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(54) **APPARATUS FOR SIZING GRAINS BETWEEN 20 AND 300 MICRONS.**

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(73) Proprietor: **MAGYAR ALUMINIUMIPARI TRÖSZT**
Pozsonyi ut. 56
H-1133 Budapest (HU)

(72) Inventor: **CSILLAG, Zsolt**
Zalai u. 6/b
H-1125 Budapest (HU)
Inventor: **ZSEMBERY, László**
Felso "-zöldmáli u. 25
H-1025 Budapest (HU)
Inventor: **KALMAN, Tibor**
Szabó I. u. 35-37
H-1015 Budapest (HU)
Inventor: **SZENTGYÖRGYI, Géza**
Szabó I. u. 35-37
H-1015 Budapest (HU)
Inventor: **SOLYMAR, Károly**
Béla király u. 7/b
H-1125 Budapest (HU)
Inventor: **LEGAT, Tibor**
Kruspér u. 6-8
H-1119 Budapest (HU)

(74) Representative: **Harrison, Ivor Stanley et al**
Withers & Rogers 4 Dyer's Building Holborn
London EC1N 2JT (GB)

Courier Press, Leamington Spa, England.

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Description

The invention relates to an apparatus for sizing grains between 20 and 300 microns comprising a housing, a sieve and a carrier medium circulating system.

Materials (pigments, fillers and abrasives, etc.) containing grains of different sizes are frequently required in the industry for separation into two phases, so that one phase contains mainly the grains smaller, and the other phase mainly the grains larger than a given grain size.

Various sizes and/or dust separators are known for the separation of grains. Such are the cyclones, centrifuges, hydraulic classifiers and sieves, the use of which depends on the material to be fractioned, the sharpness of classification and the given technology.

East German Patent Specification DD—A—220515 describes a separator for separation of bulk, preferably mineral, materials into two or more fractions with simultaneous drying, in which medium-sized material is separated in an inner chamber spaced from the delivery container by a cone to deflect separated material into an outer chamber. West German Patent Specification DE—A—3131836 describes a separation technique in which material to be separated passes doen a central pipe surrounded by a jacket pipe through which flows gas in an upward direction, a sloping impact plate or a cone being arranged below the pipes.

For the range of the 20—300 µ grain size, generally an air-jet sieve is used, if no excessively high processing capacity is required. The main part of an air-jet sieve is a sieve drum revolving in a housing, along a sloping shaft. The required fraction of the material to be sized is driven through by a gaseous carrier medium blown through the sieve drum in a radial direction, in about a quantity of 10—20 kp/h.

The drawback of this apparatus is that the greater part of the surface of the rotary sieve is covered by the material to be separated and hence—compared to the size of the appratus—the active sieve surface is relatively small. The material sits on the sieve, the grains block up the apertures and the sticking grains further deteriorate the efficiency.

On the other hand, due to the moving parts, the apparatus is sensitive to failure.

The object of the invention is to provide an apparatus for the reliable sizing of grains between 20 and 300 µ, with high output.

According to the invention, apparatus for sizing grains between 20 and 300 microns comprises a vetical housing, respective inlet means for material to be sized and for carrier medium, conical sizing means, and recirculating means for the carrier medium, characterised in that the material and carrier medium flow downwardly in the housing and the housing is divided by an endless wall into a central part, connected to both said inlet means, and a surrounding external part, the wall comprising sieve elements arranged at an angle of up to 20° to the direction of material flow, baffles being disposed within the central part of the housing and sloping outwardly from the centre of the housing at an angle of 30—45°, and a collecting channel communicating between the external part of the housing and the carrier medium recirculation system via an overflow weir, wherein the outlet for coarse grains is connected to the central part of the housing and the outlet means for fine grains is connected to the external part of the housing.

The carrier medium circulating system may be closed or open and functions with gaseous or liquid medium. Accordingly, fan or pump and fine sludge- or dust separators are in the system.

The sieve elements are replaceable and/or adjustable.

The housing is preferably provided with flexible suspensions and has a drive for improving the efficiency of the separation. The drive may be an eccentric disc connected motor.

Similarly, the efficiency of separation can be improved if the carrier medium circulating system is provided with a pulsator.

In the apparatus according to the invention, a certain part of the coarse fraction can be separated by gravitation before the sieve surface and the other part mechanically on the sieve. The fine fraction flowing through the seive surface, leaves through the outlet of the fine grains.

