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Octrooi centrum  
Nederland

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2013925

12 B1 OCTROOI

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Aanvraagnummer: **2013925**

51

Int. Cl.:  
**B07C 5/342** (2006.01) **B07C 5/36** (2006.01)

22

Aanvraag ingediend: **05/12/2014**

30

Voorrang:

73

Octrooihouder(s):  
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41

Aanvraag ingeschreven:  
**11/10/2016**

72

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43

Aanvraag gepubliceerd:  
-

47

Octrooi verleend:  
**11/10/2016**

74

Gemachtigde:  
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45

Octrooischrift uitgegeven:  
**20/02/2017**

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**Sensor separation apparatus and method.**

57

A separation apparatus, comprising an identifier arranged to identify the particles in a group of particles that have a specific property, an affinity modifier arranged to modify an affinity of the identified particles relative to that affinity of non-identified particles in a group, and a separator arranged to separate the particles in the group based on their difference in the affinity.

P105826NL00

Title: Sensor separation apparatus and method

5 The invention generally relates to separation of particles, in particular in recycling.

Separation apparatus are known in the prior art and they are typically used in raw materials processing for the classification of mixed streams of particles of recycling material into streams with particles of different types of material. The known sensor separation apparatus  
10 comprises an identifier, in particular a sensor that analyses a group of particles in order to assess the type of each individual particle. After the particles of the relevant type have been identified by the sensor, a separator is activated that physically separates the identified particles from the group of particles, for example a series of nozzles is actuated so that they initiate  
15 jets of air that eject the identified particles from the stream such that they are separated from the group of particles.

A disadvantage of the sensor separation apparatus known in the art is that they are not very accurate. In particular, the air jets will accidentally hit and eject not just the identified particles, but also  
20 neighboring non-identified particles which may be of a different type. Especially, when the particles are closely arranged in the group this decreases the accuracy of the known sensor separation apparatus. A solution in the art is to arrange the particles very sparsely in the group to avoid accidentally hitting and ejecting neighboring particles by the jet of air.  
25 However, this lowers the capacity and affects the economy of the process. For example, economic recycling of a mixed stream of smaller particles of physically similar or identical particles, e.g. shredded particles of a plastic material, e.g. PET or PE, having different colors and a maximum dimension of several mm, e.g. 10 mm or less.

30 The invention aims at alleviating one or more of the aforementioned disadvantages. In particular, the invention aims to provide

a sensor separation apparatus with improved accuracy and efficiency. To that end, the invention provides for a separation apparatus, comprising an identifier arranged to identify the particles in a group of particles that have a specific property, an affinity modifier arranged to modify an affinity of the identified particles relative to that affinity of non-identified particles in the group, and a separator arranged to separate the particles in the group based on their difference in the affinity.

By providing the separation apparatus with an affinity modifier, it may be achieved that only the identified particles that are, e.g. commercially relevant, may be separated from the group based on a provided difference in the affinity without disturbing neighboring non-identified particles. This way, accidentally separating a non-identified particle may be counteracted, and thus the accuracy of separation may be increased. Further, the affinity of the particle may be, e.g. the tendency of the particles to affix onto the separator, and, preferably, the affinity modifier increases this tendency. For example, the affinity modifier may be arranged to modify the force of attraction or attachment force of the identified particles relative to that force of attraction or attachment force of non-identified particles in the group, such that identified particles may be attracted onto the separator. The tendency may be increased by means known in the art, for example, increasing the adhesiveness of the particles, but also by statically charging the particles or using magnetization.

It is noted that the affinity modifier is arranged to modify the affinity of the identified particles relative to that affinity of non identified particles. This may e.g. comprise the following four situations: (1) the identifier identifies particles that are commercially relevant and the affinity modifier may then be arranged to change the affinity of the identified particles such that a separator can separate the identified particles from the group, e.g. by picking or engaging the particles, or (2) the identifier identifies particles that are commercially relevant and the affinity may then

be arranged to change the affinity of the non-identified particles such that the separator can separate the non-identified particles from the group, or (3) the identifier identifies particles that are not commercially relevant. The affinity modifier may then be arranged to change the affinity of the non-identified particles such that the separator can separate the non-identified particles from the group, or (4) the identifier identifies particles that are not commercially relevant and the affinity modifier may then be arranged to modify the affinity of the identified non-commercially relevant particles such that the separator can separate the identified non-commercially relevant particles from the group. It is noted that the identifier selectively and individually engages the particles, i.e. each particle of the group is being engaged and identified by the identifier.

By providing the separation apparatus with a separator, it may be achieved that, e.g. the identified particles with a modified affinity may be selectively separated from the group, and the non-identified particles may remain undisturbed. Consequently, the particles may then be arranged more closely together, and thus increasing the capacity and the economy of the process. As an option, it is noted that once the separator has separated the identified particles from the group, a second separator or more separators arranged in one go may additionally be included to separate remaining particles of a different type of material, color, or size, and thus more than one type of particle may be separated from a single sorter system.

