



Dr. Sergio Cabrera Manriquez
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P-I-2003-2180

Santiago de Cali, Diciembre 22 de 2.003

SUPERINTENDENCIA Y COMERCIO

Subsección: 00048664 0003384

Folios: 2

Fecha (UPD): 0033-12-24 10:20:30

Trámite: 522 PATENTES D 1 REGISTRO/ 530 PETICION

Dependencia: 0009 DIVISION DE NUEVAS CREACIONES

SEÑORES

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

DIVISIÓN DE NUEVAS CREACIONES

BOGOTA, D.C.

REFERENCIA: PROCESO GUBERNATIVO DE CONCESIÓN Y REGISTRO DE LA PATENTE DE INVENCION " PLANTA MODULAR PARA EL PROCESAMIENTO DE RESIDUOS SOLIDOS ".

SOLICITANTE: LATINTECH INVESTMENTS CORP.

APODERADO: SERGIO,ROBERTO CABRERA TORRES.

EXPEDIENTE No. 00048664.

SERGIO ROBERTO CABRERA TORRES. mayor de edad, vecino de la Ciudad de Cali, identificado con la Cédula de Extranjería No. 191.310, expedida en Bogotá D.C., con domicilio en la Avda. 5 Norte No. 25N-48, Barrio Versalles, de la Ciudad de Cali, Abogado con Tarjeta Profesional No. 52.140 del Ministerio de Justicia, obrando como Apoderado dentro del Proceso de la Referencia, y estando dentro del término legal, teniendo en cuenta que la solicitud de la Referencia, fue publicada en la Gaceta de la Propiedad Industrial No. 529 del 27 de Junio de 2003, solicito y acompaño a usted lo siguiente:

PRIMERO: Que se realice el Examen de Fondo de la solicitud de la Referencia, para que se examine si la invención es patentable, todo de acuerdo al Artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina.

SEGUNDO: En virtud de lo anterior, acompaño recibo por valor de \$ 335.000.00, por concepto de Examen de Patentabilidad de la Patente de Invención: " PLANTA MODULAR PARA EL PROCESAMIENTO DE RESIDUOS SOLIDOS ".

Anexo lo enunciado.

De la División, Atentamente:

DR. SERGIO ROBERTO CABRERA TORRES
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C.E. No. 191.310 DE BOGOTA

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SUPERINTENDENCIA Y COMERCIO

NIT : 800174089 Radicacion : 23048664 23048664 Felicitas: 2

Fecha (REC): 2003-12-24 10:20:55

Tramite : CDR PADENTES D : REGISTRO/ 534 PETICION

Superintendencia de Registros y Comercio

RECIBO OFICIAL DE CAJA : 03 - 93,900

FECHA : DICIEMBRE 24 DE 2003

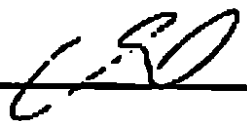
***** CONSIGNACION *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PAGO	Gr. PAGO
CEPTA & ASOCIADOS LTDA	CONSIGNACION	BANCO POPULAR	050-00110-6	15808571	22/12/2003	424,000.00
SERGIO CARRERA	CONSIGNACION	BANCO POPULAR	050-00110-6	15808573	22/12/2003	712,000.00
S IMAGEN S.A	CONSIGNACION	BANCO POPULAR	050-00110-6	15808576	23/12/2003	1,874,000.00
JOSE FDO NEJA	CONSIGNACION	BANCO POPULAR	050-00110-6	15808660	19/12/2003	1,238,000.00
FRIEDRICK KARL ROBITZCH	CONSIGNACION	BANCO POPULAR	050-00110-6	17797433	22/12/2003	335,000.
...MAS INFORMACION NO INP			TOTAL			8,811,000.00

***** C O N C E P T O *****

CANT. IDENTIFICADO	CONCEPTO	TOTAL CONCEPTO
1 50005-01-01 SOLICITUDES	03 EXAMEN DE PATENTABILIDAD DE INVEN	335,000.00
	TOTAL :	335,000.00

SUM: TRESCIENTOS TREINTA Y CINCO MIL PESOS

RESPONSABLE : 

RECIBO DE CAJA APLICADO AL EXPEDIENTE No. _____

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DIVISION DE NUEVAS CREACIONES

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RADICACIÓN EXPEDIENTE No. 00- 48664

**EL EXTRACTO DE LA PRESENTE SOLICITUD DE PATENTE DE INVENCION,
FUE PUBLICADO EN LA GACETA DE PROPIEDAD INDUSTRIAL No 529, DE
FECHA 27 DE JUNIO DE 2003, EL TERMINO HABIL SEÑALADO POR LA LEY
EXPIRA EL 24 DE SEPTIEMBRE DE 2003.**

NOTA: Dentro del plazo de los seis (6) meses siguientes a partir de la fecha de publicación en la gaceta de Propiedad Industrial, deberá solicitar y cancelar el examen de patentabilidad so pena de que la solicitud caiga en abandono, de acuerdo con lo establecido en el Artículo 44 de la Decisión 486/2000.

SE PRESENTARON OPOSICIONES POR PARTE DE TERCEROS.

SI

NO **X**

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**SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
DIVISIÓN DE NUEVAS CREACIONES**

2020
Bogotá, D.C.,

Doctor
Sergio R. Cabrera T.
(Apoderado)

ASUNTO	Radicación	00 - 048 864
	Trámite	002
	Evento	001
	Actuación	430
	Oficio	000 - 6548
	Folios	015

Como resultado del examen de fondo, realizado con fundamento en el artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le comunica:

1. Documentos estudiados:

Capítulo descriptivo original: siete (7) páginas no numeradas, folios 7 a 13. No hubo modificación.

Dibujos originales: cuatro (4) figuras, tres de las cuales están numeradas del 1 al 3, folios 16 a 19. No hubo modificación.

Capítulo reivindicatorio original: seis (6) reivindicaciones, folios 13 a 15. No hubo modificación.

El petionario presentó una solicitud de examen de patentabilidad de acuerdo con lo estipulado por el artículo 44 de la Decisión 486.

El solicitante no reclamó prioridad conforme con lo dispuesto por los artículos 9, 10 y 11 de la Decisión 486 de la Comisión de la Comunidad Andina.

2. Objeto de la invención:

La presente solicitud fue titulada originalmente *'Planta modular para el procesamiento de residuos sólidos'*

De acuerdo con el texto de la descripción, los dibujos y las reivindicaciones, el objeto de la presente solicitud es una planta modular para el procesamiento de residuos sólidos, caracterizada por estar conformada por:

- a) una zona de descargue -donde se realiza la separación de las partes grandes que deben ser removidas antes de iniciarse el proceso de reciclaje-;
- b) una línea principal -donde los residuos sólidos son cargados manual o mecánicamente en la tolva de alimentación-;
- c) una primera banda transportadora metálica -que puede colocarse sobre o por debajo del nivel del piso; cuando se coloca sobre el piso se requiere de la tolva de alimentación; y, cuando se encuentra por debajo del nivel del piso puede ser cargada directamente; donde la banda va en posición paralela a la superficie del piso, a lo largo de algunos metros y luego se

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- eleva-, para depositar su carga sobre
- d) una banda de caucho -que conduce los residuos sólidos- hasta
 -) un abridor de bolsas -donde dichos residuos caen en una banda transportadora, para luego entrar a-
 - f) un separador rotatorio -que presenta por lo menos dos pantallas provistas con perforaciones de diferente diámetro, de manera que la primera presenta los huecos de menor tamaño, y el material que sale de allí va a una de las líneas secundarias; y, en la segunda el tamaño de los huecos es mayor y el material que pasa a través de éstos va a otra línea secundaria;
 - g) una tercera banda -que continúa la línea principal y transporta los elementos de diámetros mayores-, donde dicha banda presenta
 - h) una plataforma de selección manual con puestos de trabajo -donde, una vez seleccionado el material reciclable, se separa el material no reciclable y no compostable- y es conducido hasta su lugar de depósito. [reivindicación 1]

La Clasificación Internacional de Patentes asignada a dicho objeto es: B09B 3/00, B09B 5/00, B03B 9/06

3. Claridad de la solicitud:

El artículo 28 de la Decisión 486 de la Comisión de la Comunidad Andina establece "La descripción deberá divulgar la invención de manera suficientemente clara y completa para su comprensión y para que una persona capacitada en la materia técnica correspondiente pueda ejecutarla."

