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(72) Inventor; and
(71) Applicant : **KRÖGER, Ilpo** [FI/FI]; Kaatamontie 52 a, FI-83330 Kaatamo (FI).

(74) Agent: **KOLSTER OY AB;** Iso Roobertinkatu 23, P.O.Box 148, FI-00121 Helsinki (FI).

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(54) Title: APPARATUS AND METHOD FOR PROCESSING MEDICINES TO BE DISPOSED OF

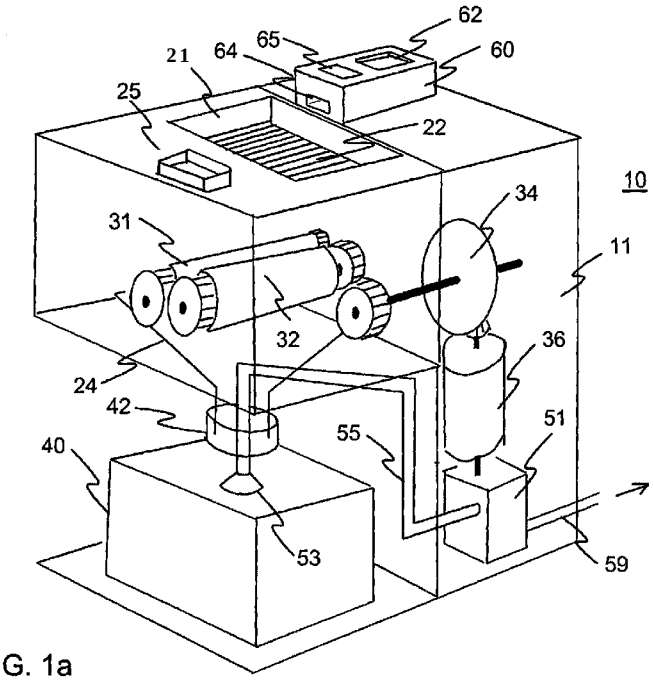

FIG. 1a

(57) Abstract: The invention relates to an apparatus and a method for processing medicines to be disposed of. The invention is most advantageously applicable in pharmacies and hospitals. Storage and transport of discarded medicines involve a risk of stealing and abuse, for instance. By means of the apparatus of the invention the discarded medicines may be crushed (31, 32) prior to storage and transport. The apparatus includes a pump (51), by means of which a negative pressure is produced inside the apparatus and medicine dust is prevented from drifting around the apparatus. The apparatus may also include means for removing tablets from strips and a tablet counter.

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

APPARATUS AND METHOD FOR PROCESSING MEDICINES TO BE DISPOSED OF

FIELD OF THE INVENTION

[0001] The invention relates to an apparatus and a method for processing medicines to be disposed of. The invention is most advantageously applicable in pharmacies and hospitals.

BACKGROUND OF THE INVENTION

[0002] A considerable amount of medicines are to be discarded, i.a. due to the drug being outdated. Private persons bring their outdated medicines to a pharmacy, wherefrom said medicines will be forwarded to a hazardous waste disposal plant. Correspondingly, hospitals are also to destroy discarded medicines. Discarded medicines are temporarily stored, for instance, in pharmacies and in terminals of haulage companies, where they await transport to be further supplied in larger lots to the hazardous waste disposal plant.

[0003] The prior art procedure involves some drawbacks. Because the discarded medicines are not particularly monitored during storage and transport, there is a risk that they are stolen and abused. Secondly, when the medicines are in their packages, the storage and transport of the discarded medicine require a lot of space. Moreover, the processing of medicine packages as hazardous waste causes considerable costs, even though the packages themselves would not require hazardous waste processing.

SUMMARY OF THE INVENTION

[0004] The object of the present invention is to eliminate or reduce the above-mentioned drawbacks of the prior art.

[0005] This is achieved with an apparatus for processing discarded medicines, which apparatus includes means for medicine crushing and a receptacle for collecting the crushed medicines, and which is characterized in that the apparatus further comprises a pump and an air duct between the pump and the receptacle for producing negative pressure in said receptacle so as to provide an air flow from the crushing means to said receptacle, and at the receptacle-side end of the air duct, inside the receptacle, there is a disposable filter for filtering medicine dust from exhaust air.