The particles in the group may be small particles of, e.g. plastic, metal and/or wood, with a diameter that may range between 1-20 mm.

The identifier may identify the particles in the group on the basis of a specific property, e.g. material type, weight, color, shape and/or size. Specifically, non-physical property, e.g. same density but different color, or size out of a specified range. For example, a particle of the group may be identified with the specific property of color while another particle of the group may be identified with the specific property of size. It is noted that the

identifier may be arranged to identify multiple specific properties, however, it is also possible to have multiple identifiers aligned in a row, each identifier arrange to identify at least one specific property.

The separation apparatus may further comprise a layerizer  
5 arranged to bring the group of particles in layer. This way, a planar array of particles may be provided, e.g. a curtain or a bed, so that identification can be facilitated and the particles may be provided with a known spatial relation. This way, it may also be prevented that too many particles stick onto each other and/or avoiding that, e.g. two or more particles are  
10 overlapping each other such that the identifier is unable to identify the lower particles.

The group of particles may be brought in a layer arrangement and/or bed by, for example, forcing the group of particles through a channel, sieve, groove, slit, slot or by means of a sweeper. Further, it is noted that the  
15 layerizer may also comprise a jig causing a pulsation such that the particles may be in a layer arrangement and/or bed and thus the identifier can easily identify at least one specific property of the particles.

Preferably, the layerizer provides the particles in the layer with a known, preferably constant, spatial relation, e.g. using a belt conveyor with  
20 compartmentalized belt surface, or a belt surface with pre-impressed spatially arranged electrostatic charges that temporarily fixate singular received particles until they reach the separator in the layer between the identifier and the affinity modifier. By doing so, the accuracy of the affinity modifier may be further increased, and accidentally modifying an affinity of  
25 the non-identified particles may be prevented.

The layerizer may comprise a conveyor belt surface on which the particles are deposited in a planar layer. The particles may, for example be in a top layer wherein the particles are non-overlapping, or in a monolayer. The particles may be conveyed along the identifier, affinity modifier and the

separator with a velocity that may range in between 0.5 – 8 m/s, preferably 1 -3 m/s and more preferably of about 2.5 m/s.

The identifier may be a sensor, e.g. optical sensor and/or an image processing device, e.g. color camera (RGB) for visual assessment, IR camera  
5 for temperature and shape assessment, near-infrared (NIR) camera for chemo-spectral and shape assessment (e.g. plastic type), X-ray methods such as X-ray Fluorescence (XRF) for elemental assessment or X-ray  
transmission for density and shape assessment, or laser induced breakdown spectroscopy (LIBS) for elemental assessment. The optical sensor may for  
10 example have a resolution in time of better than 0.5 ms and a resolution in space of better than 0.5 mm. Therefore, the optical sensor may accurately define the position, size and/or shape of particles passing by.

The affinity of the identified particles which may be modified by the affinity modifier may be e.g. the adhesiveness e.g. using water or spray  
15 able adhesive on plastic flakes, electric static charge or magnetic behavior of the identified particles. In particular, the affinity modifier may modify the affinity of the identified particles by applying affinity modifying particles to the identified particles, wherein the modifying particles may be charged particles, e.g. electrons to statically charge the identified particles.

20 Preferably, the affinity modifying particles may be material particles, wherein the affinity changing particles may form a coating surface layer onto the identified particles. Additionally or alternatively, the affinity changing particles may form, at least partially, a coating surface layer onto the identified particles, i.e. onto a surface of the identified particles that is  
25 facing the affinity modifier. For example, modifying particles may be discharged from the modifier from above the conveyor such that the modifying particles may adhere onto the surface of the particles, forming a sticky, moisturized and/or magnetic coating surface.

The affinity modifying particles discharged from the affinity  
30 modifier may be liquid droplets and/or powder particles. The affinity

modifier may comprise jets, e.g. jet printer heads. When the affinity modifier discharges liquid droplets, this may for example be oil, alcohol, but preferably water to moisturize the identified particles. The identified particles may then be covered by a water layer of approximately 10-20  
5 microns. The liquid droplets on the surface of the identified particles may then form a moisture bridge between the identified particles and the separator while the non-identified particles remain substantially dry. Optionally, it is also possible that the liquid droplets on the surface of the identified particles form a moisture bridge between the identified particles  
10 and a second material, e.g. powder particles, wherein the powder particles may be discharged by, for example, another affinity modifier, e.g. powder spray, after the identified particles have been moisturized.

The affinity modifier is arranged for individual engagement of particles. The affinity modifier may deliver 50000 droplets per second per  
15 valve, wherein each droplet may have a diameter of 40 micron. The valves may be spaced from each other with a distance of about 0.05 mm.