El artículo 30 de la Decisión 486 de la Comisión de la Comunidad Andina establece que: "Las reivindicaciones definirán la materia que se desea proteger mediante la patente. Deben ser claras y concisas y estar enteramente sustentadas por la descripción."

"Las reivindicaciones podrán ser independientes o dependientes. Una reivindicación será independiente cuando defina la materia que se desea proteger sin referencia a otra reivindicación anterior. Una reivindicación será dependiente cuando defina la materia que se desea proteger refiriéndose a una reivindicación anterior. Una reivindicación que se refiera a dos o más reivindicaciones anteriores se considerará una reivindicación dependiente múltiple."

El capítulo reivindicatorio de la presente solicitud está compuesto por una (1) reivindicación independiente y cinco (5) reivindicaciones dependientes, para un total de seis (6) reivindicaciones.

Se observa que el *diagrama de flujo* que aparece en el folio 16 no fue numerado como formando parte del juego de dibujos o figuras. A pesar de que en el capítulo descriptivo se menciona en el folio 11, esta mención no es suficiente para aclarar los componentes o el funcionamiento de la planta modular objeto de la solicitud.

Si como *figura* se entiende, entre otras acepciones, cosa que representa o significa otra (quinta acepción, del DRAE), no vemos porqué un *diagrama de flujo* no pueda ser considerado como una *figura*.

En contra de la opinión del solicitante, quien, en su respuesta al Concepto Técnico n.º1141 (que se encuentra en los folios 31 y 32) afirma que: "... resulta imposible describirlo en el capítulo correspondiente y mucho más colocarle números de referencia para "cada elemento a describir" (como lo indica el señor examinador..." se pueden consultar infinidad de documentos de patente donde los diagramas de flujo han sido descritos en el capítulo correspondiente y, en ciertos casos (no siempre), donde aparecen numerales de referencia para designar los elementos etapas ilustrados en dichos diagramas de flujo. De hecho, en diagramas de flujo

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donde se encuentren más de una vez determinadas etapas o elementos; o, en el caso de que dichas etapas o elementos correspondan a etapas o elementos ilustrados específicamente en otras figuras, no sólo es posible asignarles numerales de referencia sino que es *muy aconsejable*, para facilitar la identificación de los elementos por medio de tales signos y para evitar que se enreden las líneas de flujo. En el presente caso, sin ir más lejos, es aconsejable el uso de numerales o signos de referencia porque en el diagrama de flujo del folio 16 se encuentran algunos errores u omisiones -que se detallan a continuación- cuya ubicación sería mucho más fácil si se hubiesen empleado tales medios:

1. Existen diferentes líneas -entre los bloques que constituyen el diagrama-, donde no se emplean flechas para indicar la dirección del flujo -si las líneas de flujo se hubiesen numerado, se podría identificarlas fácilmente-.
2. En el bloque denominado *Separador magnético* se encuentra una línea de entrada y sólo una línea (presumiblemente) de salida, entonces, ¿cuál es la separación que se realiza allí?
3. En la entrada de residuos sólidos hay dos salidas pero no hay indicios que aclaren cuál de las dos salidas debe ser empleada y en qué casos.
4. Después de pasar por la etapa denominada Prensa para metales, el flujo pasa a Pacas y luego puede ir a Productos no reciclables o al Depósito de residuos reciclados o, tal vez, de la Banda transportadora -Zona de selección manual- puede pasar a Pacas, o inclusive, estas Pacas pueden provenir después de las Pacas que aparecen enseguida de la Prensa para residuos reciclados. Si esta objeción suena enredada, es porque el diagrama de flujo es enredado, por no usar, precisamente, numerales o signos de referencia.

En conclusión, el solicitante deberá presentar un nuevo juego de dibujos -completo- donde se subsanen estas objeciones. Además, como es previsible, un nuevo capítulo descriptivo -completo- donde se mencionen y describan las etapas ilustradas en el diagrama de flujo, asociándolas a los mencionados signos de referencia omitidos inicialmente. Sin perjuicio de lo anterior, el diagrama de flujo deberá hacer uso de los bloques normalmente usados para distinguir etapas intermedias, de aparatos, de etapas finales, etc.; todo, con el fin de aclarar los aspectos del objeto de la solicitud.

4. Determinación del estado de la técnica:

El artículo 16 de la Decisión 486 de la Comisión establece: "Una invención se considerará nueva cuando no está comprendida en el estado de la técnica"

"El estado de la técnica comprenderá todo lo que haya sido accesible al público por una descripción escrita u oral, utilización, comercialización o cualquier otro medio antes de la fecha de presentación de la solicitud de patente o, en su caso, de la prioridad reconocida."

"Sólo para el efecto de la determinación de la novedad, también se considerará dentro del estado de la técnica, el contenido de una solicitud de patente en trámite ante la oficina nacional competente, cuya fecha de presentación o de prioridad fuese anterior a la fecha de presentación o de prioridad de la solicitud de patente que se estuviese examinando, siempre que dicho contenido esté incluido en la solicitud de fecha anterior cuando ella se publique o hubiese transcurrido el plazo previsto en el artículo 40."

Se determina, entonces, que la fecha a partir de la cual se debe establecer el estado de la técnica es el 00-06-29, por ser dicha fecha la de presentación de la primera solicitud para este objeto.

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En concordancia con lo anterior, la búsqueda de anterioridades se efectuó entre los documentos divulgados antes de tal fecha y teniendo en cuenta la definición del estado de la técnica que establece el artículo 16 de la Decisión 486 de la Comisión de la Comunidad Andina y las excepciones fijadas en el artículo 17 de la misma Decisión.

Consultadas las fuentes de información con que cuenta este despacho, se encontraron los siguientes documentos que pertenecen al estado de la técnica más cercano al objeto de la presente solicitud.

n.º	Documento	Título	Fecha de Publicación
1	Patente US 3'595.389, cuyos inventores son George W. Morgan y Douglas S. Whitney	'Reclamation method and apparatus' (Un método y un aparato para recuperación)	1971-07-27
2	Patente US 5'205.417, cuyo inventor es John T. Herren	'Sanitary trash recycling apparatus' (Un aparato para el reciclaje higiénico de desechos)	1993-04-27
3	Patente US 5'263.591, cuyos inventores son William C. Taormina y Vincent C. Taormina, quienes le cedieron sus derechos a la Taormina Industries, Inc.	'Refuse recycling system' (Un sistema de reciclaje de residuos)	1993-11-23

Se anexa la copia de las páginas pertinentes, tomadas de de la Base de Datos de la USPTO

5. Evaluación de los requisitos de patentabilidad:

El artículo 14 de la Decisión 486 de la Comisión de la Comunidad Andina establece: "Los Países Miembros otorgarán patentes para las invenciones, sean de producto o de procedimiento, en todos los campos de la tecnología, siempre que sean nuevas, tengan nivel inventivo y sean susceptibles de aplicación industrial."