[0006] The object of the invention is also achieved by a method for processing a discarded medicine by means of an apparatus crushing medicines, the method being characterized by:

- producing a negative pressure in a collecting receptacle for providing an air flow between the crusher and the collecting receptacle;
- introducing discarded medicines into the crusher and crushing the medicines;
- conveying the crushed medicines into the receptacle;
- exhausting air from the receptacle via an air duct;
- filtering the air to be exhausted from the receptacle with a filter at the receptacle-side end of the air duct, inside the receptacle;
- the receptacle becoming full, changing the receptacle and the filter, and putting the used filter in the full receptacle;
- sealing the receptacle;
- transporting the full receptacle to a hazardous waste disposal plant for final processing.

[0007] Some preferred embodiments of the invention are disclosed in the dependent claims.

[0008] In an embodiment of the invention the receptacle is disposable. The receptacle may also be transparent. When the receptacle is changed, the full receptacle is preferably tightly sealed for storage and transport.

[0009] In an embodiment of the invention, the apparatus comprises a measuring means connected to the low-pressure duct, for instance, for indicating the degree of fullness of the receptacle.

[0010] In an embodiment of the invention, the crushing means comprise two rotating rolls, and the medicine is crushed while passing therebetween. The rolls may also include blades.

[0011] In an embodiment of the invention the apparatus comprises a grating or a conveyor belt for conveying the medicines to the crushing means. In this manner it is possible to avoid that the operator's hands/fingers would come into contact with the crushing blades. For glass ampoules the apparatus may have a separate feed opening. In an embodiment of the invention the apparatus also comprises a separate crushing means for crushing glass ampoules.

[0012] In an embodiment of the invention the apparatus comprises a means for removing tablets from a tablet strip. In another embodiment the apparatus comprises a means for shredding the tablet strip.

[0013] In an embodiment of the invention the apparatus comprises a tablet counter for counting the tablets to be processed.

[0014] Several advantages are achieved by means of the invention. The medicines may be crushed immediately at a collecting point of discarded medicines, whereby there is no risk of the medicines being stolen and abused. By means of the tablet counter it is possible to count the amount of medicine to be disposed of, and consequently, for instance in a hospital, it is possible to make sure that a correct amount of medicine has been supplied for disposal.

[0015] It is possible to manufacture the apparatus of the invention to be compact in size, whereby it is readily placeable in premises of use, such as a pharmacy, a hospital or a customs house.

[0016] By means of the apparatus of the invention it is also possible to separate the medicines from their packages, and thus the packages, such as tablet strips, may be disposed of along with miscellaneous waste, without hazardous waste processing. In addition, the hazardous waste will occupy only a small space, when the packages are not included. In this manner it is possible to economize on processing costs.

[0017] In the present patent application "negative pressure" refers to an air pressure that is lower than the ambient atmospheric pressure.

BRIEF DESCRIPTION OF THE FIGURES

[0018] In the following, some preferred embodiments of the invention will be described in greater detail, with reference to the attached figures, in which

Figure 1a is a perspective view of an apparatus of the invention for processing discarded medicines;

Figure 1b is a front view of the apparatus shown in Figure 1a;

Figure 2 shows a second embodiment of the apparatus of the invention for processing discarded medicines;

Figure 3 is a flow chart of a method of the invention for processing discarded medicines.

DESCRIPTION OF SOME EMBODIMENTS

[0019] Figures 1a and 1b show an apparatus of the invention for processing discarded medicines, seen in two different directions. The apparatus may include means 70 for removing tablets from tablet strips, and the means may be located on the side or on top of a frame 11 of the apparatus, for instance. The operation of the means may be based on rolls pressing the tablet strip, for instance. The rolls may be rotated by a separate electric motor or by means of another electric motor 36 found in the apparatus 10. The apparatus may also include a tablet counter 60. The tablet counter has an opening 62 for introducing the tablets into the counter and an opening 64 through which the counted tablets exit the counter. The number of tablets is shown on a display 65. The tablet counter may also include a bar code reader for identifying the medicine on the basis of the bar code on the package.

[0020] The medicines to be processed are placed on a grating 22 in an opening 21 of the apparatus, through which they pass. The purpose of the grating is to prevent a hand/fingers from coming into contact with crushing

rolls. There is a specific feed opening 25 for glass ampoules. The medicines fall on the crushing rolls 31 and 32 directly or along guides 27. The rolls are rotated by an electric motor 36 through cogwheels 34 and 35. By means of the cogwheels the rotating rate of the rolls may be set appropriate.

