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(71) Applicant: **Machinefabriek A. Wijnveen B.V.**
Slijpkruikweg 50 Postbus 212
NL-6710 BE Ede(NL)

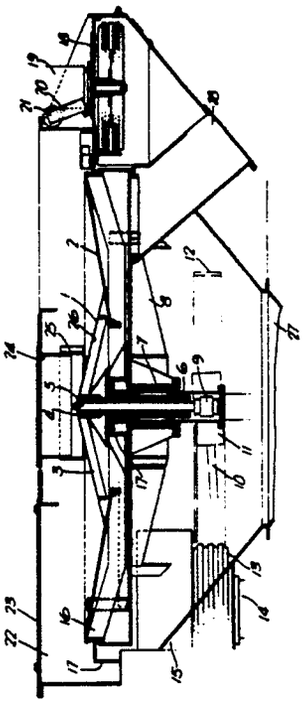
(72) Inventor: **Jans, Johan Wilhelm**
Barchemseweg 56
Lochem(NL)

(74) Representative: **Van Assen, Jan Willem Bernhard**
Octrooibureau van Assen Assenpatent B.V.
Konijnenlaan 22
NL-2243 ER Wassenaar(NL)

(54) A rotating sieving apparatus with a number of sieving surfaces each of which is subdivided into a number of concentric rings with reversible and continuously regulatable angular-velocities.

(57) The invention relates to rotatable sieving apparatus for separating a mixture of at least one fine and one coarse component, comprising a number of sieving-surface (1,2) arranged on the same rotatable shaft (5) one above another and of which at least the outermost ones have the form of a conical mantle the apex of which is directed downward and in which one or more conical collecting vessels for the fine components are arranged under the sieving-surfaces, in which a conical divider (26)with an upwardly directed apex is arranged in the centre of each sieving-surface and in which the supply means for the mixture to be separated is located in the vincinity of the centre with the aid of a height-adjustable inlet-pipe arranged above the conical divider and the diameter of which inlet-pipe is equal to the diameter of the base of the conical divider.

This type of sieving apparatus has as special characteristic that each sieving-surface is subdivided into an annular centre portion(1) in the form of a conical mantle-surface with an upwardly directed apex which follows up the divider(26) radially and with a reversible direction-of-rotation (d1) and an independent continuously-regulatable angular-velocity(w1) and a number of concentric members (2) arraranged to extend radially outward one outside of another each having the form of a truncated conical mantle the apexes of which are directed downward and each of which has a reversible direction-of-rotation(d2,dn) and an independent continuously regulatable angular-velocity(w2dn).



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A rotating sieving apparatus with a number of sieving surfaces each of which is subdivided into a number of concentric rings with reversible and continuously regulatable angular-velocities.

The invention relates to a rotatable sieving apparatus in accordance with the preamble to claim 1.

Apparatus of this type is known from NL-B-179.709 in which a good sieving action is already obtained with a reasonable processing capacity using a single sieving surface. When the capacity is stepped-up too far however, the sieving action decreases commensurately and makes the use of a second underlying sieving-surface necessary in order to maintain the same good sieving action; this means the use of a more complicated, larger and costlier sieving apparatus.

The object of the invention is to provide a sieving apparatus of the type described in the preamble hereto and in which, in addition to maintaining a good sieving action, the processing capacity can be considerably increased whilst at the same time a less complicated, smaller and cheaper sieving apparatus is obtained than is possible with one in which a number of sieving surfaces lie one above another.

According to the invention, this object is achieved by taking the measures outlined in the characterising clause to claim 1 and through which the the processing capacity for some products can be increased by 50% whilst still maintaining the same degree of sieving quality.

Preferred embodiments of the invention are described in the accompanying claims.

It should be mentioned here that a rotating-surface sieving apparatus is known from DE-B-440.697 AD 1925 and which apparatus incorporates two flat sieving-surfaces one lying above the other and the upper one of which is of circular form and the the lower one of which is of annular form. The product to be sieved is thrown off the circular upper sieving-surface and collides with a cylindrical return-plate encircling the latter and then falls onto the annular lower sieving-surface. The latter is driven at a lower angular-velocity than the upper sieving-surface. Both angular-velocities are constant however and driven from the same central driving shaft. Collision of the sieved product against the cylindrical return-plate has an unfavourable effect on the product. This is particularly so for example when the product is in the form of compressed cattlefeed-pellets which may then be subjected to undesirable breakage or crumbling. Furthermore, the angular-velocities of the sieving portions cannot be adapted to the specific requirements of the particular product being processed so that both the sieving action and processing capacity are limited.