It is noted that multiple modifiers or one modifier having multiple valves may be arranged in a row that is transverse to the conveyor direction, or they may be partly co-moving in the direction of the conveyor to eliminate  
20 the relatively motion between the modifier and particles during the modifying action (e.g. spraying jets mounted on a device rotating opposite to the conveyor belt). Each valve and/or modifier may contain different modifying particles to be discharged. By having the modifier that is able to deliver 5000 droplets per second per valve, it may be achieved that the  
25 accuracy between the sensor and the separator may be better coordinated. In particular, the resolution of the separator may be about 0.4 mm and thus it easily matches the resolution of the identifier of 0.5 mm and therefore the separator may operate with the same accuracy as the identifier.

It is noted that besides the above mentioned fluids, it is also possible that the modifier discharges glutinously fluids onto the identified particles, e.g. starch.

The powder particles may be a magnetic powder, e.g. industrial  
5 Ferrosilicon, preferably spherically shaped. Preferably, the modifier discharges powder particles after the particles have been at least partially covered by liquid droplets. For example, 40-150 micron magnetic powder particles may be added per moisturized identified particles such that the powder will stick onto the moisturized identified particles.

10 Preferably, the affinity modifier comprises a printer head wherein the printer head may be of the type inkjet printer for discharging the liquid droplets. The affinity modifier may further comprise a powder spray arranged to discharge the powder particles, e.g. Ferrosilicon. Thus, the printer head is arranged to discharge water droplets onto the identified  
15 particles after which the powder spray sprays spherically shaped Ferrosilicon on the moisturized identified particles. The droplets may thus form a water bond, with a strength comparable with a yellow sticky note, between the identified particles and the Ferrosilicon. By providing the identified particles with liquid droplets and a layer of Ferrosilicon, the  
20 identified particles may be selectively attracted to a magnet or a magnetizable material.

The separator may have a contact surface onto which the identified particles are affixed thereon. The separator may be arranged to individually engage the particles. The separator may be an active separator  
25 i.e. a separator that is mechanically driven to ensure that the contact surface engages the identified particles and/or the group of particles. However, it is also possible to have a passive separator, i.e. wherein the identified particles and/or group of particles fall onto the contact surface of the separator. The contact surface may be coated with a hydrophilic  
30 material arranged to attract the moisturized particles. The contact surface



may also be a magnet or at least is coated with a magnetizable layer arranged to interact with the magnetic spherically powder particles that may be on the surface of the identified particles such that the identified particles may be attracted by the separator, or affix onto it.

5            Preferably, the separator may be a mechanical pick up device having a contact surface that contacts the group of particles for picking up the identified particles. The separator may, for example, be a drum with a rotating axis transverse to the conveyor direction. The drum may have a contact surface that is coated with a magnetizable layer or with hydrophilic  
10 fibrous material with fibers having a size that may range in between 100-500 micron diameter and is preferably about 300 micron diameter. The fibers may have a rounded top and these fibers may be moved up and down individually fast enough to connect to moisturized particles such that the moisturized particles are affixed onto the fibers.

15            The invention further relates to a use of a printer head for separation of identified particles from a group of particles.

              The invention further relates to a method for separation of particles from a group of particles, comprising the steps of:

              - supplying an group of particles in an arrangement, wherein the  
20 group of particles comprises particles with different properties, e.g. material, color, shape and/or size;

              - identify particles in the group of particles that have a specific property;

              - modify an affinity of the identified particles relative to that  
25 affinity of non-identified particles in the group with an affinity modifier;

              - separate the particles in the group based on their difference in the affinity with a separator.

              When fine powder particles, e.g. ferrosilicon have been applied by the modifier to the identified particles, the method may further comprise a  
30 recovering step after the separation step, wherein the wetted particles with

ferrosilicon powder on their surface are dried such that ferrosilicon powder particles may be recovered.

It is noted that in the method for separation, the identifier may also be a human that identifies the particles to be separated and marks  
5 them with a marker.

The invention will be further elucidated on the basis of an exemplary embodiment which is represented in a drawing. In the drawing:

Fig. 1 shows a schematic view of the separation apparatus.

It is noted that the figures are merely schematic representations  
10 of a preferred embodiment of the invention, which is given here by way of non-limiting exemplary embodiment. In the description, the same or similar part and elements have the same or similar reference signs.

In Fig. 1 is shown a separation apparatus 1 comprising an identifier 2 arranged to identify the particles 3 in a group of particles 4 that  
15 have a specific property. The separation apparatus 1 is arranged for individual engagement of particles. The particles may be small particles such as shredded PE, PP or PET of different colors or different grades with a diameter size that may range between 1-20 mm. An affinity modifier 5 is provided that is arranged to selectively modify an affinity of the identified  
20 particles 3 relative to that affinity of non-identified particles 6 in a group 4, and a separator 7 is arranged to separate the particles in the group 4 based on their difference in the affinity. The specific property that is measured by the identifier 2 may be, e.g. a type of material, weight, color, shape and/or  
size.

