problems are particularly serious in the screening of solid urban refuse, in which materials of various types and nature can be present, for example, clothes, rags, belts, strips or ribbons, or plastic bags, or other types of filaments.

[0016] The presence of filaments inside the solid materials to be screened can constitute a disadvantage, since they can obstruct or stop the functioning of known screens. Indeed, filaments have a tendency to wind around the rotary shafts, filling and blocking the gaps between the discs and the shafts, preventing a correct screening of the material and possibly causing an obstacle to the reciprocal rotation of the shafts. This can block the screen, with consequent frequent need to stop the machines in order to clean them and remove the blocked material, as well as for maintenance in the case of damage to the rotary shafts and/or to the motion transmission members.

[0017] There is therefore a need, correlated to the screening of solid materials comprising filaments, to prevent or at least contrast the possibility of creating blockages due to the winding of filaments around the rotary shafts.

[0018] There are known solutions of screens with discs in which anti-obstruction sleeves are provided, having a cylindrical shape and an internal diameter bigger than that of the external diameter of the rotary shafts and smaller than the radial extension of the discs. Each anti-obstruction sleeve is located externally to the shaft in an intermediate position between two discs and has a longitudinal extension smaller than the distance between the latter two that allows a translation thereof along the axis of the corresponding rotary shaft. Moreover, the anti-obstruction sleeves are rotationally not constrained with respect to the rotary shafts, and therefore also with respect to the discs, and are also free to translate radially with respect to the rotary shafts due to the effect of the reciprocal difference in diameter. In these solutions, the rotational independence between sleeves and shafts should obstruct the winding of filaments around the sleeves and thus prevent blockage of the screen.

[0019] In other known solutions, for example described in document WO-A-2011/045656, the anti-obstruction sleeves each consist of a pair of cylindrical tubular elements, disposed one inside the other and with axes parallel to each other and to the axis of the rotary shaft on which they are mounted. In the space that is created between the two cylindrical tubular elements one or more stabilizing masses are located, immersed in a filling material, with the function of preventing the complete rotation of the anti-obstruction sleeve around the axis of the rotary shaft, allowing only the oscillation thereof, due to the effect of gravity. In this way WO-A-2011/045656 intends to prevent the complete winding around the anti-obstruction sleeve of filaments possibly present in the solid materials to be screened.

[0020] One disadvantage of known screens with discs is that they are not reliable and efficient enough to prevent the winding of the filaments around the rotation shafts and therefore, are not able to prevent, except in a very limited way, the onset of blockages or obstructions as above.

[0021] Indeed, in the first solutions described above, the solid materials to be screened, and in particular the filaments contained therein, in any case determine a rotation of the anti-obstruction sleeves around their axis during the rotation of the rotary shafts, which consequently causes the radial accumulation of the filaments around the sleeves, with subsequent blockage of the screen because the gaps are filled and obstructed.

[0022] Moreover, in these known solutions, the anti-obstruction sleeves can contact the rotary shafts due to the effect of their translation in a radial direction, in practice resting on them, which has the disadvantageous consequence that the anti-obstruction sleeves are made to rotate solid with the rotary shafts due to the friction that derives from such contact. As it is fundamental for the correct functioning of the anti-obstruction sleeves to be free to rotate independently of the rotary shafts, the inefficiency of known screens is all too obvious.

[0023] The other solutions described above also have the disadvantage that they are subject to obstructions and blockages, mainly due to the fact that the radial mobility of the sleeves with respect to the rotary shafts causes movement and drawing of the filaments inside the plays laterally present between the anti-obstruction sleeves and the screening discs, so that the filaments become blocked in the plays and frustrate the function of the sleeves.

[0024] These known solutions have a further disadvantage that they are complex and costly to produce and install, as well as being heavy, bulky and difficult to maintain because of the numerous components provided.

[0025] One purpose of the present invention is to make a separation screen for screening solid materials that is able to separate efficiently and reliably solid materials even comprising filaments, for example solid urban refuse, and that is able to prevent these filaments obstructing the gaps between screening discs and rotary shafts, blocking the functioning of the screen.

[0026] Another purpose of the present invention is to make a screen that is easy to make and install and that is able to obtain the above purpose with the least possible number of components.