[0021] The crushed medicine falls further in a receptacle 40. To guide the medicine crush into the receptacle the apparatus has a funnel 24. The apparatus also includes a vacuum pump 51 that is preferably coupled to the same electric motor 36 that rotates the rolls. From the vacuum pump an air duct 55 leads to the receptacle 40. At the end of the duct there is a filter 53. Thus, the vacuum pump provides low pressure in the receptacle 40, thanks to which low pressure medicine dust formed in crushing is transferred along with air flow into the receptacle and it does not spread around the apparatus. In order for the air flow being provided from the crushing blades to the receptacle, a seal 45 is preferably arranged between the receptacle and the funnel 24.

[0022] The vacuum pump transfers the aspirated air preferably out¬side the apparatus via a tube 59, for instance, into an exhaust air duct of a building. The filter 53 is to prevent the medicine dust from drifting outside the apparatus along with the air transferred by the pump. The filter may be re¬placed, for instance, in connection with a receptacle change. Most preferably the filter is inside the receptacle, at the end of the low-pressure pipe 55. Both the filter and the receptacle may preferably be changed manually without any tools. They are both preferably disposable. The receptacle may also be trans¬parent, and therefore it is possible to monitor how it fills up.

[0023] In connection with the vacuum pump there is preferably a measuring means for measuring pressure (not shown in the figure). When the receptacle begins to fill up, the air flow in the filter decreases and a pressure difference between the duct 55 and the surroundings of the apparatus increas¬es. Thus, the measuring means may indicate that the receptacle is filling up and, for instance, prompt an alarm light or tone to activate in the apparatus. The measuring means may also indicate a filling degree of the receptacle. Measuring means of this kind are used, for instance, in vacuum cleaners to show the filling degree of a dust bag.

[0024] Figure 2 shows a second embodiment 20 of the apparatus of the invention. It differs from the apparatus of Figures 1a and 1b as follows. Medicines to be crushed are placed on a conveyor belt 23 which is driven by the same motor 36 that rotates the crushing blades, for instance. The conveyor belt transfers the medicines onto the crushing rolls. For tablet strips the apparatus includes a separate cutter 80 that shreds the strips with tablets. The strips are introduced into a shredder through a slotted grating 81. The crushing blades 32 also have cutting blades 33 that preferably cut perpendicularly to the cutter 80. In addition, the apparatus includes a separate crusher 39 for glass ampoules.

[0025] It is possible to make the apparatus of the invention compact in size, e.g. 0.2m in width, 0.5m in depth and 0.3 to 0.5m in height, depending on the size of a waste bin. The width of the apparatus is preferably less than 0.5m and most preferably less than 0.3m, correspondingly, the depth is preferably less than 1m and most preferably less than 0.7m and the height is preferably less than 1.2m and most preferably less than 0.6m.

[0026] Figure 3 is a flow chart of a method of the invention for processing 1 discarded medicines. If the medicines to be processed are in tablet strips, the tablets are separated from the strips in step 2. If it is deemed necessary to tally the tablets to be disposed of, they are counted with a counter in step 3. In step 4, negative pressure is generated inside the apparatus, in particular in a collecting receptacle. The pressure may be generated any time prior to crushing the medicines. The medicines are crushed in step 5 with crushing means, such as rotating rolls described in connection with the previous figures. The crushed medicines are conveyed to the collecting receptacle in step 6. When the collecting receptacle is filled up, it is replaced by an empty receptacle in step 7. At the same time it is also possible to replace a filter, in which case the used filter may be put in the full collecting receptacle, if so desired, without touching with hands. Preferably the full receptacle is sealed tightly. In step 8, the full receptacle and the filter, if any, are transported to a hazardous waste disposal plant, for instance, for final processing, whereafter the processing is completed.

[0027] The scope of protection of the invention is defined in the following claims. It is obvious to a person skilled in the art that the details of different features of the invention may vary within the inventive concept, depending on each particular embodiment of the invention.

