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(54) **METHOD FOR RECYCLING DOMESTIC SOLID WASTE**

(57) The present invention relates to a method for recycling domestic solid waste that involves submitting said waste to preliminary disintegration and drying process until a final humidity not exceeding 50% is reached. The waste is further dried until all humidity is completely

removed. The waste is then burnt in a regeneration boiler at a temperature t of between 1100 and 1700°C, wherein the waste thus prepared is supplied to the combustor of the boiler in a highly alkaline medium using a screw sprayer, while the time of residence of the combustion products in the flames exceeds three seconds.

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Description

[0001] The present invention relates to a method of recycling solid domestic wastes. The given problem is very pressing today and requires new ways to settle it. The most widespread method for handling this problem is waste incineration.

[0002] For example, there is a well-known heat treatment method for recycling refuse and domestic wastes. It includes charging wastes into the boiler furnace, supplying there preliminary heated air, and utilising smoky gases with the help of a regenerator (B.Levin "Using solid domestic wastes in the power supply system", 1982, p.60).

[0003] The weak point of the given method is that there are certain demands to the composition of the starting raw materials, as well as a strict technological dependence on the processes which happen in the neighbouring furnaces.

[0004] There is another heat treatment method when the air is preliminary humidified, and then the mixture of gases and air is supplied from below as a counter flow in relation to the raw material charged. (RU, 202 3211 F 23 G 5/00, 1994).

[0005] There is also known a method of refuse incineration when heat from departing gases is utilised with the help of special equipment. It consists of a bunker for refuse, an incinerator, a unit for purification of departing gases and a power supply system (RU, F 23 G 5/00, 1996). However, being quite effective, the method has a substantial drawback, it is technically clumsy.

[0006] The present invention is aimed at the development of a highly effective, and at the same time very economical way of recycling solid domestic wastes. It does not require expensive equipment and reactants. The method, if fulfilled, practically excludes completely the formation of toxic products received at burning, dioxins in particular.

[0007] The task undertaken is coped with because the solid domestic wastes preliminary go through crushing and drying unless moisture does not exceed 50%. Heat treatment is carried out in the black liquor recovery furnace at temperature 1100-1700 C, in the strong alkali medium. The time of staying the products of burning in the flame is not less than 2 seconds. The burning at this takes place on the cushion of hearth furnace, on condition that waste inlet is one meter higher than fuel inlet, not less. The optimal way is to use organic or bio-organic fuel received from abundant activated sludge at the concentration of 60-75% absolutely dry substance, and to provide heat treatment at temperature 1000-1500 C.

[0008] The method proposed affords to recycle solid domestic wastes (SDW) effectively. It practically affords to exclude completely the formation of dioxins, makes the process cheaper at the account of using the well-known equipment which brings to a considerable reduction of costs.

Thus, the black liquor recovery furnace (CPK) mentioned above, is used in pulp industry for burning black lye (U. Nepenin "Production of sulphate pulp", v.2, Timber industry, 1990).

[0009] Picture 1 shows the flow chart of the unit for incinerating SDW by the method proposed herein.

[0010] The unit consists of magnetic separator (1,5), container (2,6), crusher (3), conveyor (4), drum for drying (7), transportation device (8, 12), pipe reactor (9), cyclone (19), bunker (11), boiler (13), tank for melting (14), clarifier (15), electric filter (16), scrubber for smoky gases (17).

[0011] It works in the following way: SDW preliminary pass the metal separator (1), where metal is separated and falls into the container (2). SDW, having passed two- or three stage crusher (3), is supplied by the conveyor to the second metal separator (5), where the metal caught falls into the container (6). Then, the wastes crushed and separated from metal, are passed to the drying drum(7), where they are dried up to 20-30% moisture. After that they go to the transportation device (8), in the pipe reactor they are mixed with alkali, pass to the cyclone (10), and further to the bunker (11).