En cumplimiento de este artículo, se procedió a evaluar los requisitos de novedad, nivel inventivo y aplicación industrial con el fin de establecer la patentabilidad de la invención reivindicada en la solicitud en estudio.

Evaluación de la Novedad:

El Art.16 de la Decisión 486 de la Comisión de la Comunidad Andina establece: "Una invención se considerará nueva cuando no está comprendida en el estado de la técnica."

"El estado de la técnica comprenderá todo lo que haya sido accesible al público por una descripción escrita u oral, utilización, comercialización o cualquier otro medio antes de la fecha de presentación de la solicitud de patente o, en su caso, de la prioridad reconocida."

"Sólo para el efecto de la determinación de la novedad, también se considerará dentro del estado de la técnica, el contenido de una solicitud de patente en trámite ante la oficina nacional competente, cuya fecha de presentación o de prioridad fuese anterior a la fecha de presentación o de prioridad de la solicitud de patente que se estuviese examinando, siempre que

dicho contenido esté incluido en la solicitud de fecha anterior cuando ella se publique o hubiese transcurrido el plazo previsto en el artículo 40."

Se efectuó la comparación entre el objeto de la solicitud [tal como se encuentra definido en las reivindicaciones] y las anterioridades encontradas, dando como resultado que en ninguna de las anterioridades citadas se revelan todas las etapas que caracterizan al objeto de la solicitud

Se determinó que el objeto de la solicitud no se refiere a un uso distinto al originalmente comprendido en alguna patente anterior, y, en consecuencia, no está comprendido en la excepción establecida en el artículo 21 de la Decisión 486 de la Comisión de la Comunidad Andina.

No se presentaron oposiciones por parte de terceros, según lo permite el artículo 42 de la Decisión 486 de la Comisión de la Comunidad Andina, a raíz de la publicación del extracto en la Gaceta.

En consecuencia con todo lo anterior, se considera que no se vería afectada negativamente la novedad del objeto de la presente solicitud, tal como fue reclamado en las reivindicaciones, porque no habría sido divulgado integralmente en una o más de las anterioridades encontradas, en otras palabras, sería nuevo porque no estaría contenido en el estado de la técnica, según lo dispuesto por el artículo 16 de la Decisión 486 de la Comisión de la Comunidad Andina.

Evaluación del Nivel Inventivo:

El Art. 18 de la Decisión 486 de la Comisión de la Comunidad Andina establece: "Se considerará que una invención tiene nivel inventivo, si para una persona del oficio normalmente versada en la materia técnica correspondiente, esa invención no hubiese resultado obvia ni se hubiese derivado de manera evidente del estado de la técnica."

En el documento de la primera anterioridad citada (la patente US 3'595.389) se revela un aparato y un método para separar elementos útiles desde una mezcla como la de los desechos domésticos. El método consiste en alimentar la mezcla a una banda transportadora desde donde unas personas escogen el tipo de material, clasificándolo según sea papel, cartón, metal, vidrio, etc., y lo separan de la corriente ó flujo principal, enviándolo a contenedores apropiados. Algunas de las bandas transportadoras corren transversalmente respecto a la banda principal, y otras bandas pueden ir a diferentes elevaciones respecto a dicha banda.

En el documento de la segunda referencia (la patente US 5'205.417) se revela un aparato mediante el cual se separan materiales útiles desde un flujo de desechos que corre sobre una banda transportadora. La separación se realiza manualmente, gracias a unos operarios que entresacan los materiales útiles. El aparato está dotado de medios para remover electromagnéticamente los materiales ferrosos dese la corriente de desechos mientras avanza sobre la banda transportadora.

En el documento de la tercera referencia (patente US 5'263.591) se divulga un sistema de reciclaje que incluye un transportador para acarrear residuos a lo largo de una línea de personal de operación que extrae el material reciclable y lo deposita separadamente en depósitos adecuados. El sistema puede operar dependiendo de la alimentación: así, si el desecho es de origen comercial, se hacen ciertos tratamientos y si es de origen doméstico se hacen otros.

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Una característica común a las referencias citadas es que las soluciones divulgadas pueden ser usadas según el sistema de módulos, esto es, se pueden emplear varias unidades de separación en paralelo en serie, dependiendo de las características de la alimentación; en otras palabras, según sea el tipo de desechos a tratar, se puede aumentar el número de etapas que se deban emplear.

Ahora bien, si se tiene en cuenta que en el estado de la técnica se encuentran los abridores (o más precisamente, rompedores) de bolsas y los separadores rotatorios, entre otros elementos citados por el solicitante, aunque no se hayan citado en ninguno de los documentos mencionados como anterioridades, se llega a la conclusión de que la combinación de esos elementos junto con los divulgados en los documentos referenciados, no constituye un indicio de actividad inventiva; simplemente se emplean tales elementos en el orden en que se van necesitando. No hay una etapa o efecto sorprendente o inesperado.

En cada reivindicación presentada, considerada por separado, la combinación, en sí misma, es evidente, porque se trata de la combinación de elementos conocidos que son tomados de campos relacionados con la tecnología en cuestión y porque la combinación está basada en la escogencia de un número limitado de posibilidades; además la combinación no implica un efecto que es mayor que, o diferente de, el efecto esperado de la suma de los efectos de cada uno de los elementos combinados tomados individualmente, en otras palabras, en cada uno de estos casos en consideración, no se obtiene un resultado sorprendente o inesperado. También, para determinar que la combinación es obvia, se estableció que con la combinación no se supera ningún prejuicio de los expertos en el arte.

En el caso concreto que se encuentra bajo análisis, la persona del nivel medio ensayaría las soluciones propuestas por los documentos de las referencias [así como las soluciones que la persona del nivel medio en la técnica conoce por ser parte de su bagaje cultural], dado que, se presupone, todos estos documentos, al pertenecer al estado de la técnica, forman parte de los conocimientos normales de dicha persona del oficio. No habría ningún asomo de actividad inventiva al poner en práctica dichas soluciones cuando éstas se encontraban disponibles antes de la fecha de presentación de la solicitud. Entonces, se concluye, las seis reivindicaciones son objetadas por falta de nivel inventivo.

Conforme con lo dispuesto en el artículo 18 de la Decisión 486 de la Comisión de la Comunidad Andina, después de realizar la comparación entre el objeto de la presente solicitud y los documentos citados como anterioridades, se considera que el objeto de la presente solicitud, para una persona del oficio del nivel medio, resultaría obvio y se derivaría evidentemente del estado de la técnica. También se tuvo en cuenta, al llegar a esta determinación, que no hubo oposiciones por parte de terceros que válidamente puedan desvirtuar la patentabilidad de la invención.