CLAIMS

1. An apparatus (10, 20) for processing discarded medicines, the apparatus including means (31 to 33) for crushing medicines and a receptacle (40) for collecting the crushed medicine, cha racterize d in that the apparatus further comprises a pump (51) and an air duct (55) between the pump and the receptacle for producing a negative pressure in said receptacle (40) so as to provide an air flow from the crushing means to said receptacle, and at the receptacle-side end of the air duct, inside the receptacle, there is a dis¬posable filter (53) for filtering medicine dust from exhaust air.

2. The apparatus of claim 1, c h a racte riz ed in t h a t the crushing means comprise at least two rotating rolls (31 , 32), whereby the medicine is crushed between the rolls.

3. The apparatus of claim 2, c h a r a cterized in that the rolls (31 , 32) have cutting blades (33).

4. The apparatus of claim 1, c h a ract e rized in t hat the filter (53) is arranged replaceable without tools.

5. The apparatus of any one of the preceding claims, cha ract e rize d in t h a t the receptacle (40) is disposable and replaceable without tools.

6. The apparatus of any one of the preceding claims, characte rize d in that the apparatus comprises separate crushing means (39) for crushing glass ampoules.

7. The apparatus of any one of the preceding claims, cha racte rize d in t h a t the apparatus comprises means, such as a grating (22) or a conveyor belt (23), for preventing hands from coming into contact with the crushing means.

8. The apparatus of any one of the preceding claims, characterized in that the apparatus comprises means (70) for removing medicine tablets from tablet strips.

9. The apparatus of any one of the preceding claims, characterized in that the apparatus comprises means (60) for counting medicine tablets.

10. A method for processing discarded medicine by means of an apparatus crushing medicines, characterized by:

- producing a negative pressure (4) in a collecting receptacle for providing an air flow between the crusher and the collecting receptacle;
- introducing discarded medicines into the crusher and crushing the medicines (5);
- conveying the crushed medicines into the receptacle (6);
- exhausting air from the receptacle via an air duct;
- filtering the air to be exhausted from the receptacle with a filter at the receptacle-side end of the air duct, inside the receptacle;
- the receptacle becoming full, changing (7) the receptacle and the filter, and putting the used filter in the full receptacle;
- sealing the receptacle;
- transporting the full receptacle to a hazardous waste disposal plant for final processing (8).

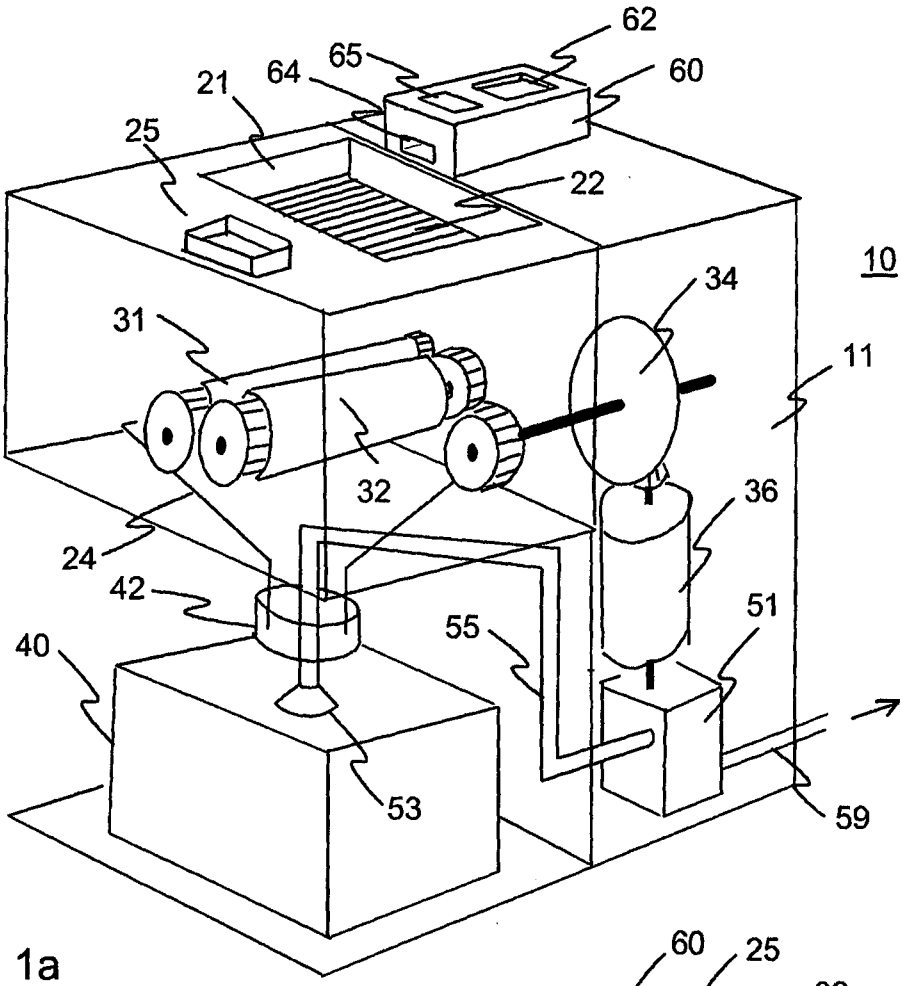
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FIG. 1a