[0027] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0028] The present invention is set forth and characterized in the independent claim, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0029] In accordance with the above purposes, a screening device according to the present invention is usable in a separation screen of solid materials, and comprises a rotary shaft, a plurality of screening tools mounted solid on the rotary shaft, disposed adjacent and reciprocally distanced along it, and each provided with at least a plate with a radial development with respect to the rotary shaft. The screening device also comprises a plurality of tubular sleeves, each of which is mounted, free to rotate, on the rotary shaft and interposed between a pair of consecutive screening tools, and having respective end edges located, during use, substantially facing the respective plate of the corresponding screening tool.

[0030] According to one aspect of the present invention, each of the plates is provided with a protective lip which protrudes from the plate so as to overlap, during use, at least one of the end edges of the tubular sleeves. Moreover the protective lip has an annular shape and is configured so as to surround, in direct proximity, at least one of the end edges.

[0031] In this way, thanks to the protection conferred on the rotary shaft by the protective lip, and to the co-presence of the tubular sleeves free to rotate, the advantage is obtained of preventing the winding of possible

filaments around the rotary shaft in correspondence with a possible interspace between the end edges and the plates, which winding would cause the blockage of the screening device.

[0032] In some forms of embodiment, the protective lip protrudes from opposite sides of a development plane of the plate, so as to simultaneously overlap, during use, at least two of the end edges.

[0033] This solution advantageously increases the degree of protection conferred by the protective lip.

[0034] According to some aspects of the present invention, each tubular sleeve has a length less than the distance between two consecutive screening tools along the rotary shaft, to define an axial play between the tubular sleeve and the plates of the two screening tools. Moreover, the protective lip is positioned to peripherally cover said axial play.

[0035] In some forms of embodiment, each tubular sleeve is constrained in its movement in a radial direction with respect to the corresponding rotary shaft on which it is mounted and with respect to which it is axially mobile and free to rotate.

[0036] In some forms of embodiment, the overlapping of the protective lip on the tubular sleeve is such as to prevent the radial translation of the tubular sleeve with respect to the respective rotary shaft.

[0037] The present invention also concerns a separation screen for screening solid materials, comprising two or more screening devices made as described above, in which the screening devices are reciprocally adjacent and facing to define a plurality of passage apertures each delimited at least by two respective tubular sleeves, two protection lips and two plates.

BRIEF DESCRIPTION OF THE DRAWINGS

[0038] These and other characteristics of the present invention will become apparent from the following description of some forms of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a plan view of a screen according to the present invention;
- fig. 2 is a plan and sectioned view of a part of the screen in fig. 1;
- fig. 3 is a three-dimensional view of a detail of fig. 2.

[0039] In the following description, the same reference numbers indicate identical parts of the device for separation screens for solid materials according to the present invention, also in different forms of embodiment. It is understood that elements and characteristics of one form of embodiment can be conveniently incorporated into other forms of embodiment without further clarifications.

DETAILED DESCRIPTION OF SOME FORMS OF EMBODIMENT

[0040] We shall now refer in detail to the various forms of embodiment of the present invention, of which one or more examples are shown in the attached drawing. Each example is supplied by way of illustration of the invention and shall not be understood as a limitation thereof. For example, the characteristics shown or described insomuch as they are part of one form of embodiment can be adopted on, or in association with, other forms of embodiment to produce another form of embodiment. It is understood that the present invention shall include all such modifications and variants.

[0041] Fig. 1 is used to describe forms of embodiment of a separation screen 10 according to the present invention, for screening solid materials comprising different sized elements, both wet and dry, and also in filament form.

[0042] The separation screen 10 includes a support and containing structure 11 configured to rotatably support a plurality of rotary shafts 12 and delimiting a containing chamber 13 inside which the rotary shafts 12 are transversely disposed.

[0043] The rotary shafts 12 are rotatable around their own longitudinal axes X and are made to rotate by a drive unit 14, which can possibly include motion transmission devices, not shown in the attached drawings.

[0044] Inside the containing chamber 13, the rotary shafts 12 are disposed with their respective longitudinal axes X adjacent and parallel to each other, and substantially define a screening surface, or screening bed, that can have a planar, curved, concave, convex or undulating development, according to the specific needs.

[0045] Each rotary shaft 12 can be provided along its longitudinal extension with a plurality of screening tools, or screening discs 15, mounted on the rotary shaft 12 adjacent to and distanced from each other.

[0046] In possible solutions, the screening discs 15 are mounted integrated on the rotary shafts 12 and rotate solidly therewith.