[0012] From the bunker the wastes are fed by the transportation device (12) through atomiser to the hearth of the boiler (13).The organic part of SDW burns and gives heat. The mineral part melts and flows to the tank (14) in the form of mineral salts. Then the suspension is pumped from the tank to the clarifier (15), where the unsolved part forms a sediment and through the hydraulic ash filter is moved away to a dump. The soda solution from the clarifier is fed to the scrubber (17), and then from the scrubber the water with ash caught returns to the clarifier. The smoky gases purified are released to the atmosphere. In this case, chemical destruction and high temperature burning happen simultaneously in the one reactor.

[0013] Due to chemical and physical conditions, in the working zone of CPK (boiling unit) the formation of dioxins is suppressed practically completely. The fact is reflected in low levels of their discharge (1-5 ПкГ.ММ3).

The table below shows a composition of SDW as an example:

Type of wastes	Quantity, %	Calorific value, K/kg
Paper and cardboard	13	18000
Plastics	4	36000
Fabrics	1	18500

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(continued)

<i>Type of wastes</i>	<i>Quantity, %</i>	<i>Calorific value, KJ/kg</i>
Metal	5	0
Leather - rubber	3	20000
Glass	8	0
Wood waste	3	8000
Food waste	57	3500
Others	5	4000

[0014] As we can see from the table, heating capacity affords to burn the said wastes without adding any fuel. But the moisture in this case should not exceed 50%, since it reduces the calorific value. Should fuel be used, the increase of moisture over 50% considerably influences power and fuel costs.

[0015] To decompose wastes completely and to exclude formation of highly toxic dioxins, it is necessary to follow the described mode of treatment, since it is being the most optimal one. The method at temperature over 1700 C is not expedient from the economical and technological point of view. At the same time, lower temperatures and duration less than 2 seconds can lead to formation of by-products and extremely toxic dioxins which are resistant thermodynamically. As for the mentioned-above distance between the atomisers of fuel and waste, this parameter is optimal to form a stable cushion, i.e. burning waste surface, and affords considerably to intensify the process. The use of screw atomisers makes possible to distribute the supplied fuel in equal portions on the surface of the furnace. It creates good conditions for drying up the fuel and piling it on the hearth of the furnace.

[0016] The method is illustrated with the following examples:

Example 1.

[0017] Subject to destruction are SDW with the following components:

<i>Type of wastes</i>	<i>Quantity, %</i>
Paper and cardboard	13
Plastics	4
Fabrics	1
Metal	5
Leather - rubber	3
Glass	8
Wood waste	3
Food waste	57
Others	5

[0018] The method is carried out in the way described above. The temperature sustained is 1100-1500 C. The duration of staying in the given temperature is 9 seconds. The velocity of feeding wastes is 3 t per day. The quantity of dioxins that can appear at this is _____. The volume of gases released is 20000 Hm³/hour. The discharge of dioxins measured in the smoky pipe after filtering, is 1ΠκΓ/m³.

[0019] The analysis of the smoky gases demonstrated the absence of by-products (products formed as a result of not thorough burning) in the released gases.

Claims

1. The method of recycling solid domestic wastes in the way of preliminary crushing, feeding them to the boiler unit for heating treatment with the following burning and removing the products of burning, differs with the fact that the

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wastes after their crushing are subject to drying up to moisture not more than 50%, with the following drying up unless all the moisture is removed. Heat treatment is carried out in the boiler unit (CPK) at temperature 1100-1700 C. SDW is supplied to strong alkali medium through the screw atomiser, time of staying products of burning in the flame is not less than 2 seconds, drying at this happens on the cushion of the hearth.