Arrangement of the sieve surface in a vertical or inward sloping position prevents the material from laying on the sieve, whereby the sieve surface remains clean, free from clogging, and functions with an output higher than the devices known in the art.

The main advantage of the apparatus is that contrary to the traditional apparatuses of 10—20 kp/h output, its output is 2—10 q/h (the output of the known devices is 10—20 kp/n) and functions with high efficiency.

With vibratory or wobbling motion, the efficiency of the apparatus can be further improved, since flow of the medium on the sieve is constantly outward-oriented, which easily passes the grains smaller than the aperture through the sieve. However, the grains slightly larger than the aperture, are inclined to get stuck in the aperture and they have to be removed continuously. Upon vibration, a certain part of the grains falls out, but removal of the more sticking grains necessitates to eliminate periodically the pressing-in effect of the medium-flow. This is accomplished by adjusting the motion as to have the horizontal movement of the mesh panel faster than the velocity of the medium-flow. There will always be a moment in each phase of the motion, when the sieve moves outwards faster than the medium-flow. Consequently, the grains can get detached from the mesh panel. The separation can also be accomplished with pulsating medium-flow, but this is less efficient, and technically more complicated.

Further advantage of the apparatus is that it can be operated with gaseous as well as liquid carrier

medium, and the sieves are replaceable according to the quality and the grain size of the material. Replacement of the sieves or adjustment of their position can be quickly and easily carried out.

Since there is no moving part in the sizing space of the apparatus, its operation is reliable and the maintenance is fairly simple.

Further details of the invention are described by way of example with the aid of drawing, in which

Figure 1 is a sectional view of the apparatus according to the invention,

Figure 2 is the apparatus shown in Figure 1, functioning with a liquid carrier medium,

Figure 3 is the apparatus shown in Figure 1 functioning with a gaseous carrier medium.

The apparatus shown in Figure 1 consists of a housing 1 divided by a partition wall 4 into a central part 2 and an external part 3. The central part 2 of the partition wall 4 is formed by sieve elements 5, and baffles 6 are arranged in the central part 2 at the height of sieve elements 5. The baffles 6 are sloping outwards from the centre-line of the internal space 2 to conduct the material to be separated on to the sieve elements 5. The angle of slope of the baffles 6 is 30—45°. In the present example, the baffles 6 are truncated cone surfaces, having central openings (6a). The cross-section of the openings is decreasing downwards at each level. The lowest baffle may not have any opening at all. The half cone angle of the baffles (i.e. the angle of slope) is 40° to the vertical centreline.

Of course, baffles of other forms may also be applied. They can have a form of a truncated pyramid or they can be simple plates as well.

The sieve elements 5 may be similarly in a slightly tilted position, at an angle of max. 20° to the vertical first of all, when no drive is provided. However, in the present embodiment the sieve elements 5 are vertical. Their distance from the end of the baffles 6 is adjustable.

The material charging hopper 7 is connected on the top to the central part 2 of the housing and the material to be separated is admitted therethrough into the apparatus. The carrier medium inlet stub 8 is also centrally located, with the charging cone 9 underneath for setting the amount of material to be admitted.

The coarse grain outlet stub 10 is connected to the internal space 2 and the fine grain outlet stub to the external space 3 of the house 1. Both stubs are provided with butterfly valves 12 and 13 and connected to a closed space, such as a container (with or without an elevator) or a sluiced delivery.

The housing 1 is provided on the top with an overflow weir 14 connected to a sloping collecting channel 15. An outlet stub 16 is formed on its deepest point.

In the course of operation of the apparatus, the material to be separated passes into the material charging hopper 7, from where it is entrained by the carrier medium flowing through the inlet stub 8 in the quantity determined by the charging cone 9. Thus, the material passes into the central part 2 of the house 1 and to the baffles 6. From there, it flows directly to the sieve elements 5, where the larger grains fall sown by gravitation between the baffle plates 6 and sieve elements 5. The further large grains hanging up on the sieve elements 5 fall down to the bottom of the central part 2, from where they leave through the coarse grain outlet stub 10.

The fine fraction together with the carrier medium flows through the apertures of the sieve elements 5 and leaves through the fine grain outlet stub 11.

The carrier medium together with the finest fraction falls through te overflow weir 14 and from the collecting channel 15 it leaves through the outlet stub 16.