[0047] In possible forms of embodiment, the screening discs 15 can be mounted by interposing anti-rotation tongues between the screening discs 15 and the corresponding rotary shaft 12 and spacers 21 between consecutive screening discs 15, wherein the spacers 21 are closed "pack-wise" along the longitudinal axis X on the screening discs 15.

[0048] The combined rotary shaft 12 and the corresponding plurality of screening discs 15 mounted thereon together define a screening device 20.

[0049] The separation screen 10 therefore includes a plurality of screening devices 20 adjacent and facing each other.

[0050] Adjacent rotary shafts 12 have an interaxis such that the screening discs 15 of one screening device 20 are interposed between the screening discs 15 of adjacent screening devices 20, and a passage aperture, or

gap G, is defined between the screening discs 15 of one screening device 20 and the rotary shaft 12 of the adjacent screening devices 20, and reciprocally between the screening discs 15 of the facing screening devices 20.

[0051] The containing chamber 13 can be provided with a loading aperture 16 through which the solid materials are loaded onto the screening bed, and an exit aperture 17 from which possible residues of non-screened solid materials are expelled.

[0052] The solid materials with smaller sizes than the size of the gaps G pass through them and fall, due to gravity, under the screening bed, where containers or collection devices can be provided to collect the screened solid materials.

[0053] The feed of the solid materials inside the containing chamber 13 is obtained by the effect of the rotation of the rotary shafts 12 and the consequent rotation of the screening discs 15, that impact on and thrust the solid materials.

[0054] In some forms of embodiment, the rotary shafts 12 can be equidistant, so as to define uniform gaps G inside the containing chamber 13, or, as shown by way of example in fig. 1, they can be progressively distanced from the loading aperture 16 toward the exit aperture 17, to effect the separation of solid materials with ever increasing sizes.

[0055] Fig. 2 is used to describe forms of embodiment in which each screening disc 15 can include a plate 15a provided with a through hole 15b to house the rotary shaft 12 and to attach it.

[0056] In these forms of embodiment, each plate 15a is coupled to the corresponding rotary shaft 12, inserting it with its through hole 15b on the rotary shaft 12.

[0057] In some forms of embodiment, the reciprocal coupling of the plate 15a and rotary shaft 12 can be carried out by mechanical interference or by welding.

[0058] In other forms of embodiment, the plates 15a can be made in a single piece with the corresponding rotary shaft 12, for example by molding or forging.

[0059] Each plate 15a extends radially with respect to the rotary shaft 12 and lies on a plane located substantially perpendicular with respect to the longitudinal axis X of the corresponding rotary shaft 12.

[0060] The plate 15a can have a substantially circular flat shape even if it cannot be excluded that it can have different shapes, polygonal, curved or mixed for example.

[0061] The screening disc 15 can also be provided with a thrust profile 15c, protruding from the plate 15a in a direction orthogonal to the development plane of the plate 15a. The thrust profile 15c is configured to enter into contact with the solid material to be screened and thrusts it due to the effect of the rotation of the rotary shaft 12, and thus of the screening disc 15.

[0062] In possible forms of embodiment, the thrust profile 15c affects the whole peripheral development of the plate 15a around a rotary shaft 12.

[0063] In some forms of embodiment, the thrust profile 15c can be positioned at the radial end of the plate 15a farthest from the rotary shaft 12, or can be positioned in a radially intermediate position of the plate 15a.

[0064] In some forms of embodiment, the thrust profile 15c can be defined by the external peripheral surface of the plate 15a, and can be shaped so as to optimize the cleaning action of a screening disc 15 adjacent to or facing it.

[0065] This cleaning action can be achieved by removing possible filament residues or other particles of solid material present in contact with the screening disc 15, to prevent the twisting and/or the blockage of the screen 10.

[0066] Fig. 3 is used to describe forms of embodiment in which the thrust profile 15c of each screening disc 15 is positioned in the radial periphery of the latter and has an indented shape, defined by hollows 115c and ridges 215c alternating along the circumferential development of the thrust profile 15c.

[0067] Each screening disc 15 includes a protective lip 15d, interposed between the thrust profile 15c and the rotary shaft 12.

[0068] In possible forms of embodiment, the protective lip 15d is interposed between the thrust profile 15c and the through hole 15b configured to house the rotary shaft 12.