En conclusión, los requisitos de patentabilidad de la presente solicitud se podrían ver afectados así:

n. °	Documento	Reivindicaciones Afectadas	Requisito que afecta
1	Patente US 3'595.389	1 a 6	Nivel Inventivo
2	Patente US 5'205.417	1 a 6	Nivel Inventivo
3	Patente US 5'263.591	1 a 6	Nivel Inventivo

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En cumplimiento del artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le indica al solicitante que debe dar respuesta dentro del término de sesenta días contados a partir de la fecha de notificación de la presente comunicación. En caso de no dar respuesta al presente requerimiento, o si a pesar de la respuesta subsistieran los impedimentos para la concesión, se denegará la patente.

Notifíquese el presente oficio conforme a lo dispuesto en el numeral 5.2, literal e), del capítulo quinto del título primero de la circular única n.º 10 de 2001.


ALIX CARMENZA CÉSPÉDES DE VERGEL
Jefe de División de Nuevas Creaciones

El anterior requerimiento fue notificado por fijación en lista, de fecha
31 MAYO 2007

CONCEPTO TÉCNICO n.º 767	EXAMINADOR TÉCNICO Código n.º 202009
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[72] Inventors George W. Morgan
2640 East Norm Place
Douglas E. Whitney, 2616 East Norm Place,
both of Anaheim, Calif. 92800
[21] Appl. No. 16,888
[22] Filed Mar. 5, 1970
[45] Patented July 27, 1971

ABSTRACT: Apparatus and method for economically separating reusable paper, cardboard, rags, metal, glass and the like from mixed household refuse is described. A separation station, preferably at a refuse transfer point, has a plurality of feed conveyors for moving mixed refuse past a plurality of work stations where valuable components of the mixed refuse are removed. These components are placed in receiving hoppers which communicate by chutes with a matrix of conveyor belts below the floor level of the work stations. Each work station has a plurality of such hoppers, each for receiving a particular component such as, for one example, cardboard, and the several cardboard hoppers feed onto "cardboard" conveyors for continuously moving the cardboard to a baling station or the like. Separate conveyors carry other components, such as metal, glass, paper or the like to separate processing stations. Some of the conveyors, preferably those handling large volume, run transverse to the feed conveyors and in opposite directions for carrying the bulkier products to separate locations. Other conveyors at different elevations from the transverse conveyors run parallel to the feed conveyors for moving other products. Thus, each feed belt has a plurality of work stations, and each work station has a plurality of product-receiving hoppers. Each product-receiving conveyor serves a plurality of product-receiving hoppers of the same kind. Thus a large volume of refuse can be sorted rapidly and economically with most of the material handling being done automatically.

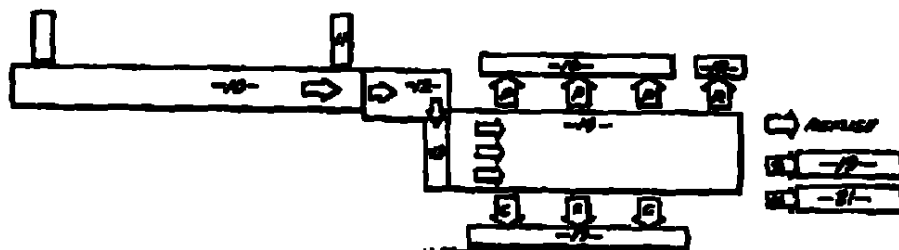
[54] RECLAMATION METHOD AND APPARATUS
17 Claims, 5 Drawing Figs.

[52] U.S. Cl. 209/125
[51] Int. Cl. B07c 7/04
[50] Field of Search 209/125,
123, 122

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RECLAMATION METHOD AND APPARATUS

BACKGROUND

A major problem in our modern affluent society is the production and disposal of solid waste materials which are commonly discarded and usually buried in cut-and-cover dumps. This not only involves substantial problems in the effective disposal of waste but also amounts to an enormous expenditure of natural resources which are in no way reclaimed. There is a large value in the great variety of products presently disposed of; however, with prior techniques it is usually uneconomical to salvage more than a limited portion of the most valuable of these products. At present the only techniques even slightly successful have involved manual selection of relatively large articles or particularly high-value articles from mixed refuse for purposes of salvage. This is inefficient and in many cut-and-cover operations is not permitted in order to avoid interfering with the disposal trucks. Some salvage is accomplished by organizations saving newspaper and the like, and successful use has been made of mercury and similar refuse when isolated prior to mixing with household refuse.

Some efforts have been made to mechanize the handling of solid waste in order to produce a useful product; however, most of these techniques have suffered from the difficulty that a tremendous volume of materials is present in household and industrial refuse, and the mechanical arrangements have been, in general, unsatisfactory for handling the variety of products having varying properties.

A common technique for handling refuse at present involves collection trucks proceeding from door to door collecting refuse and packing it into the trucks. The local collection trucks transport it into the so centrally located transfer station where the thoroughly mixed refuse is transferred to larger, special purpose trucks that convey the refuse to more remote locations where it is dumped. A vast variety of material varying enormously in time, composition, weight, density, and value passes through the transfer stations. Thus, for example, the mixed refuse may include newspapers, metal in a variety of forms, cardboard boxes, bottles, garbage, tires, garden trimmings, clothing, dirt, masonry, wood, etc. Many of these materials have value and are presently lost, or only recovered with great inefficiency.

It is therefore, desirable to provide a method and apparatus for rapidly and economically separating valuable components from solid waste materials and thereby recovering the value, maintaining the loss of natural resources, and alleviating the problem of dumping the solid wastes, and if desired retaining harmful substances now being buried as a pollutant of underground water supplies.

BRIEF SUMMARY OF THE INVENTION

Thus, in practice of this invention according to a preferred embodiment, there is provided an apparatus for sorting a mixture into its separate components comprising a feed conveyor for moving the mixture past a plurality of work stations, at each of which partial sorting of the mixed components is conducted for obtaining separated components. The separated components are placed in a plurality of receivers at each of the work stations from whence they fall to a matrix of conveyors beneath the work stations for separately conducting the separated components to recovery stations.

DRAWINGS

These and other features and advantages of this invention will be appreciated as the same becomes better understood by reference to the following detailed description of a presently preferred embodiment when considered in connection with the accompanying drawings wherein:

FIG. 1 illustrates in plan a general plant layout for an apparatus constructed according to principles of this invention;

FIG. 2 illustrates in plan a work station level for separating refuse;

FIG. 3 illustrates schematically in plan a matrix of conveyors below the work station level of FIG. 2;

FIG. 4 illustrates a vertical cross section of the apparatus of FIGS. 2 and 3; and

FIG. 5 illustrates in perspective a single work station in the apparatus of FIGS. 2 and 3.

Throughout the drawings like reference numerals refer to like parts.

DESCRIPTION

FIG. 1 illustrates a separating station constructed according to principles of this invention. As illustrated in this preferred embodiment, there is provided an elongated dumping bin 10 into which refuse trucks 11 dump refuse in a conventional manner. A number of truck-dumping stations are provided along the bin so that, for example, as many as 40 truckloads of refuse per hour can be accommodated. Conventional means (not shown) convey refuse from the bin 10 to an intermediate station 12 which may provide for an appreciable temporary storage of refuse, in combination with the inherent capacity of the receiving bin 10, for accommodating surges in input or output from the system. Additionally, the station 12 may process the refuse by loosening the compacted material from the trucks, deodorizing, disinfesting, moistening, drying, ripping open sacks, or the like. A conveyor 13 then conducts refuse from the intermediate station 12 to a separation station 14 where valuable components are separated from the waste products.