The invention is now to be described further with reference to the accompanying schematical drawing which shows a vertical cross-section of an exemplary embodiment of a multi-deck sieving apparatus according to the invention. As shown in the drawing, the sieving apparatus comprises a central conically-formed sieving-surface 1, the unperforated apex of the cone of which is directed upward, an outer sieving-surface 2 in the form of a frustrum of a cone the imaginary apex of which is directed downward. In order to prevent leakage between both sieving portions, the central sieving-surface 1 overlaps the outermost sieving-surface 2 over a short radial distance. The sieving-surface 1 is carried by a spoked-wheel 3 the radially-arranged spokes of which extend from the hub 4 which is in turn a affixed to a mainly vertical central driving-shaft 5. The driving shaft 5 is rotatably supported in an inner bearing-assembly 6 which, in its turn, is rotatably supported in an outer bearing-assembly 7 affixed to the frame 8 of the sieving apparatus. Primarily, the driving-shaft 5 can be driven in turn via a gearbox 9 (shown in dotted lines) coupled to the shaft's lower end and which gearbox 9 is coupled again in turn to an electromotor (not shown). An alternative driving means for the shaft 5 may be a driving-wheel 10 (shown in fine lines) which is affixed by its own hub 11 to the driving-shaft 5 instead of the gearbox 9. The rim 2 of the driving-wheel 11 grips a friction-wheel 13 mounted on a mainly vertical shaft 14 the driving electromotor (not shown) for which is accomodated in the protective casing 15. Both the direction-of-rotation (rl) and the angular-velocity (w1) of the driving-shaft 5 can be reversed and infinitely varied respectively by the electromotor used as the driving medium. The outermost sieving-surface 2 is supported by a spoked-wheel 16 having a hub 17 which is again affixed to the innermost bearing assembly 6. This spoked-wheel 16 has a peripherally-arranged rim 17 which is engaged by an ordinary pneumatic-tire or the like encircling the friction-wheel 18 driven by the mainly vertical shaft which itself is driven in turn by an electromotor 19. This electromotor 19 is suspended from a pivotable-arm on a pivot-shat 21 so as to urge the periphery of the friction-wheel 18 into gripping engagement with the rim 17 of the spoked-wheel 16. Again in this case, both the direction-of-rotation (r2) and the angular-velocity (w2) of the electromotor 18 can be reversed and infinitely varied respectively by the electromotor 19.

The sieving-surfaces 1 and 2 are accomodated in a housing 22 having a removable toplid 23 and

an a central feedthrough-pipe 24 for the product to be sieved. The lower end of the pipe 24 is provided with a tubular-shutter 25 the height of which is vertically-adjustable for the infinitely-variable regulation of the size of the annular discharge-aperture between the non-perforated central portion of the divider 26 of sieving-surface 1 and the lower end of the tubular-shutter 25. The tubular-shutter 25 and the divider 26 have been purposefully provided with substantially the same diameters. Furthermore, the housing 22 is provided with a centrally-located lower output-pipe 27 for the coarse components of the sieved product just as it is provided with a side outlet 28 for the fine components of the sieved product.

The sieving operation of the apparatus takes place as follows:-

The mixture of fine and coarse components to be separated is fed into the supply pipe 24 and the tubular-shutter 25 whereafter it flows to the divider 26 and through the annular discharge-aperture between this divider 26 and the mouth of the tubular-shutter 26 and then to the central sieving-surface 1 which is rotating at an angular-velocity (w1) in one direction. Under the influence of centrifugal, gravitational and frictional forces with respect to the sieving-surface, the product moves along approximately involute-flowlines downward to the outer periphery of the sieving-surface 1. Hereafter the product is thrown outward to the inner peripheral surface of the outermost sieving-surface 2 which may for example run at a slower angular-velocity (w2) in a reverse direction-of-rotation so that the product momentarily becomes stationary on impact. Following this, the product then moves in the reverse direction upward toward and over the outer rim of the last quoted sieving-surface 2. During this displacement over both the sieving-surfaces, the fine components are sieved out and discharged through the side outlet 28 whilst the coarse components are discharged via the central outlet 27.