[0069] The protective lip 15d can have a continuous annular shape and can completely surround the through hole 15b according to a circular, elliptical or polygonal circumferential development.

[0070] The protective lip 15d protrudes transversely, in this case orthogonally, with respect to the development plane of the plate 15a, from two opposite sides of the plate 15a and has a height D, measured from the plane of the plate 15a, which can be comprised between at least 10 mm and about 30 mm.

[0071] Each screening device 20 can also include a plurality of tubular sleeves 18, each mounted free to rotate on the respective rotary shaft 12 considered, and interposed between a pair of consecutive screening discs 15 of the corresponding screening device 20.

[0072] Each tubular sleeve 18 has a length less than the distance between two screening discs 15, thus defining an axial play A between the tubular sleeve 18 and the plates 15a of the two screening discs 15. In this way, the tubular sleeve 18 is mobile in a direction parallel to the longitudinal axis X.

[0073] In possible solutions of the present invention, each tubular sleeve 18 has an annular cross section of a circular shape.

[0074] The axial mobility of the tubular sleeve 18 must however be limited, so as not to allow the insertion of filaments inside the axial plays A, the value of which can be comprised between at least 3mm and about 12 mm.

[0075] The tubular sleeves 18 are each provided with an internal cavity 19, whose radial dimension, that is, in a direction orthogonal to the longitudinal axis X, is greater than the radial bulk of the rotary shafts 12 on which they are mounted, so that each tubular sleeve 18 is free to rotate on the corresponding rotary shaft 12 as described

above.

[0076] Fig. 2 is used to describe forms of embodiment in which the internal cavity 19 of each tubular sleeve 18 has a radial size more than double the diameter of the corresponding rotary shaft 12. This ratio is purely indicative of a possible solution, and in any case it can be provided that the internal cavity 19 has a radial size greater than the diameter of the rotary shaft 12 by an amount more than double the size of the axial play A.

[0077] The tubular sleeves 18 have respective end edges 18a each of which, during use, is located substantially facing the respective plate 15a.

[0078] In accordance with one aspect of the present invention, the protective lip 15d of each plate 15a surrounds and overlaps in direct proximity to the corresponding end edge 18a of one of the tubular sleeves 18.

[0079] The protective lip 15d in practice defines a circular housing seating in the plate 15a in which one of the end edges 18a of the tubular sleeves 18 is housed and kept in position. The protective lip 15d allows to keep the tubular sleeves 18 axially aligned with the longitudinal axis X of each rotary shaft 12.

[0080] In possible solutions, the protective lip 15d has a substantially circular cross section shape.

[0081] In accordance with one possible solution, the external diameter of the tubular sleeves 18 is substantially equal to the internal diameter of the protective lip 15d.

[0082] In this way, each gap G comprised between two adjacent screening devices 20 is delimited by two respective tubular sleeves 18, two pairs of protective lips 15d and two plates 15a.

[0083] In some forms of embodiment, between the protective lip 15d and the end edge 18a there can be a radial interspace I which can be comprised between 1 mm and 3 mm.

[0084] In some forms of embodiment, the interspace I can be smaller or equal in size to the size of the axial plays A between the tubular sleeves 18 and the plates 15a of the screening discs 15.

[0085] In particular, the protective lip 15d is positioned externally close to the tubular sleeve 18 and can have an internal surface 115d facing an external surface 18e of the tubular sleeve 18.

[0086] The internal surface 115d is radially separated and distanced from the external surface 18e by the interspace I.

[0087] The protective lip 15d therefore partly overlaps the tubular sleeve 18, covering the axial plays A and protecting them from blockages.

[0088] The protective lip 15d, surrounding the tubular sleeve 18 at a very small distance defined by the interspace I, which has the sole function of allowing the free rotation of the tubular sleeve 18, prevents the latter from translating radially with respect to the rotary shaft 12.

[0089] The fact that the tubular sleeve 18 is not radially mobile, that is, its radial mobility is only provided to allow a rotation of the tubular sleeve 18 with respect to the rotary shaft 12, prevents the material to be screened from being drawn inside the axial plays A between the tubular sleeves 18 and the plates 15a. This drawing, in fact, occurs due to the effect of the combined action of the axial translation and radial translation of the tubular sleeves 18.