The flow of material through the system is indicated by arrows in FIG. 1 with arrows corresponding to valuable products labeled with letters designating a particular valuable product. Thus, the symbol P indicates paper such as newspaper, magazines and the like, which in domestic waste amounts to about 35 percent by weight of the total waste in a typical metropolitan area. The symbol C indicates cardboard such as from boxes or the like, which comprises about 18 percent by weight of domestic waste. Although only about half the weight of paper, the cardboard may occupy a considerably larger volume because of its lower density and poorer packing. The symbol R indicates rags, such as discarded clothing and other fabric, which comprises about 1 percent by weight of domestic waste. Although the percentage of rags in waste is not extremely high, this product has a relatively high value in a scrap market and can economically be recovered. The symbol G represents glass, such as bottles and other containers, which is present in domestic waste at about 5 percent by weight. The glass recovered may, if desired, be separated into bottles and other containers suitable for reuse, and other glass which is valuable for starting glass furnaces. The symbol M represents metal which is normally present in domestic waste at about 1 percent by weight. In the separation station herein described, metal is indiscriminately separated from other materials, and if desired the metal can be passed to a second station for sorting into ferrous materials, copper, aluminum, etc.

The balance of the domestic waste, namely about 40 percent by weight, comprises a mixture of garbage, garden trimmings, grass, dirt, concrete, plastic and the like which presently do not have sufficient value to be worth recovering. This refuse is discharged and dumped in a conventional manner. Noting the above quantities of paper, cardboard, glass, metal and rags in domestic waste, it will be apparent that even with certain losses as may well occur during operation of a system, as much as one-third to one-half of the weight of presently discarded domestic waste can be salvaged for a consequent saving of natural resources and recovery of substantial value.

The materials from the separation station 14, hereinafter described in greater detail, pass to receiving stations for further processing. Thus, for example, paper P is conveyed to a baler or balers 16 where it is packed into bales in a conventional manner for shipment to an ultimate user. Similarly, the

cardboard C is conducted to a baler 17 to be baled for shipment. The rags R are conducted to a conventional rag baler 18, and the glass G and metal M are conducted to receiving stations 19 and 21, respectively, where they may be temporarily stored for shipment or further sorting, or they may be discharged directly into railroad cars for removal. As mentioned hereinabove, refuse from the separating station 14 may be conducted to a conventional cut-and-cover dump or the like.

If preferred, the final refuse from the separating station can be ground and impregnated with bacteria or other additives to produce organic compounds suitable for agricultural use. The added bacteria start immediate decomposition of organic and many inorganic materials, thereby neutralizing many harmful chemical materials and making essential food elements readily available to plant life. Appropriate additives can be made at this point to balance the PH and other properties of the compost.

It is preferred that the plant illustrated in FIG. 1 be located at a refuse transfer station since this is normally relatively centrally located for the convenience of local trash trucks. If desired, however, the plant can be located at the dumping site. Location at the transfer station is preferred since this site is more likely to be permanent than the dump which may become filled. The transfer station is normally access to a railroad siding, major highways, and industrial users of the products recovered from the domestic waste.

FIG. 2 illustrates in plan view the working level of a separation station 14 constructed according to principles of this invention. This working level is normally about 21 feet above a prevailing grade. Domestic waste enters the separation station from the conveyor 13 (FIG. 1) by way of three parallel feed conveyors 25 that run along the length of the separation station in a direction as indicated by the arrows. At the discharge end of the feed conveyors 25 is a refuse conveyor 26 running transverse to the feed conveyors for receiving refuse after valuable materials have been removed therefrom and conveying the refuse either to a trucking station for removal or directly to a dumping station (not shown).

A peripheral walkway 27 is provided around the entire working level for providing access by workmen. Along each of the three delivery or feed conveyors 25, three work modules (two of which are indicated by the dashed boundaries in FIG. 2) are provided, at which positions manual separation of valuable materials from the domestic waste is accomplished. One such work module and certain surrounding facilities are illustrated in perspective in FIG. 3, and a portion of such work modules can be seen in FIG. 4.

Five receiving hoppers are provided within each work module for receiving separated valuable components from the waste. Thus, at each module there is a receiving hopper 28 having a relatively large top opening for receiving waste paper. On the same side of the feed conveyor 25 there is also provided a smaller hopper 29 for receiving metal and a third open hopper 31 for receiving glass. A worker 32 is normally stationed between the open hoppers 28, 29 and 31 at each station so that the paper hopper 28 is on his right hand, and the metal hopper 29 and the glass hopper 31 are at his left. Each working module also includes an open topped cardboard hopper 33 on the opposite side of the feed conveyor 25 from the paper hopper. A relatively smaller rag hopper 34 is provided on the same side of the belt as the cardboard hopper, and a worker 36 is normally stationed between the two open hoppers so that the cardboard hopper is on his right and the rag hopper is on his left. Within each of the three work modules the hopper for the larger and more contentious component is to the right of the worker for ready access by the majority of workers.

As mentioned hereinabove, three such work modules are provided along the length of each of the delivery conveyors 25, and a pair of workers 32 and 36 are provided within each work module. In between adjacent work modules another worker 37 is provided having a metal hopper 29 and a glass

hopper 31 from one module on his right hand and the larger paper hopper 28 of the adjacent module on his left hand. Similarly, between adjacent work modules, a worker 38 is provided having the rag hopper 34 from one module on his right hand and the cardboard hopper 33 from another module on his left hand. Thus, along the length of each of the feed conveyors there are provided five workers 32 and 37 having access to hoppers for paper, metal and glass, and five additional workers 36 and 38 are provided having access to hoppers for cardboard and rags. These five opportunities to select valuable components from the mixed waste are provided with three work modules. If desired, the sorting station can have a larger number of similar work modules along each belt and the number of workers on each side of the belt is $2n-1$ where n is the number of work modules along the feed conveyor.

Even though there are physically only three work modules built along each belt 25, it is of special importance to note that there are five work stations per belt; each of the work modules being manned by a pair of workmen of opposite sides of the belt. Each pair of workmen thus has convenient access to five receiving hoppers which accommodate the principal categories of waste. Additional hoppers can, of course, be added when additional components of waste become profitable to separate. Thus, the five receiving hoppers provided at each work module each perform a dual function by serving workers at two work stations (except for a portion of the hoppers at the end modules). Workers 32 and 36 form a work pair to handle all types of components to be recovered. Similarly, workers 37 and 38 form a work pair to handle all types of waste components. The dual use of each of the receiving hoppers permits economic and efficient utilization of a number of sets of receiving hoppers by an appreciable larger number of workmen.

As waste material travels along the delivery conveyor 28 from left to right in FIG. 2, the first two operators 32 and 36 will normally remove the larger articles, mostly cardboard boxes and paper, and drop these articles into the appropriate hopper. As the waste material proceeds along the feed conveyor, successive workers have an opportunity to pick articles of metal, glass, paper, rags and cardboard from the mixed refuse on the belt and drop these into the respective hoppers. Thus, in the illustrated embodiment there are five opportunities as the waste material travels along the length of the belt to pick out items of value for salvage, and these articles are deposited in selected receptacles so as to be mutually separated.

Such manual separation can be conducted rapidly and economically since all of the waste is conveyed serially past several workers, each of which has opportunity to select articles of value, and merely pick them from the mixed waste for deposit in the appropriate hopper. There is no need for the workers to carry the selected articles any distance or take any great care in placing them. The 30 workers provided in the illustrative embodiment can effectively remove the major portion of items of value from domestic waste, at a rate of about 60 to 65 truckloads of domestic waste per hour with each truckload containing about 35 cubic yards.