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2. The method according to p. 1 differs with the fact that additional fuel is used. It is organic or bio-organic fuel obtained from abundant activated sludge with concentration 60% and more, of absolutely dry substance.
 3. The method according to. pp 1-2 differs with the fact that heat treatment is carried out at the temperature 1100-1700 C.
 4. The method according. to pp. 1-3 differs with the fact that the screw atomiser for the waste inlet is higher than the screw atomiser for the organic fuel inlet.
 5. The method according to p. 1 differs with the fact that crushing of wastes is carried out after their drying.
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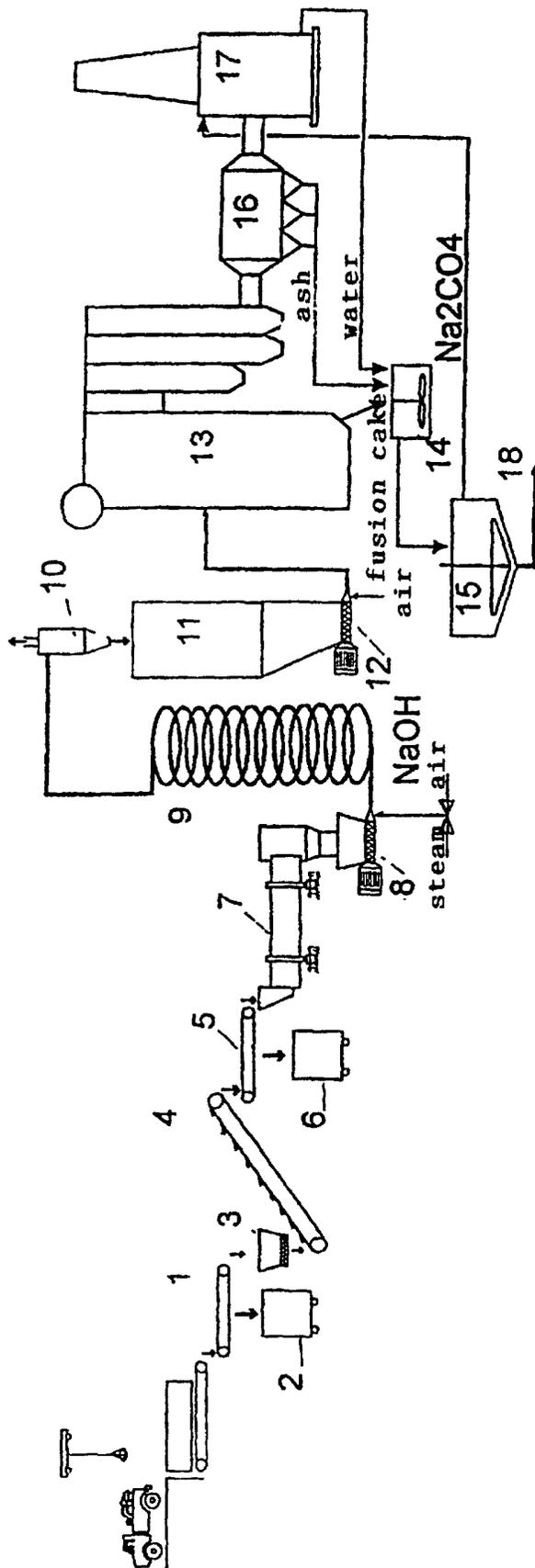
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GENERAL SCHEME OF RECYCLING SOLID DOMESTIC WASTES



INTERNATIONAL SEARCH REPORT

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PCT/RU 98/00393A. CLASSIFICATION OF SUBJECT MATTER 7:
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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B09B 3/00; F23G 5/00, 5/02

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	RU 2070548 C1 (FILIP PISHA) 20 December 1996 (20.12.96)	1 - 5
A	RU 2075694 C1 (KLYATCHENKO VIKTOR FOMICH) 20 March 1997 (20.03.97)	1 - 5
A	DE 4117444 A1 (DEUTSCHE BABCOCK ANLAGEN GMBH) 03-December 1992 (03.12.92)	1 - 5
A	GB 2191478 A (MING CHAO CHANG) 16 December 1987 (16.12.87)	1 - 5
A	WO 93/13361 A1 (SAPOUNAS LEONIDAS) 08 July 1993 (08.07.93)	1 - 5

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

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"&" document member of the same patent family

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14 December 1999 (14.12.99)Date of mailing of the international search report
13 January 2000 (13.01.00)Name and mailing address of the ISA/
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