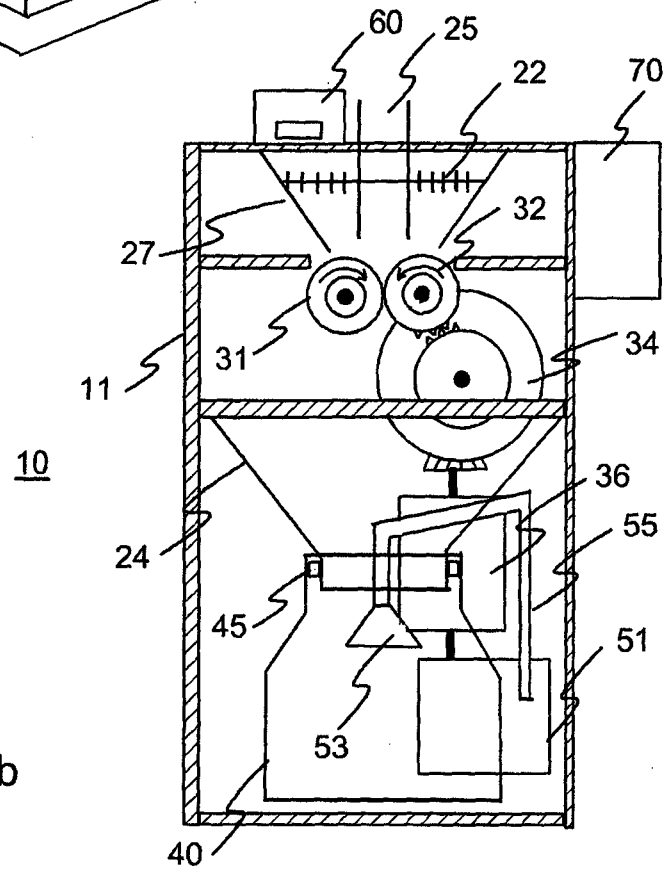
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FIG. 1b