It is important to note that the modular layout in the sorting station, along with the cross matrix of conveyor belts is easily adapted to larger or smaller capacities. Thus, for example, a small city may employ fewer than three feed belts 25 whereas a very large city having a single transfer station may have eight, 10 or more sets of belts in a matrix as described herein. Apparatus provided in practice of this invention is therefore especially adaptable to differences in urban size and is expandable to accommodate urban growth.

Below the working level illustrated in FIG. 2 there is provided a matrix of conveyors for continuously removing material from the receiving hoppers on the working level. Chutes assure that the separated material in the hoppers falls onto the conveyors for removal and conveyance to a remote baler or other utilization station. It may be noted that the conveyors for feeding domestic waste, removing refuse or removing

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Harron

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[54] SANITARY TRASH RECYCLING
APPARATUS

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198/637; 209/705; 209/930; 209/933

[58] Field of Search 209/702, 705, 630, 930,

209/933, 942; 198/346, 637

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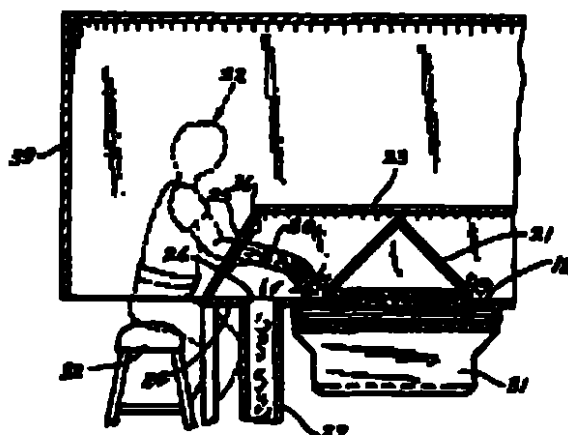
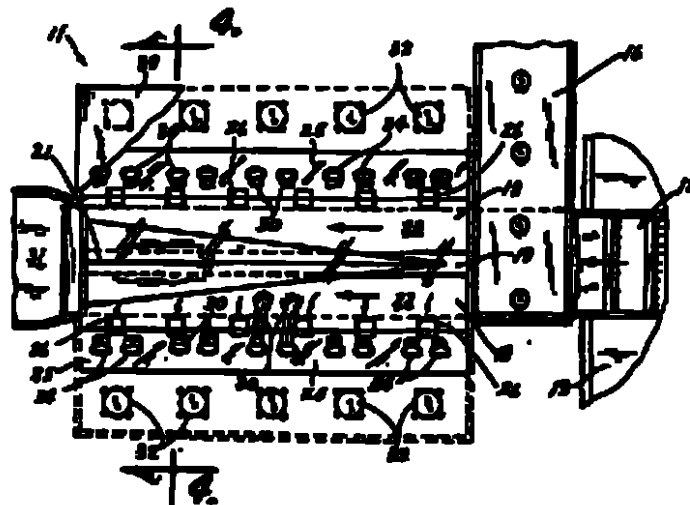
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Primary Examiner—Donald T. Hajec
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[57] ABSTRACT

A sanitary trash recycling apparatus includes a pit for receiving unsorted refuse, a electromagnetic device for removing ferrous materials and stations for permitting manual sorting of recyclable materials. The stations for manually sorting materials includes a device for moving the material to be sorted out toward the sorting operators as it moves through the station. A plurality of chutes are provided for each one of a number of recyclable products and bins are provided for receiving the sorted materials.

17 Claims, 2 Drawing Sheets



SANITARY TRASH RECYCLING APPARATUS

TECHNICAL FIELD

The present invention relates generally to a sanitary trash recycling apparatus and more particularly to such an apparatus which facilitates manual sorting of recyclable refuse in an uncomplicated and economical fashion.

BACKGROUND ART

While almost everyone agrees that it is desirable to recycle certain products such as plastic bottles, aluminum cans and other recyclable materials, recycling will never become a common practice until and unless it becomes economical to do so.

Because previous sorting operations have been too expensive by virtue of either the expense of the machinery used therein or the amount of manual labor required in the sorting process, recycling of recyclable materials has not become as widespread as is now possible.

DISCLOSURE OF THE INVENTION

The present invention relates generally to a sanitary trash recycling apparatus having a conveyor belt for receiving refuse at one end thereof and moving it toward the other end thereof and having a tapered device disposed above the conveyor belt for causing the refuse to move outwardly from the conveyor belt as refuse is moved along so that persons disposed adjacent to the conveyor belt can readily see and grasp recyclable products and allow non-recyclable products to continue on the conveyor belt. A transparent shield is disposed over the conveyor belt and holes are provided therein for permitting people to reach through the shield, grasp recyclable products with gloved hands and place them in one or more of a plurality of chutes designated for individual recyclable products.

The chutes have closures on the bottom end thereof and bins are disposed below the closures so that when the bins are full of a certain type of recyclable product, they can be emptied and materials will accumulate in the chutes until the bin is replaced and the closure opened.

A pit is provided for receiving unsorted refuse and a conveyor is provided for moving the unsorted refuse first to a device for electromagnetically removing ferrous materials therefrom and then further moving the unsorted refuse onto the aforementioned conveyor belt.

The pit and its associated sanitary trash recycling unit are preferably disposed in a larger building for screening the operation from public view, preventing trash from blowing from the premises and minimizing odors which might otherwise emanate therefrom. This also provides storage space for sorted items.

An object of the present invention is to provide an improved sanitary trash recycling apparatus.

A further object of the present invention is to provide a sanitary trash recycling apparatus that is economical to produce and operate.

Other objects, advantages, and novel features of the present invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of a plurality of sanitary trash recycling units used in conjunction with a single pit for receiving unsorted refuse;

FIG. 2 is an enlarged cross sectional view taken along 2-3 of FIG. 1;

FIG. 3 is an enlarged portion of one of the units shown in FIG. 1; and

FIG. 4 is an enlarged cross sectional view taken along line 4-4 of FIG. 3.

BEST MODE FOR CARRYING OUT THE INVENTION

Referring now to the drawings wherein like reference numerals designate identical or corresponding parts throughout the several views, FIG. 1 shows an apparatus (10) constructed in accordance with the present invention having three sanitary trash recycling units (11) attached by conveyor belts (12) to a common pit (13).

The pit (13) has three flat sloping sides, as is shown in FIGS. 1 and 2, and one side is vertical so that a truck (14), shown in dashed lines in FIG. 1, can dump unsorted refuse into the pit (13). Of course, refuse could be dumped into the pit (13) in many other ways.

The conveyor apparatus (12) extends from the bottom of the pit (13) under conveyor belt (16) having electromagnetic devices (17) disposed thereon for holding items made of ferrous materials and causing them to move onto the electromagnetic conveyor (16) where they are then released. Removing ferrous materials will loosen up the remaining trash for easier sorting. These ferrous materials can be sorted on table (20) into categories such as stainless, bi-metal cans, tin cans, light steel, cast iron, etc.