25 The sensor separation apparatus 1 in the example further comprise a layerizer 8 arranged to bring the group of particles 4 in layer, and preferably provides the particles 4 in the layer with a known constant spatial relation in the layer between the identifier 2 and the affinity modifier 5.

The layerizer 8 in this embodiment comprises a conveyor belt surface 8A on which the particles are deposited in a planar layer. As shown in Fig.1 the group particles 4 are being fed onto the conveyor belt surface 8A by a feeder 9. The group particles 4 may be fed onto the conveyor belt as a continuous curtain of particles or as sections with a predetermined distance.

The identifier 2 is in Fig. 1 embodied as an optical sensor 10 wherein it is positioned above the layerizer 7 to identify the group particles 4 that have a specific property. For example, the identifier 2 is arranged to identify the color of the particles 4 in a stream of clear particles. The identifier 2 is also arranged to identify a specific type of PP via a marker provided in the PP material. Furthermore, the identifier 2 is arranged to identify the position of the particles on the conveyor belt surface 8A.

After the particles 4 have passed along the identifier 2, the affinity modifier 5 modifies the affinity of the identified particles 3 by applying affinity modifying particles 11 to the identified particles 3. The modifying particles 11 is, for example discharged from above the conveyor belt surface 8A such that the affinity modifying particles 11 form a coating surface layer onto the identified particles 3.

The affinity modifying particles 11 may in Fig. 1 be liquid droplets and/or powder particles wherein the liquid droplets is in this example is water to moisturize the identified particles to form a moisture bridge between the identified particles 3 and the separator 7. Optionally, it also possible that after the identified particles 3 have been moisturized by liquid droplets, a second modifier 5B or the same modifier 5A discharges a second material, preferably powder particles. The powder particles in Fig.1 may be magnetic powder particles, e.g. industrial ferrosilicon wherein they are preferably spherically shaped such that the identified particles 3 may be engaged individually and/or lifted by the separator 7.

The affinity modifier 5 is in Fig. 1 embodied as a printer head 5A and/or a powder spray, e.g. Ferrosilicon spray 5B.

The separator 7 has a contact surface 12 onto which identified particles 3 are affixed thereon such that they can be separated from the group particles 4. The separator 7 individually engages particles for separation. Preferably, the separator 7 is a mechanical pick up device which  
5 contact surface 12 contacts the group of particles 4 for picking up the identified particles 3. As shown in Fig. 1 the separator 7 is embodied as a drum 13 having a rotating surface transverse to the conveying direction. The contact surface 12 of the drum 13 is in this example coated with a hydrophilic fibrous material such that the identified moisturized particles  
10 may be affixed thereon. Further, it is also possible that the separator 7 is a magnet or that its contact surface 12 is a magnet, or at least is coated with a magnetizable layer to separate the identified particles 3 which have been coated with magnetic powder.

Further, in Fig. 1 is shown that a second conveyor 14 may be  
15 provided to convey the identified particles 3 away from the group particles 4 after the identified particles 3 have been separated.

As for the purpose of this disclosure, it is pointed out that technical features which have been described may be susceptible of functional generalization. It is further pointed out that – insofar as not  
20 explicitly mentioned– such technical features can be considered separately from the context of the given exemplary embodiment, and can further be considered separately from the technical features with which they cooperate in the context of the example.

It is pointed out that the invention is not limited to the exemplary  
25 embodiments represented here, and that many variations are possible. For example, the identifier may also be an identifier station comprising multiple identifiers arranged in a row or the separation apparatus may comprise multiple identifier stations, preferably also arranged in a row. There may also be an affinity modifier station or a separator station.

Further, it is noted that the separator and the affinity modifier may be accommodated in a single device wherein modifying the affinity of identified particles and separation may be single action and may take place at the same time at a same position.

5           It is further noted that multiple separation apparatus may be placed in one go, e.g. above a conveyor, such that multiple different particles may be separated from a single stream of particles.

          These and other embodiments will be apparent to the person skilled in the art and are considered to lie within the scope of the invention  
10   as formulated by the following claims

## Conclusies

1. Scheidingsapparaat, omvattende:
  - een identifier die is ingericht om de deeltjes die een bepaalde eigenschap hebben binnen een groep deeltjes te identificeren;
  - een affiniteitsmodifier die is ingericht om een affiniteit van de geïdentificeerde deeltjes te modifieren ten opzichte van niet geïdentificeerde deeltjes binnen een groep;
  - een scheider die is ingericht om de deeltjes binnen de groep te scheiden gebaseerd op hun verschil in affiniteit.
2. Apparaat volgens conclusie 1, voorts omvattende een laagmaker die is ingericht om de groep deeltjes in een laag te brengen.
3. Apparaat volgens conclusie 2, waarbij de laagmaker de deeltjes in de laag tussen de identifier en de affiniteitsmodifier voorziet van een bekende, bij voorkeur constante ruimtelijke relatie.
4. Apparaat volgens een der voorgaande conclusies, waarbij de laagmaker een bandtransporteuroppervlak omvat waarop de deeltjes in een vlakke laag worden gedeponerd.
5. Apparaat volgens een der voorgaande conclusies, waarbij de identifier een optische sensor is.
6. Apparaat volgen een der voorgaande conclusies, waarbij de affiniteitsmodifier de affiniteit van de geïdentificeerde deeltjes modificeert door affiniteitsmodificerende deeltjes op de geïdentificeerde deeltjes aan te brengen.
7. Apparaat volgens een der voorgaande conclusies, waarbij de affiniteitsmodificerende deeltjes een oppervlaktecoatingslaag op de geïdentificeerde deeltjes vormt.