Efficiency of the separation can be improved by vibratory or wobbling motion of the sieve. As mentioned earlier, the free sieve surface will be greater if the sieve mantle is in motion, since the grains become shaken off the mantle. For this purpose the housing 1 may be interconnected with an actuating mechanism. This is a motor 17 in the present embodiment, provided with an eccentric disc 18 through which it is connected to the housing 1. Movement of the housing 1 is enabled by flexible supports 19.

As mentioned earlier, the apparatus according to the invention functions equally with liquid and gaseous carrier medium. A system functioning with liquid carrier medium is shown in Figure 2.

As seen in in the drawing, a closed carrier medium-circulating system 20 is connected to the outlet stub 16 of the collecting channel 15. Here, the flow of the liquid is ensured by a pump 21. For separation of the very fine fraction present in the discharged carrier medium, the carrier medium-circulating system 20 is provided with a fine sludge separator 22. From here the cleaned carrier medium returns to the carrier medium inlet stub 8.

The fractions discharged from the apparatus are carried off by closed elevators 23 and 24.

A version of the apparatus according to the invention functioning with gaseous carrier medium is shown in Figure 3. Here, the carrier medium is not returned to the inlet stub 8, but after having been cleaned it is discharged into the surrounding air. This system is actuated by a fan 25 and the fine fraction in the medium is removed by cyclones 26 and 27.

In view of the foregoing, it is evident that build-up of the apparatus according to the invention is very simple, at the same time it carries out the separation of the media containing 20 to 300 microns grains extremely efficiently and reliably. There are no moving parts in the separating system, hence the wear is minimal, and the system does not require maintenance.

The sieves are replaceable and their position is adjustable.

The apparatus functions equally with liquid and gaseous carrier medium, thus it can be used in an extensive range.

Claims

1. Apparatus for sizing grains between 20 and 300 microns, the apparatus comprising a vertical housing, respective inlet means for material to be sized and for carrier medium, conical sizing means, and recirculating means for the carrier medium, characterised in that the material and carrier medium flow downwardly in the housing and the housing (1) is divided by an endless wall (4) into a central part (2), connected to both said inlet means, and a surrounding external part (3), the wall (4) comprising sieve elements (5) arranged at an angle of up to 20° to the vertical, baffles (6) being disposed withing the central part (2) of the housing (1) and sloping outwardly from the centre of the housing at an angle of 30—45°, and a collecting channel (15) communicating between the external part of the housing and the carrier medium recirculation system (20) via an overflow weir (14), wherein the outlet (10) for coarse grains is connected to the central part (2) of the housing and the outlet means for fine grains is connected to the external part (3) of the housing (1).

2. Apparatus according to Claim 1, characterised in that the baffles (6) are provided with central openings the cross-sections of which decrease in the direction of flow.

3. Apparatus according to Claim 1, characterised in that the carrier medium circulating system (20) is closed.

4. Apparatus according to Claim 1, characterised in that the carrier medium circulating system (20) is open.

5. Apparatus according to Claims 2 to 4, characterised in that the carrier medium circulating system (20) is provided with a fan (21) or pump (25).

6. Apparatus according to any of Claims 1 to 5, characterised in that the carrier medium circulating system (20) is provided with at least one fine sludge- or dust separator (22, 26, 27).

7. Apparatus according to any of Claims 1 to 6, characterised in that the sieve elements (5) are replaceable and/or adjustable.

8. Apparatus according to any of Claims 1 to 6, characterised in that the housing (1) is resiliently mounted (19) and is provided with a drive.

9. Apparatus according to Claim 8, characterised in that the drive consists of a motor (17) and an eccentric disc (18).

10. Apparatus according to any of Claims 1 to 9, characterised in that the carrier medium circulating system (20) is provided with a pulsator.