The materials from pit (13) which are not ferrous will be forced on into the main conveyor chamber consisting of two conveyor belts (18) which are substantially identical and are disposed on each side of a divider (19) (see FIG. 3). Attached to the divider (19) and held up above the conveyor belts (18) is a tapered member (21). This tapered member (21) is substantially triangular in cross section along the length thereof, as is shown in FIG. 4, and the function of this tapered device is to force refuse travelling on the conveyor belts (18) to move outwardly as it is moved by the conveyor belts (18) from one end of conveyor (18) to the other and thereof. This tapered divider (21) also causes a somewhat tumbling effect as the refuse moves up onto divider (21) as it moves to the left in FIG. 3 to further permit a person (22) (shown in FIG. 4) to sort the refuse, as will be explained further below.

A transparent shield (23) is formed around and over the conveyor belts (18) and over the tapered device (21). To each side of the conveyor belts (18) is a shelf (24) having openings (25) therein leading to chutes (27). These chutes (27), as shown in FIG. 2, have bins (28) disposed therebelow and they also have a slide gate or pivoted closure member (29) thereon which can be selectively either opened or closed. A chute (31) is provided to receive all refuse which is not otherwise removed by the ferro-magnetic sorter or by the manual sorting process and this chute (31) is preferably arranged such that it will drop the remainder into a truck or the like for removal to a landfill or to another suitable place, e.g. to a W.T.E. plant.

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U.S. PATENT AND TRADEMARK OFFICE

US005263591A

United States Patent [19]
Tzormina et al.

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[45] Date of Patent: Nov. 23, 1993

[54] REFUSE RECYCLING SYSTEM

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[73] Assignee: Tzormina Industries, Inc., Anaheim, Calif.

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[22] Filed: Dec. 11, 1991

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[58] Field of Search: 209/702, 705, 706, 209/930, 680, 937, 942; 198/809, 758, 560, 346

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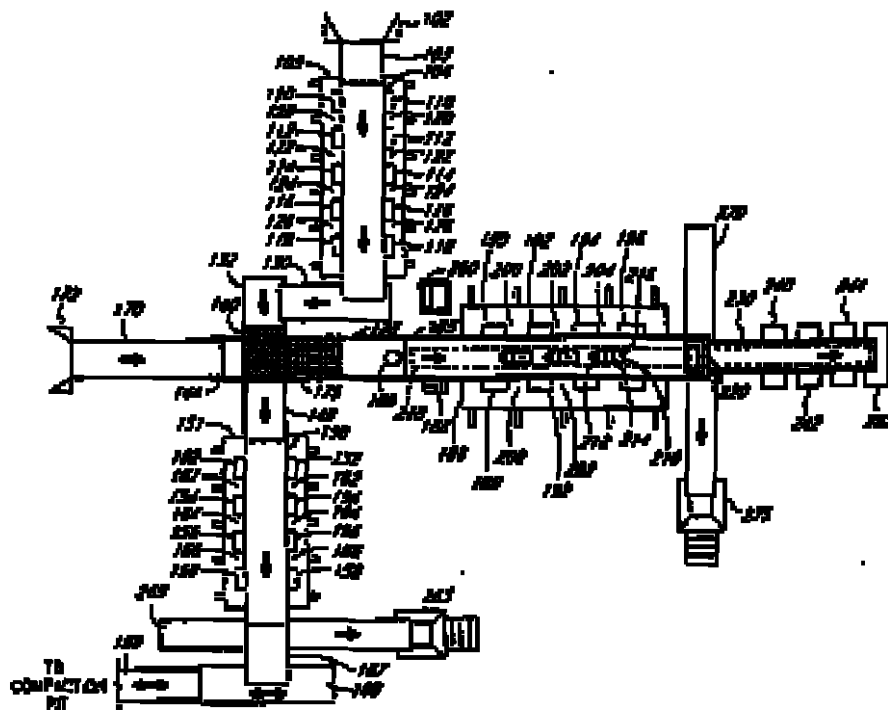
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Primary Examiner—D. Glenn Dayton
Attorney, Agent, or Firm—Knobbe, Martens, Olson & Bear

[37] ABSTRACT

A controllable refuse recycling system includes a conveyor for conveying refuse. The refuse is carried past a plurality of operating personnel who extract recyclable materials from the refuse, and deposit the extracted materials into separate deposit chutes. At least one deposit chute is situated directly in front of each operator so that the deposit chute is located on the conveyor itself, or on the other side of the conveyor from the operator. The system is also controllable, and includes a control desk for monitoring and controlling the operation of the system. In one embodiment, the operation of the refuse recycling system is modified depending upon the species of refuse which is introduced into the system, so that the system operates in a first mode when commercial refuse is received, and in a second mode when residential refuse is received.

6 Claims, 5 Drawing Sheets



REFUSE RECYCLING SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to waste management systems which process recyclable materials.

2. Description of the Related Art

In recent years, high priority has been given to the task of conserving natural resources while at the same time reducing the amount of waste which is transferred to landfills and other dump sites. In fact, the reduction of waste has become such a high priority that, in some states, legislation has been passed which mandates the reduction of waste that is transferred to landfills by as much as 50%. One way of accomplishing this goal is to increase the percentage of goods which are recycled in proportion to the total volume of refuse.

In previous refuse recycling systems, a flow of refuse is usually transported by a conveyor or similar means past a number of operators who manually extract recyclable materials from the flow of refuse. Each operator is assigned a particular kind of recyclable material (e.g., newspapers, plastics, glass, etc.) which that operator extracts from the refuse flow. The operators are positioned proximate to one or two chutes which lead to separate deposit banks, so that the operators are able to deposit the extracted recyclable materials into the chutes proximate to their position. Each chute is generally designated to receive only one kind of recyclable material so that each deposit bank accumulates only one type of material. The materials in each deposit bank are then packaged and transported to the appropriate recycling facilities. The materials which are not recovered from the refuse flow are typically transferred to a landfill or other waste disposal site.

The physical layout of such systems usually includes a conveyor belt which runs directly in front of the operator so that it is easy for the operator to identify and extract the appropriate materials. The chute or chutes are then typically positioned to the immediate right and/or left of the operator, and are generally made to have a relatively large receiving orifice, so that the operator can quickly deposit the extracted materials without having to turn and see where the extracted material is to be placed. This is important since, in the time it takes for an operator to turn and locate a chute, it is possible that a quantity of recyclable material which that operator might otherwise have extracted could pass out of reach of the operator, thereby decreasing the efficiency of the system. In addition, the necessity of turning back and forth between the conveyor and the deposit chute could contribute to operator fatigue.

Since it is important that the chutes be relatively large, and located proximate to the operator, additional chutes would have to be positioned somewhat behind the operator in conventional systems. This is disadvantageous because the operator would be required to turn around while depositing goods into those chutes. Thus, in order to preserve efficiency in such a system, each operator is effectively limited to two chutes.

Because each operator is effectively limited to two chutes, and each chute typically receives only one type of recyclable material, the number of types of recyclable materials recovered in such systems is usually limited. This is because it is often costly to employ additional operators and to construct additional recovery stations. Thus, waste management facilities are often

reluctant to increase their operating costs in order to recover additional kinds of recyclable materials. As a result, certain kinds of recyclable materials are not recovered by facilities which use the previous systems described above. This, in turn, results in an increase in the amount of material which is transferred to landfills. In addition, this results in a greater consumption of natural resources because goods which could otherwise have been recycled are instead wasted.

Thus, a need exists for a refuse recycling system which provides for increased recovery of recyclable materials without compromising operator efficiency and without increasing operating costs.