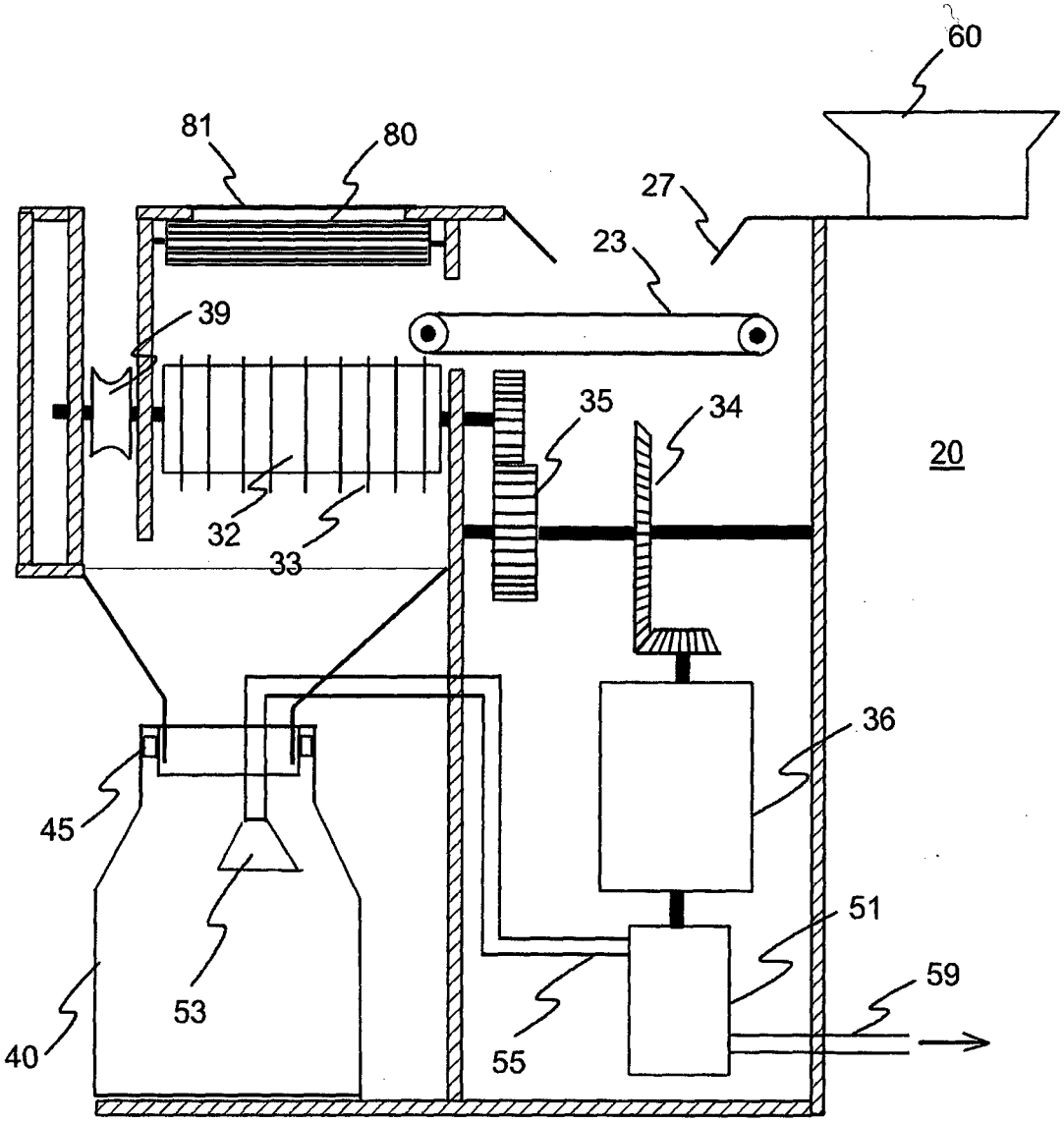

FIG. 2

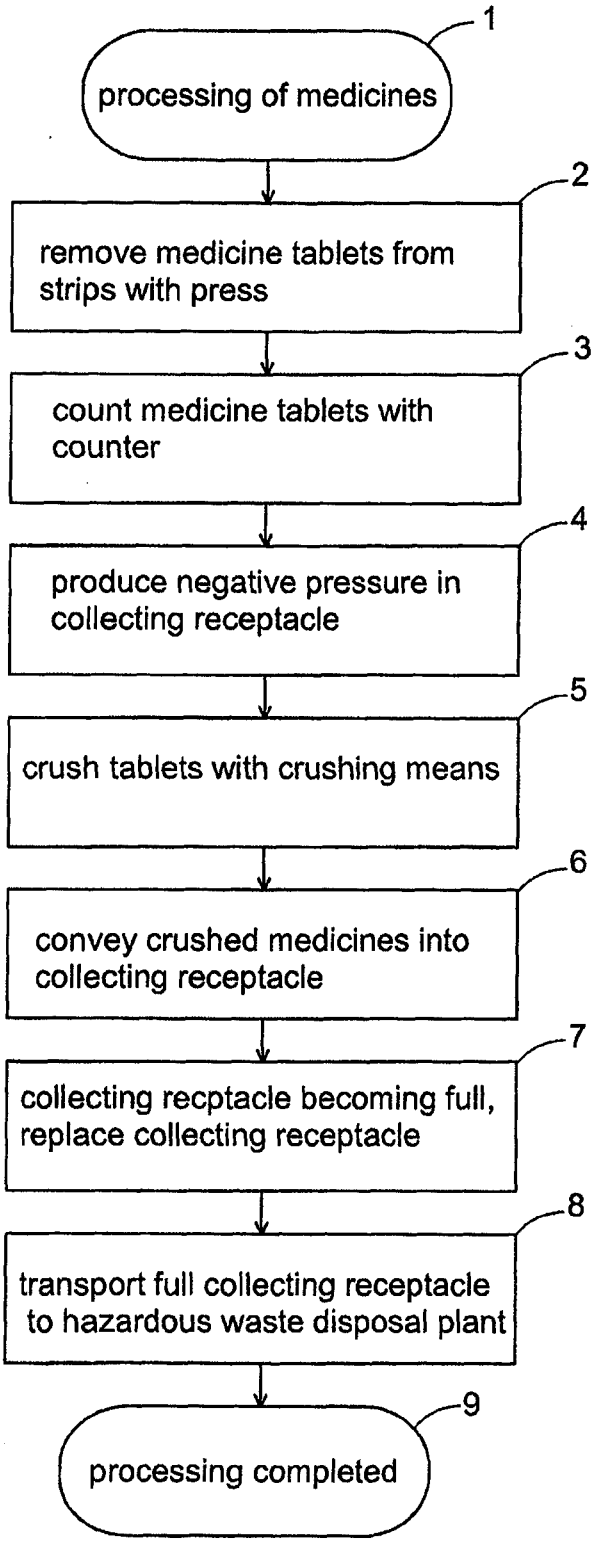
1
processing of medicines
2
remove medicine tablets from strips with press
3
count medicine tablets with counter
4
produce negative pressure in collecting receptacle
5
crush tablets with crushing means
6
convey crushed medicines into collecting receptacle
7
collecting recptacle becoming full, replace collecting receptacle
8
transport full collecting receptacle to hazardous waste disposal plant
9
processing completed

FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI2012/051 179

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B02C, B09B, B65F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

FI, SE, NO, DK

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7896271 B2 (WAKEMAN ANN) 01 March 2011 (01.03.2011) from column 2, line 34 - column 4, line 12; figures 1-4	1-10
A	US 7673825 B2 (JEANSONNE GORDON BUD et al.) 09 March 2010 (09.03.2010) abstract; column 3, line 42 - column 5, line 45; figures 1-3	1-10
A	CN 201603598 U (HENAN KANGXING PHARM CO LTD) 13 October 2010 (13.10.2010) & abstract [online] [retrieved on 2013-04-02] from database WPI on EPOQUENET & full text machine translation into English [online] [retrieved on 2013-04-03], from database CNFULL, QUESTEL on STN WPI: abstract; CNFULL: the whole document; esp. claims and figure 1	1-10
A	US 4988046 A (HEILENZ SIEGFRIED) 29 January 1991 (29.01.1991) abstract; column 1, line 46 - column 2, line 16; column 3, lines 31-45; column 5, lines 16-27 and 58-64; claims; figure 3	1-10

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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"E" earlier application or patent but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
09 April 2013 (09.04.2013)	11 April 2013 (11.04.2013)

Name and mailing address of the ISA/FI	Authorized officer
National Board of Patents and Registration of Finland P.O. Box 1160, FI-00101 HELSINKI, Finland	Stiina Kaikkonen
Facsimile No. +358 9 6939 5328	Telephone No. +358 9 6939 500

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI201 2/051 179

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category'*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0625373 A2 (EMERSON ELECTRIC CO) 23 November 1994 (23. 11.1994) abstract; column 1, line 34 - column 2, line 3; column 6, lines 35-49	1-10
A	US 52421 26 A (BOMZE HOWARD J) 07 September 1993 (07.09. 1993) column 1, lines 45-48; column 2, line 29 - column 3, line 68; column 5, lines 27-32; claims 7-1 1; figures 1-6	1-10
A	US 4037795 A (FYFE DONALD R) 26 July 1977 (26.07. 1977) abstract; figures 1 and 2	1-10
A	US 45781 85 A (WILSON JOSEPH H et al.) 25 March 1986 (25.03. 1986) abstract; column 3, lines 33-38; column 9, lines 20-68; column 12, lines 24-29, column 13, lines 15-2 1, column 18 line 43 - column 19, line 10; figures 1, 2 and 11	1-10

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/FI201 2/051 179

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US 789627 1 B2	01/03/201 1	US 201 0127104 A 1	27/05/20 10
US 7673825 B2	09/03/201 0	None	
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CLASSIFICATION OF SUBJECT MATTER

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B09B 3/00 (2006.01)
B65F 1/00 (2006.01)