8. Apparaat volgens een der voorgaande conclusies, waarbij de affiniteitsmodificerende deeltjes vloeistofdruppels en/of poederdeeltjes zijn.
9. Apparaat volgens een der voorgaande conclusies, waarbij de vloeistofdruppels water zijn om de geïdentificeerde deeltjes vochtig te  
5 maken teneinde een vloeistofbrug tussen de geïdentificeerde deeltjes en de separator of de poederdeeltjes te vormen.
10. Apparaat volgens een der voorgaande conclusies, waarbij de poederdeeltjes magnetische poederdeeltjes zijn, bijvoorbeeld industrieel ferrosilicium, bij voorkeur bolvormig.
- 10 11. Apparaat volgens een der voorgaande conclusies, waarbij de affiniteitsmodifier een printkop omvat.
12. Apparaat volgens een der voorgaande conclusies, waarbij de bepaalde eigenschap materiaaltipe, kleur, vorm en/of grootte is.
13. Apparaat volgens een der voorgaande conclusies, waarbij de scheider  
15 een contactoppervlak heft waarop de geïdentificeerde deeltjes worden aangebracht.
14. Apparaat volgens conclusie 13, waarbij het contactoppervlak is gecoat met hydrofiel vezelmateriaal.
15. Apparaat volgens conclusie 13, waarbij het contactoppervlak een  
20 magneet is of althans gecoat is met een magnetiseerbare laag.
16. Apparaat volgens een der voorgaande conclusies, waarbij de scheider een mechanische oppakinrichting is die een contactoppervlak heeft dat contact maakt met de groep deeltjes om de geïdentificeerde deeltjes op te pakken.
- 25 17. Apparaat volgens een der voorgaande conclusies, waarbij de scheider een trommel is.
18. Apparaat volgens een der voorgaande conclusies, waarbij de groep deeltjes kleine deeltjes omvat met een diameter van 1-20mm.

19. Gebruik van een printkop voor het scheiden van geïdentificeerde deeltjes uit een groep deeltjes.

20. Werkwijze voor het scheiden van deeltjes uit een groep deeltjes, omvattende de stappen van:

5 - aanvoeren van een groep deeltjes in een arrangement, waarbij de groep deeltjes deeltjes omvat met verschillende eigenschappen, bijv.

materiaal, kleur, vorm en/of grootte;

- identificeren van deeltjes in de groep die een bepaalde eigenschap hebben;

10 - met een affiniteitsmodifier modificeren van een affiniteit van deeltjes in de groep ten opzichte van niet geïdentificeerde deeltjes in de groep;

- met een scheider scheiden van de deeltjes in de groep gebaseerd op hun verschil in affiniteit.



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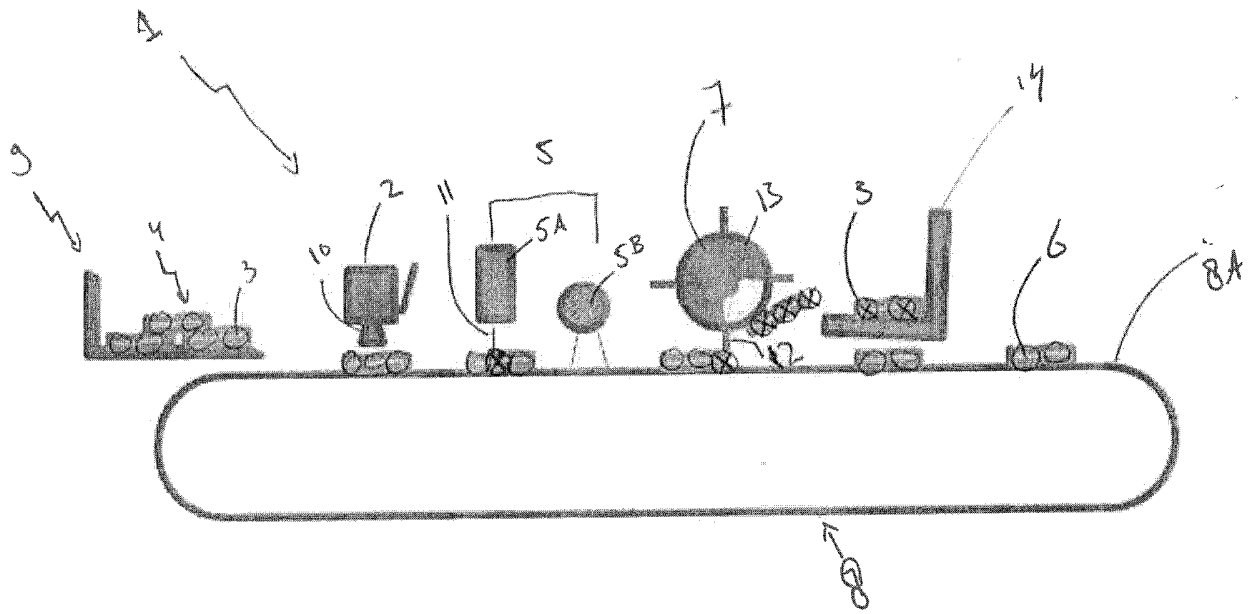