Should the outer sieving-surface 2 rotate in the same direction as the inner sieving-surface 1, then there will be no reversal of direction of the components but only a retardation of movement in the transition zone between both the sieving-surfaces 1 and 2.

The invention is not limited to the described and illustrated exemplary embodiments of the invention but extends to all manner of variations thereof. Thus more than two radially arranged sieving-surfaces may be provided whilst, in addition hereto, a number of these sieving-surfaces may also be arranged vertically one above another.

Claims

1. Sieving apparatus for separating a mixture of at least fine and coarse components and comprising a number of sieving-surfaces arranged on the same rotatable shaft one above another and of which at least the outermost ones have the form of a hollow conical mantle the apex of which is directed downward and in which one or more collecting vessels for the fine components are arranged under the sieving-surfaces, in which a conical divider with an upwardly directed apex is arranged in the centre of each sieving-surface and in which the supply means for the mixture to be separated is located in the vicinity of the centre with the aid of a height-adjustable inlet-pipe arranged above the conical divider and the diameter of which inlet-pipe is equal to the diameter of base of the conical divider, characterised in this that each sieving-surface is subdivided into an annular centre portion (1) in the form of conical mantle-surface with an upwardly directed apex which follows up the divider (26) radially and with a reversible direction-of-rotation (d1) and an independent continuously-regulatable angular-velocity (w1) and a number of concentric members (2) arranged to extend radially outward one outside of another each having the form of a truncated conical mantle the apexes of which are directed downward and each of which has an reversible direction-of-rotation (d2,dn) and an independent continuously-regulatable angular-velocity (w2dn).

2. Sieving apparatus as claimed in claim 1 characterised in this that there is provided a annular outer portion (2) with a reversible direction-of-rotation (d2) and an independent continuously-regulatable angular-velocity (w2).

3. Sieving apparatus as claimed in claim 1 or claim 2 characterised in this that the annular outer portion (2) has a cylindrical driving-surface (17) which is arranged in gripping-engagement with a friction-wheel drive (18).

4. Sieving apparatus as claimed in any one or more of claims 1 to 3 inclusive characterised in this that the annular centre portion (1) is centrally driven with the aid of a central shaft (5).

5. Sieving apparatus as claimed in any one or more of claims 1 to 4 inclusive characterised in this that the central shaft (5) is driven with the aid of a gear-transmission (9).