In addition to the aforementioned shortcomings of previous waste management systems, certain other limitations exist with conventional refuse recycling systems. These further limitations are due, in part, to the inability of these systems to effectively distinguish between certain species of refuse. Refuse which is delivered to recycling facilities typically comes from two major sources: commercial and residential. It has been found that the proportions between the types of recyclable materials in commercial refuse is generally different from the proportions between the types of recyclable materials in residential refuse. Thus, to optimize the efficiency of a recycling system, it may be advantageous to alter the operation of the recycling system in accordance with the species of refuse (e.g., commercial or residential) which are delivered to the system. Most systems, however, do not alter their operation in accordance with the species of refuse which are delivered to them. This may oftentimes lead to processing inefficiencies and an increase in the amount of waste produced by such systems.

Thus, a further need exists for a refuse recycling system which may be controlled to increase processing efficiency in response to the introduction of different species of refuse.

SUMMARY OF THE INVENTION

The subject invention provides for a significant reduction of waste by increasing the volume of recyclable goods which are recovered from the refuse flow. This increase in the volume of recovered recyclable goods is attributable to an increase in the number of kinds of recyclable goods which each operator is able to recover. That is, rather than limiting each operator to one or two deposit chutes, the present invention allows an operator to function efficiently while using three or more deposit chutes.

The present invention comprises a semi-automated system for discriminating between and recovering multiple types of recyclable refuse. By increasing the number of recyclable materials which may be extracted from the flow of refuse, the overall volume of materials recovered is increased in proportion to the volume of refuse flow. In accordance with the invention, one or more deposit chutes are located in the middle of the conveyor belt so that they are situated directly in front of the operator. Therefore, the operator is able to quickly deposit materials into the deposit chutes without wasting significant time or effort. It has been found that the present invention allows an operator to function efficiently while employing five or more deposit chutes. This is because the deposit chutes which are located in the middle of the conveyor and in front of the

operator are always within view and are readily accessible.

In accordance with a further aspect of the invention, there is provided a means for controlling the operation of a refuse recycling system so as to increase system efficiency in response to the introduction of different species of refuse. The refuse recycling system of the present invention includes a control deck which may be used to alter the operation of the system depending upon the kinds of material which are present within the refuse flow. The control deck is capable of altering such characteristics as the speed and direction of selected conveyors, in accordance with the species of refuse which is received (i.e., residential or commercial), so as to optimize the percentage of recyclable goods which are recovered. Thus, the efficiency of a refuse recycling system constructed in accordance with the present invention is further increased.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan schematic view showing the major structural elements of the refuse recycling system.

FIG. 2 is a schematic material flow diagram which details the overall method of operation of the refuse recycling facility.

FIGS. 3a and 3b are plan and elevational schematic views respectively which show the super-station refuse processing sub-system in greater detail.

FIGS. 4a-4c are cross-sectional views of the super-station refuse processing sub-system along selected lines as shown in FIGS. 3a and 3b.

DETAILED DESCRIPTION OF THE INVENTION

As shown in FIG. 1, the refuse recycling system 100 comprises two branches which are situated substantially perpendicular to one another, with refuse being conveyed in directions generally designated by arrows. The first branch begins at a main refuse inlet port 102 which is constructed to receive refuse of several kinds including paper, plastics, ferrous materials, glass, and other recyclable and nonrecyclable products. In one embodiment, the main inlet port 102 is approximately 6-8 feet wide at the mouth, and feeds into an inclined belt conveyor 103. The inclined conveyor 103 is situated between the inlet port 102 and a main belt conveyor 104 and is angled upward so that the refuse 300 is able to be carried to the main belt conveyor 104 at an elevated level on a platform 105. The main conveyor 104 is constructed of durable materials capable of moving large volumes of refuse past a plurality of deposit chute pairs 110, 112, 114, 116, 118 and operator station pairs 120, 122, 124, 126.

The deposit chutes 110-118 may, in one embodiment, be large chutes which open into lower deposit banks. The lower deposit banks are located below the elevated platform 105 directly beneath the chutes 110-118 and will be described with reference to FIG. 2. The operator stations 120-126 are situated between the deposit chutes 110-118 and next to the main conveyor 104 so that the deposit chutes 110-118 as well as any refuse which is carried past the operator stations 120-126 is within easy reach of an operator.

The main conveyor 104 is perpendicular to a belt transfer conveyor 130 located at the outlet end of the conveyor 104, so that any refuse which is carried past the operator stations 120-126 can be deposited onto the transfer conveyor 130 from the main conveyor 104. A

vibrating screen input slide 132 is located at the outlet end of the transfer conveyor 130 to funnel the refuse by means of vibration. A coarse refuse screen 140, which is constructed to have rubber coated vibrating fingers, is located at the end of the slide 132. The fingers of the screen 140 are spaced approximately 1 inch, so that refuse which is smaller than 1 inches in any dimension typically falls through the screen fingers, and onto a screen input vibrating slide 144. The vibrating slide 144 is situated directly beneath the screen 140, and is included as part of a refuse processing branch that runs perpendicular to the direction of motion of the refuse on the screen 140.

The vibrating of the screen 140 is synchronized so that refuse larger than 1 inches is able to be carried across the screen 140 to a vibrating output conveyor 148. The vibrating output conveyor 148 acts as a transfer connection between the coarse screen 140 and a secondary belt conveyor 150. The secondary belt conveyor 150 is situated on an elevated platform 151, and extends through a plurality of secondary deposit chute pairs 152, 154, 156, 158 and operator station pairs 162, 164, 166. The configuration of the belt 150, the chutes 152-158, and the operator stations 162-166 is similar to that of the main conveyor 104, the chutes 110-118, and the stations 120-126. That is, the operator stations 162-166 are situated between the chutes 152-158 respectively, within easy reach of the belt 150 and the chutes 152-158. In addition, deposit banks (described below with reference to FIG. 2) are located below the platform 151 directly beneath the chutes 152-158. A pivotable belt conveyor 157 is located at the outlet end of the secondary conveyor 150, so that refuse which is carried past the operator stations 162-166 is able to be deposited onto the pivotable conveyor 157. A reversible belt conveyor 168 is located at the end of the pivotable conveyor 157, so that refuse which is transported by means of the conveyor 157 can be deposited onto the reversible conveyor 168 where the refuse may be conveyed to one of two locations. In an advantageous embodiment, a second reversible belt conveyor 169 is located at one end of the reversible conveyor 168 so that the second reversible conveyor 169 is at a lower level than the conveyor 168.

The second refuse processing branch which runs perpendicular to the general direction of flow on the first branch includes a bottle and can inlet port 172, which is constructed to receive bottles and cans of various sizes and materials. In one embodiment, the bottles and cans which are to be loaded into the port 172 are presumed to be less than 8 inches in any one dimension. The inlet port 172 is approximately 6-8 feet wide at the mouth and is funnel shaped to deliver the bottles and cans onto a receiving end of a belt conveyor 176 which has an output end at the vibrating slide 144.

The vibrating slide 144 is connected to a fine screen 175 which is constructed to have rubber coated vibrating fingers. The fingers of the screen 175 are spaced approximately 1/2 inch apart, so that refuse which is smaller than 1/2 inches in any dimension typically falls through the fingers of the screen 175. This fallen refuse may be deposited onto another conveyor (not shown here) which runs beneath the screen 175 parallel to the general direction of conveyor 176, or may be deposited directly into a refuse bin. The vibrations of the screen 175 allow refuse which is sized so that it does not fall through the screen 175 to be transferred to a vibrating conveyor 178. A cyclone air classifier 180, which gener-