FIG. 1

Title:     Sensor separation apparatus and method

Abstract

A separation apparatus, comprising an identifier arranged to identify the particles in a group of particles that have a specific property, an affinity modifier arranged to modify an affinity of the identified particles relative to that affinity of non-identified particles in an group, and a separator arranged to separate the particles in the group based on their difference in the affinity.

# SAMENWERKINGSVERDRAG (PCT)

## RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE
	<b>P105826NL00</b>
Nederlands aanvraag nr.	Indieningsdatum
<b>2013925</b>	<b>05-12-2014</b>
	Ingeroepen voorrangsdatum
Aanvrager (Naam)	
<b>Urban Mining Corp B.V.</b>	
Datum van het verzoek voor een onderzoek van internationaal type	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr.
<b>11-04-2015</b>	<b>SN63905</b>
<b>I. CLASSIFICATIE VAN HET ONDERWERP</b> (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)	
Volgens de internationale classificatie (IPC)	
<b>B07C5/342;B07C5/36</b>	
<b>II. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK</b>	
Onderzochte minimumdocumentatie	
Classificatiesysteem	Classificatiesymbolen
<b>IPC</b>	<b>B07C</b>
Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen	
III. <input type="checkbox"/>	<b>GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES</b> (opmerkingen op aanvullingsblad)
IV. <input checked="" type="checkbox"/>	<b>GEBREK AAN EENHEID VAN UITVINDING</b> (opmerkingen op aanvullingsblad)

**ONDERZOEKSRAPPORT BETREFFENDE HET  
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND  
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar  
de stand van de techniek  
NL 2013925

**A. CLASSIFICATIE VAN HET ONDERWERP**

INV. B07C5/342 B07C5/36  
ADD.

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

**B. ONDERZOCHETE GEBIEDEN VAN DE TECHNIEK**

Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen)  
B07C

Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)

EPO-Internal, WPI Data

**C. VAN BELANG GEACHTE DOCUMENTEN**

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	EENHEID VAN UITVINDING ONTBREEKT zie aanvullingsblad B ----- US 2010/261864 A1 (MIYASAKA MASATOSHI [JP] ET AL) 14 oktober 2010 (2010-10-14) * figuren 1,2 *	1-4,20
X	----- WO 2008/067589 A1 (UNIV QUEENSLAND [AU]; MORRISON ROBERT DAVID [AU]) 12 juni 2008 (2008-06-12) * samenvatting; figuren *	1,20

Verdere documenten worden vermeld in het vervolg van vak C.

Leden van dezelfde octroofamilie zijn vermeld in een bijlage

° Speciale categorieën van aangehaalde documenten

\*A\* niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

\*D\* in de octrooiaanvraag vermeld

\*E\* eerdere octropi(aanvraag), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

\*L\* om andere redenen vermelde literatuur

\*O\* niet-schriftelijke stand van de techniek

\*P\* tussen de voorrangdatum en de indieningsdatum gepubliceerde literatuur

\*T\* na de indieningsdatum of de voorrangdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

\*X\* de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

\*Y\* de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

\*Z\* lid van dezelfde octroofamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid

24 juli 2015

Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type

Naam en adres van de instantie

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De bevoegde ambtenaar

Wich, Roland

**GEBREK AAN EENHEID VAN UITVINDING**

Octrooiaanvraag Nr.:

SN 63905

NL 2013925

**AANVULLINGSBLAD B**

De Instantie belast met het uitvoeren van het onderzoek naar de stand van de techniek heeft vastgesteld dat deze aanvraag meerdere uitvindingen bevat, te weten:

1. conclusies: 1-4, 20  
Layering device  
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2. conclusie: 5  
Optical sensor  
---
3. conclusies: 6-10  
Affinity modification  
---
4. conclusie: 11  
Printer head  
---
5. conclusie: 12  
Material property  
---
6. conclusies: 13-15  
Contact surface  
---
7. conclusie: 16  
Mechanical picker  
---
8. conclusie: 17  
Drum  
---
9. conclusie: 18  
Part size  
---
10. conclusie: 19  
Use of printer head  
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Het vooronderzoek werd tot het eerste onderwerp beperkt.