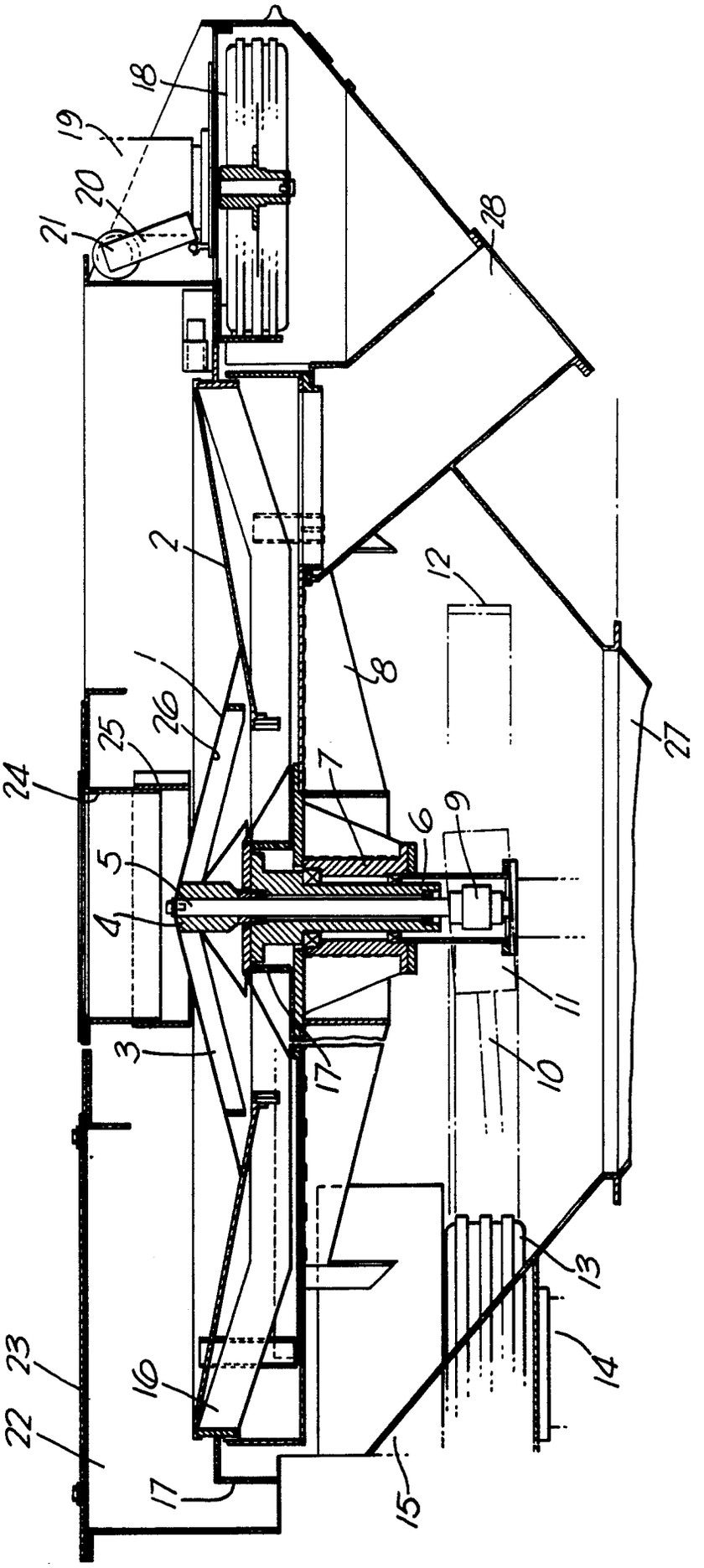
6. Sieving apparatus as claimed in any one of claims 1 to 5 inclusive characterised in this that that the central shaft (5) is driven with the aid of a concentric driving wheel (10,11) having a cylindrical driving-surface (12) with a friction-wheel drive (13,15) in gripping engagement therewith.

7. Sieving apparatus as claimed in any one or more of claims 1 to 6 inclusive characterised in this that the annular centre portion (1) and the annular outer portion (2) rotate in directions (r1,r2) reverse to one another.

8. Sieving apparatus as claimed in any one or more of claims 1 to 7 inclusive characterised in this that the annular centre portion (1) rotates in the same direction (r1 or r2) as the outer annular portion (2).

9. Sieving apparatus as claimed in any one or more of claims 1 to 8 inclusive characterised in this that that the annular centre portion (1) is driven with a greater angular-velocity (w1) than the angular-velocity (w2) at which the outer annular potion (2) is driven.

10. Sieving apparatus as claimed in any one or more of claims 1 to 9 inclusive characterised in this that the annular centre portion (1) partially overlaps the annular outer portion (2) over a short radial distance.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EUROPEAN SEARCH REPORT

Application Number

EP 87 20 2470

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	GB-A- 308 530 (O. WIENCKE) * Page 1, lines 85-96; page 2, lines 42-47; figures 3,6 *	1,2,4,5,8,9	B 07 B 1/08
A	DE-A-2 723 242 (COÖPERATIEVE LANDBOUW AAN- EN VERKOOPCOMBINATIE) * Page 3, line 1 - page 4, line 9; page 5, lines 1-22; figure * & NL-B-179 709 (Cat. A,D)	1,4	
A,D	DE-C- 440 697 (O. WIENCKE) * Whole document *	1,2,4,5,7,9	
A	EP-A-0 090 471 (COÖPERATIEVE LANDBOUW AAN- EN VERKOOPCOMBINATIE) * Page 3, lines 4-27; figure *	3	
A	EP-A-0 027 296 (COÖPERATIEVE LANDBOUW AAN- EN VERKOOPCOMBINATIE)		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 07 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19-04-1988	LAVAL J.C.A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
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