[0090] Solutions are also possible, merely by way of example, in which the tubular sleeve 18 can be mounted on the rotary shaft 12 with a tolerance of play, or in any case with a very limited difference in diameter, for example in the order of 1-2 mm, and only provided to allow the free rotation of the tubular sleeve 18 with respect to the rotary shaft 12. For this reason, it can be maintained that, in such solutions, the tubular sleeve 18 is constrained in movement in a radial direction with respect to the rotary shaft 12.

[0091] In possible implementations, the coupling of the tubular sleeve 18 and the corresponding rotary shaft 12 can be carried out using bearings, or other radial support and/or constraint means, configured to support the tubular sleeve 18 and at the same time, to prevent its radial translation with respect to the rotary shaft 12.

[0092] With reference to fig. 2, the height D, measured from the plate 15a, can have a value at least double that of the axial play A present between one end of the tubular sleeve 18 and the plate 15a, for example comprised between two and three times the value of the axial play A.

[0093] In this way, the advantage is obtained of preventing the infiltration of filaments inside the axial plays A between the tubular sleeves 18 and the screening discs 15, protecting the axial plays A by positioning the protective lips 15d above them.

[0094] Moreover, this superimposition allows a greater security of the radial constraint imposed on the tubular sleeves 18 by the protective lips 15d.

[0095] It is clear that modifications and/or additions of parts may be made to the separation screen 10 for screening solid materials as described heretofore, without departing from the field and scope of the present invention.

Claims

1. Screening device for a separation screen (10) of solid materials, comprising:

   - a rotary shaft (12),
   - a plurality of screening tools (15) mounted solid on said rotary shaft (12), adjacent and reciprocally distanced and comprising at least a plate (15a) with a radial development with respect to said rotary shaft (12), and
   - a plurality of tubular sleeves (18), each of which is mounted, free to rotate, on said rotary shaft (12) and interposed between a pair of consecutive screening tools (15), each tubular sleeve (18) having respective end edges (18a) located

during use substantially facing the respective plate (15a) of the corresponding screening tool (15),

characterized in that each of said plates (15a) is provided with a protective lip (15d) protruding from said plate (15a) so as to overlap, during use, at least one of said end edges (18a) of said tubular sleeves (18), said protective lip (15d) having an annular shape and being configured so as to surround in direct proximity at least one of said end edges (18a).

2. Screening device as in claim 1, **characterized in that** said protective lip (15d) protrudes from opposite sides of a development plane of said plate (15a), so as to simultaneously overlap, during use, at least two of said end edges (18a).

3. Screening device as in any claim hereinbefore, **characterized in that** said tubular sleeve (18) is constrained in its movement in a radial direction with respect to said rotary shaft (12).

4. Screening device as in any claim hereinbefore, **characterized in that** said tubular sleeve (18) has an annular cross section substantially circular in shape, and **in that** said protective lip (15d) has a substantially circular cross section shape, the external diameter of said tubular sleeves (18) being substantially equal to the internal diameter of said protective lip (15d).

5. Screening device as in any claim hereinbefore, **characterized in that** at least some of said screening tools (15) are provided, in their radial periphery, with a circumferential thrust profile (15c), having an indented form defined by alternate hollows (115c) and ridges (215c), and **in that** said protective lip (15d) is interposed between said thrust profile (15c) and said rotary shaft (12).

6. Screening device as in any claim hereinbefore, **characterized in that** each of said tubular sleeves (18) has a length less than the distance between two consecutive screening tools (15) along said rotary shaft (12), to define an axial play (A) between said tubular sleeve (18) and the plates (15a) of the two screening tools (15), and **in that** said protective lip (15d) is positioned to peripherally cover said axial play (A).

7. Screening device as in claim 6, **characterized in that** between said protective lip (15d) and said end edge (18a) there is a radial interspace (I) less than or equal to said axial play (A).

8. Screening device as in claim 7, **characterized in that** said radial interspace (I) is comprised between 1 mm and 3 mm.

9. Separation screen for screening solid materials, **characterized in that** it comprises a plurality of screening devices (20) as in any claim hereinbefore, said screening devices (20) being adjacent and reciprocally facing to define a plurality of passage apertures (G), each delimited at least by two respective tubular sleeves (18), two pairs of protective lips (15d) and two plates (15a).