**AANVULLINGSBLAD B**

De Instantie belast met het uitvoeren van het onderzoek naar de stand van de techniek heeft vastgesteld dat deze aanvraag meerdere uitvindingen bevat, te weten:

The claims are not linked as to form a general inventive concept for the following reasons :

The common technical features of the independent claims 1, 19 and 20 appear to be : Separating identified parts from a group.

These features are obviously widely known in the prior art, e.g from US-A-2010/0261864 (D1), WO-A-2008/067589 (D2) as well as literally ANY document of IPC group B07C5.

Claims 1 and 20 are directed to separation based on modified affinity, claim 19 is directed to a printer head as such.

The subject-matter of claim 1 is not novel over D1 or D2.

For instance, D1 shows already on Figures 1 and 2 a separation device, comprising an identification device (110, 120) for identifying parts having a specific property among a group of parts, an affinity modifier (droplets applicator 130) for modifying the affinity of identified parts (1) in relation to parts of the group not identified, and a separator for separating the parts from the group based on the different affinity.

D1 or D2 also disclose the corresponding method as defined in claim 20.

As the subject-matter of claim 1 is not novel, the claims directly dependent on claim 1 are not linked as to form a general inventive concept, as their common technical features are not novel and cannot be considered to be special technical features.

The subject-matter directly dependent on claim 1 is considered to be directed to the following subject-matter :

The subject-matter of claim 2 is directed to a layering device, forming a first claimed inventive concept. The problem to be solved by these additional features may be considered as to provide for a suitable position of the parts in order to be able to modify the affinity. Claim 4 has erroneously been drafted as dependent on claim 1, but defines further restrictions to the layering device and should at least have been formulated as dependent on claim 2.

The subject-matter of claim 5 is directed to an optical sensor, forming a second claimed inventive concept. The problem to be solved by these additional features may be considered as to provide for an identification result.

The subject-matter of claim 6 is directed to the affinity modifier by applying separate matter, forming a third claimed inventive concept. The problem to be solved by these additional features may be considered as to provide for different affinity without modifying the parts themselves. Claims 7-10 (coating, droplets) should have been made dependent at least on claim 6 and are grouped with this third claimed inventive concept.

The subject-matter of claim 11 is directed to application using a printer

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De Instantie belast met het uitvoeren van het onderzoek naar de stand van de techniek heeft vastgesteld dat deze aanvraag meerdere uitvindingen bevat, te weten:

head, forming a fourth claimed inventive concept. The problem to be solved by these additional features may be considered as to provide for a suitable means for the affinity modifier

The subject-matter of claim 12 is directed to the detected part properties, forming a fifth claimed inventive concept. The problem to be solved by these additional features may be considered as to define the sorting criteria.

The subject-matter of claim 13 is directed to a contact surface, forming a sixth claimed inventive concept. The problem to be solved by these additional features may be considered as to provide for a first suitable separation device.

The subject-matter of claim 16 is directed to a mechanical picker, forming a seventh claimed inventive concept. The problem to be solved by these additional features may be considered as to provide for a second suitable separation device.

The subject-matter of claim 17 is directed to a drum, forming an eighth claimed inventive concept. The problem to be solved by these additional features may be considered as to provide for a third suitable separation device.

The subject-matter of claim 18 is directed to part size, forming a ninth claimed inventive concept. The problem to be solved by these additional features may be considered as to provide for a device that is suitable for sorting small parts of the specified size.

Finally, claim 19 is directed to the use of a printer head for separating parts, forming a tenth claimed inventive concept.

**ONDERZOEKSRAPPORT BETREFFENDE HET  
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND  
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar  
de stand van de techniek

NL 2013925

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
US 2010261864	A1	14-10-2010	CN 101861214 A 13-10-2010
			EP 2343136 A1 13-07-2011
			JP 5052667 B2 17-10-2012
			US 2010261864 A1 14-10-2010
			WO 2010050126 A1 06-05-2010
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WO 2008067589	A1	12-06-2008	AU 2007329169 A1 12-06-2008
			BR PI0719719 A2 18-02-2014
			CA 2671297 A1 12-06-2008
			CL 2007003488 A1 14-03-2008
			CN 101687227 A 31-03-2010
			CO 6210744 A2 20-10-2010
			EP 2099573 A1 16-09-2009
			US 2010065734 A1 18-03-2010
			WO 2008067589 A1 12-06-2008
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## WRITTEN OPINION

File No. SN63905	Filing date (day/month/year) 05.12.2014	Priority date (day/month/year)	Application No. NL2013925
International Patent Classification (IPC) INV. B07C5/342 B07C5/36			
Applicant Urban Mining Corp B.V.			