Patentansprüche

1. Vorrichtung zum Klassieren von Körnern zwischen 20 und 300 µm mit einem vertikalen Gehäuse, mit jeweils einer Einlaßeinrichtung für das zu klassierende Material und ein Trägermedium, mit konischen Klassiereinrichtungen und mit Umwälzeinrichtungen für das Trägermedium, dadurch gekennzeichnet, daß das Material und das Trägermdium in dem Gehäuse abwärts strömen, daß das Gehäuse (1) durch eine endlose Wand (4) in einen zentralen Teil (2), der mit beiden Einlaßeinrichtungen verbunden ist, und einen umschließenden externen Teil (3) unterteilt ist, daß die Wand (4) Siebelemente (5) aufweist, die in einem Winkel von bis zu 20° zu der Vertikalen angeordnet sind, daß Leitflächen (6) in dem zentralen Teil (2) des Gehäuses (1) angeordnet sind, die sich von der Mitte des Gehäuses unter einem Winkel von 30 bis 45° nach außen neigen, und daß ein Sammelkanal (15) eine Verbindung zwischen dem externen Teil des Gehäuses und dem Umwälzsystem (20) für das Trägermedium über ein Überströwehr (14) herstellt, wobei der Auslaß (10) für grobe Körner mit dem zentralen Teil (2) des Gehäuses verbunden ist und die Auslaßeinrichtungen für feine Körner mit dem externen Teil (3) des Gehäuses (1) verbunden sind.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Leitflächen (6) mit zentralen Öffnungen versehen sind, deren Querschnitte in Fleißrichtung abnehmen.

3. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das Umwälzsystem (20) für das Trägermedium geschlossen ist.

4. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das Umwälzsystem (20) für das Trägermedium offen ist.

5. Vorrichtung nach den Ansprüchen 2 bis 4, dadurch gekennzeichnet, daß das Umwälzsystem (20) für das Trägermedium mit einem Gebläse (21) oder einer Pumpe (25) versehen ist.

6. Vorrichtung nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß das Umwälzsystem (20) für das Trägermedium mit wenigstens einem Feinschlamm- oder Staubseparator (22, 26, 27) versehen ist.

7. Vorrichtung nach einem der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß die Siebelemente (5) austauschbar und/oder einstellbar sind.

8. Vorrichtung nach einem der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß das Gehäuse (1) elastisch angebracht (19) und mit einem Antrieb versehen ist.

9. Vorrichtung nach Anspruch 8, dadurch gekennzeichnet, daß der Antrieb aus einem Motor (17) und einer Exzenterscheibe (18) besteht.

10. Vorrichtung nach einem der Ansprüche 1 bis 9, dadurch gekennzeichnet, daß das Umwälzsystem (20) für das Trägermedium mit einem Pulsator versehen ist.

Revendications

1. Appareil permettant de réguler la granulométrie de grains entre 20 et 300 microns, l'appareil comportant un boîtier vertical, des moyens d'admission respectifs pour le matériau à réguler et pour le moyen porteur, des moyens de dimensionnement coniques et des moyens de recirculation pour le moyen porteur caractérisé en ce que le matériau et le moyen porteur s'écoulent vers le bas dans le boîtier et le boîtier (1) est divisé par

une paroi sans fin (4) dans une partie centrale (2) connectée aux deux de ces moyens d'admission et une partie externe entourant (3), la paroi (4) comportant des éléments formant tamis (5) disposés à un angle qui peut atteindre 20° par rapport à la verticale, des cloisons (6) étant disposées à l'intérieur de la partie centrale (2) du boîtier (1) et se trouvant en pente vers l'extérieur à partir du centre du boîtier avec un angle de 30—45° et un canal collecteur (15) communiquant entre la partie externe du boîtier et le système de recirculation du moyen porteur (20) par l'intermédiaire d'un barrage de déversement (14), dans lequel la sortie (10) de grains grossiers est connectée à la partie centrale (2) du boîtier et les moyens de sortie pour les grains fins sont connectés à la partie externe (3) du boîtier (1).

2. Appareil selon la revendication 1 caractérisé en ce que les cloisons (6) sont prévues avec des ouvertures centrales dont les sections décroissent dans le sens de l'écoulement.

3. Appareil selon la revendication 1 caractérisé en ce que le système de circulation du moyen porteur (20) est fermé.

4. Appareil selon la revendication 1 caractérisé en ce que le système de circulation du moyen porteur (20) est ouvert.

5. Appareil selon les revendications 2 à 4 caractérisé en ce que le système de circulation du moyen porteur (20) est prévu avec un ventilateur (21) ou une pompe (25).

6. Appareil selon l'une quelconque des revendications 1 à 5 caractérisé en ce que le système de circulation du moyen porteur (20) est prévu avec au moins un séparateur de boues ou de poussières fines (22, 26, 27).

7. Appareil selon l'une quelconque des revendications 1 à 6 caractérisé en ce que les éléments formant tamis (5) sont susceptibles d'être remplacés et/ou réglés.

8. Appareil selon l'une quelconque des revendications 1 à 6 caractérisé en ce que le boîtier (1) est monté élastiquement (19) et comporte un moyen d'entraînement.