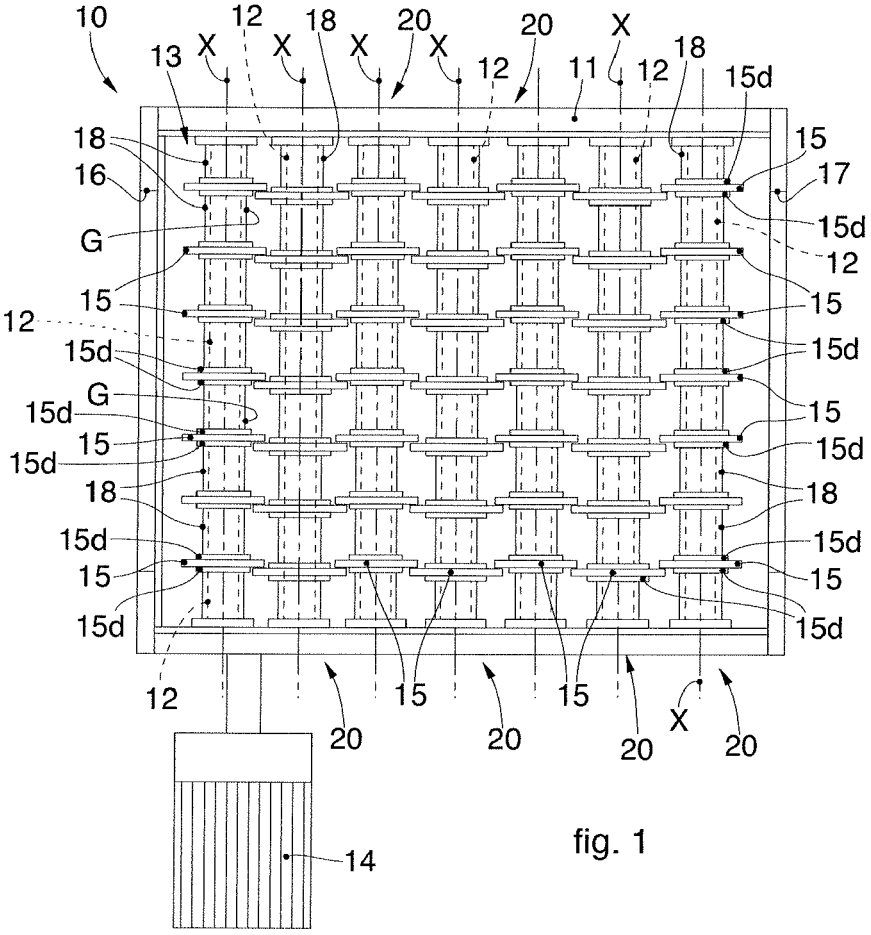

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fig. 1

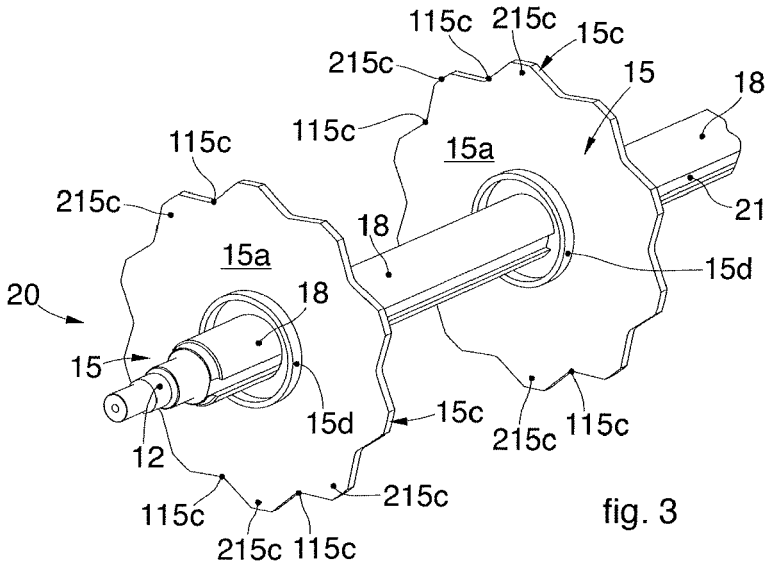

115c
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fig. 3

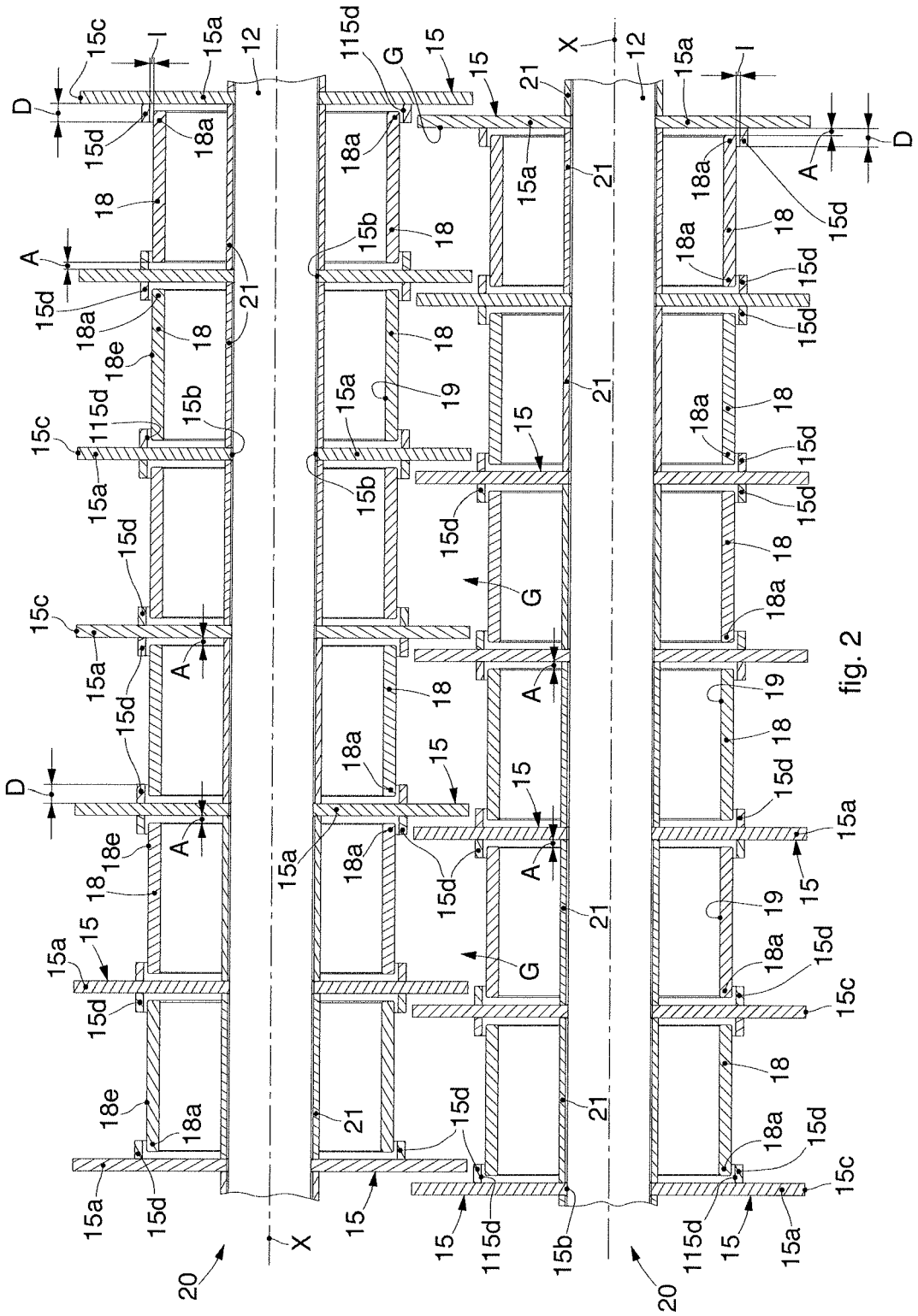


fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 15 15 8657

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2011/045656 A1 (ECOSTAR SRL [IT]; CAPPOZZO DOMENICO [IT]) 21 April 2011 (2011-04-21) * page 2, line 23 - line 31 * * page 3, line 9 - line 10 * * page 3, line 15 - line 21 * * page 5, line 28 - page 6, line 2 * * page 6, line 30 - page 7, line 4 * * page 7, line 9 - line 16 * * page 7, line 28 - line 35; claims 1-3,6-7 * -----	1-9	INV. B07B1/15
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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	24 July 2015	Lang, Xavier

CATEGORY OF CITED DOCUMENTS

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