This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the application
- Box No. VIII Certain observations on the application

	Examiner Wich, Roland
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## WRITTEN OPINION

Application number  
NL2013925

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### Box No. I Basis of this opinion

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1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:
    - a sequence listing
    - table(s) related to the sequence listing
  - b. format of material:
    - on paper
    - in electronic form
  - c. time of filing/furnishing:
    - contained in the application as filed.
    - filed together with the application in electronic form.
    - furnished subsequently for the purposes of search.
3.  In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

WRITTEN OPINION

Application number  
NL2013925

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**Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

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The questions whether the claimed invention appears to be novel, to involve an inventive step, or to be industrially applicable have not been examined in respect of

- the entire application
- claims Nos. 5-19

because:

- the said application, or the said claims Nos. relate to the following subject matter which does not require a search (*specify*):
- the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):
- the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed (*specify*):
- no search report has been established for the whole application or for said claims Nos. 5-19
- a meaningful opinion could not be formed as the sequence listing was either not available, or was not furnished in the international format (WIPO ST25).
- a meaningful opinion could not be formed without the tables related to the sequence listings; or such tables were not available in electronic form.
- See Supplemental Box for further details.

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**Box No. IV Lack of unity of invention**

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1. The requirement of unity of invention is not complied with for the following reasons:

**see separate sheet**

2. This report has been established in respect of the following parts of the application:

- all parts.
- the parts relating to claims Nos. (see Search Report)

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**Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

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1. Statement

Novelty	Yes: Claims	
	No: Claims	1-4, 20
Inventive step	Yes: Claims	
	No: Claims	1-4, 20
Industrial applicability	Yes: Claims	1-4, 20
	No: Claims	

2. Citations and explanations

**see separate sheet**

POINT IV

POINT V

The claims are not linked as to form a general inventive concept for the following reasons :

The common technical features of the independent claims 1, 19 and 20 appear to be :  
Separating identified parts from a group.

These features are obviously widely known in the prior art, e.g from US-A-2010/0261864 (D1), WO-A-2008/067589 (D2) as well as literally ANY document of IPC group B07C5.

Claims 1 and 20 are directed to separation based on modified affinity, claim 19 is directed to a printer head as such.

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For instance, D1 shows already on Figures 1 and 2 a separation device, comprising an identification device (110, 120) for identifying parts having a specific property among a group of parts, an affinity modifier (droplets applicator 130) for modifying the affinity of identified parts (1) in relation to parts of the group not identified, and a separator for separating the parts from the group based on the different affinity.

D1 or D2 also disclose the corresponding method as defined in claim 20.

As the subject-matter of claim 1 is not novel, the claims directly dependent on claim 1 are not linked as to form a general inventive concept, as their common technical features are not novel and cannot be considered to be special technical features.

The subject-matter directly dependent on claim 1 is considered to be directed to the following subject-matter :

The subject-matter of claim 2 is directed to a layering device, forming a first claimed inventive concept. The problem to be solved by these additional features may be considered as to provide for a suitable position of the parts in order to be able to modify the affinity. Claim 4 has erroneously been drafted as dependent on claim 1, but defines further restrictions to the layering device and should at least have been formulated as dependent on claim 2.

The features of claims 2-4 are also known from D1.

The subject-matter of claim 5 is directed to an optical sensor, forming a second claimed inventive concept. The problem to be solved by these additional features may be considered as to provide for an identification result.

The subject-matter of claim 6 is directed to the affinity modifier by applying separate matter, forming a third claimed inventive concept. The problem to be solved by these additional features may be considered as to provide for different affinity without modifying the parts themselves. Claims 7-10 (coating, droplets) should have been made dependent at least on claim 6 and are grouped with this third claimed inventive concept.

The subject-matter of claim 11 is directed to application using a printer head, forming a fourth claimed inventive concept. The problem to be solved by these additional features may be considered as to provide for a suitable means for the affinity modifier

The subject-matter of claim 12 is directed to the detected part properties, forming a fifth claimed inventive concept. The problem to be solved by these additional features may be considered as to define the sorting criteria.

The subject-matter of claim 13 is directed to a contact surface, forming a sixth claimed inventive concept. The problem to be solved by these additional features may be considered as to provide for a first suitable separation device.

The subject-matter of claim 16 is directed to a mechanical picker, forming a seventh claimed inventive concept. The problem to be solved by these additional features may be considered as to provide for a second suitable separation device.

The subject-matter of claim 17 is directed to a drum, forming an eighth claimed inventive concept. The problem to be solved by these additional features may be considered as to provide for a third suitable separation device.

The subject-matter of claim 18 is directed to part size, forming a ninth claimed inventive concept. The problem to be solved by these additional features may be considered as to provide for a device that is suitable for sorting small parts of the specified size.

Finally, claim 19 is directed to the use of a printer head for separating parts, forming a tenth claimed inventive concept.

It is pointed out that most features of the dependent claims are already known or obvious from D1 or D2 (e.g. part size, properties, droplets, optical sensor etc.). Also already the judgement of a printed sheet (e.g. in postal sorting) anticipates the subject-matter of claim 19.