9. Appareil selon la revendication 8 caractérisé en ce que le moyen d'entraînement consiste en un moteur (17) et un disque excentrique (18).

10. Appareil selon l'une quelconque des revendications 1 à 9 caractérisé en ce que le système de circulation du moyen porteur (20) est prévu avec un crible ou pulsomètre.

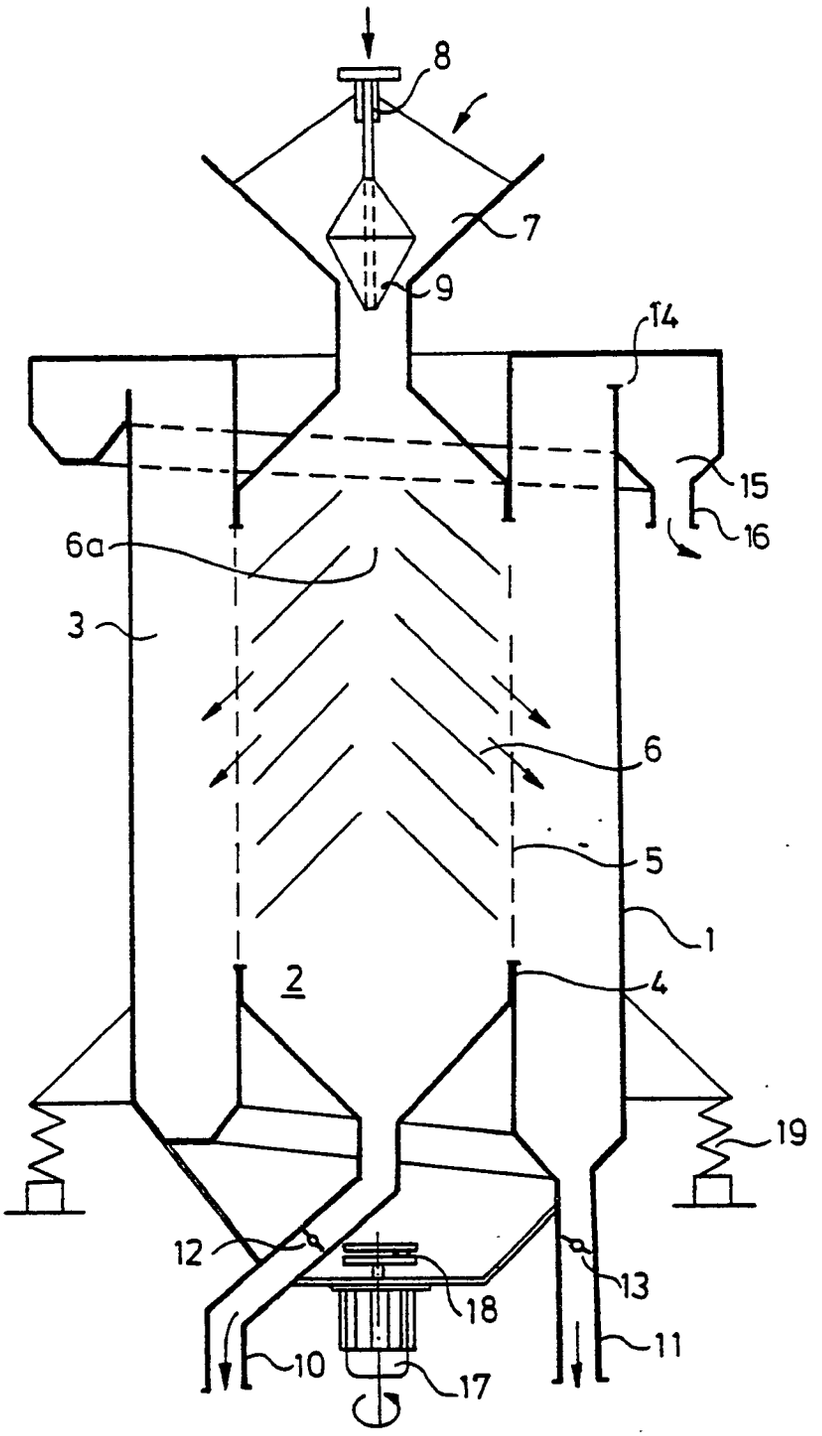

Fig.1

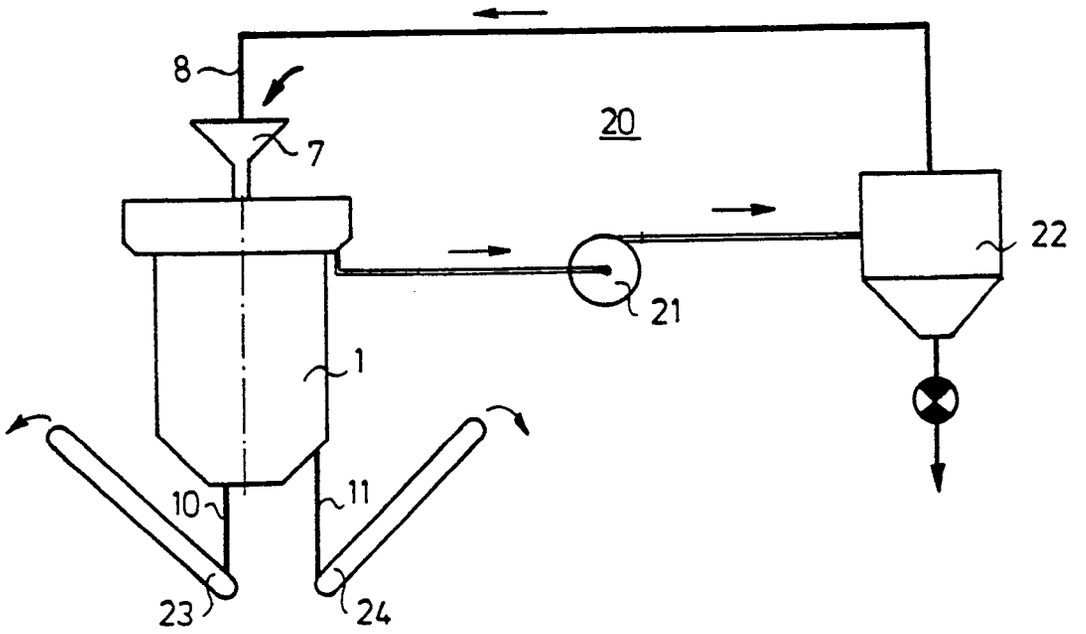

Fig. 2

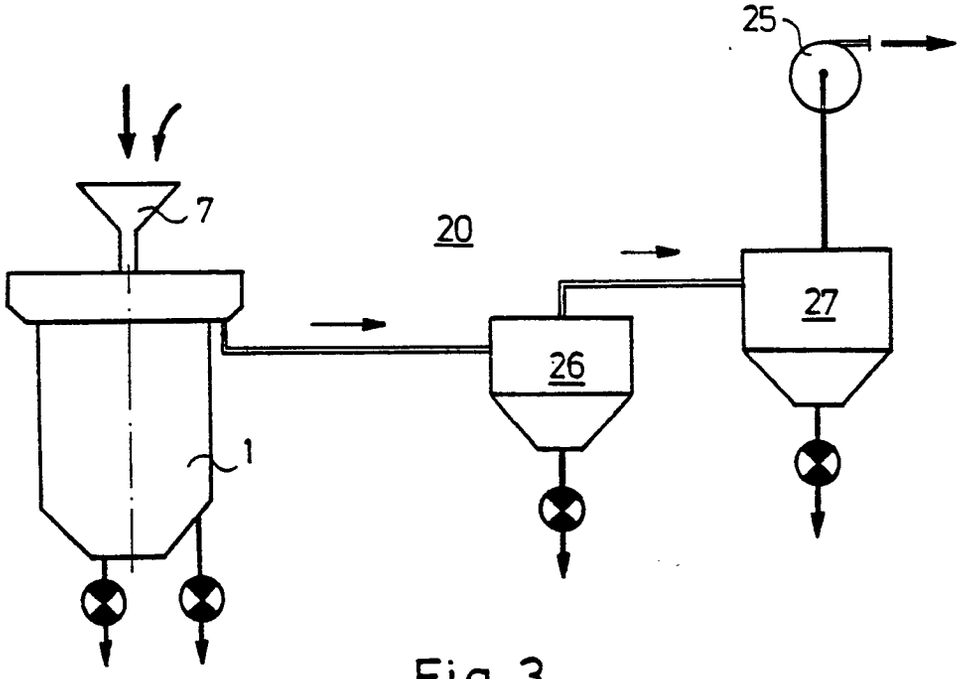

Fig. 3