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(71) Applicant: **Vink, Gerrit Jan**
6661 NG Elst (NL)

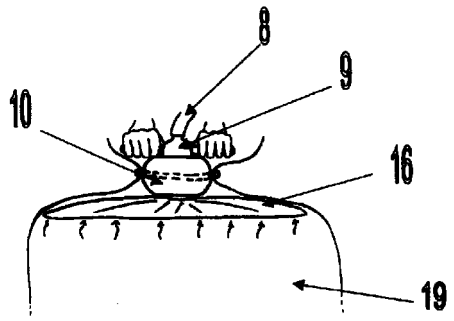
(72) Inventor: **Vink, Gerrit Jan**
6661 NG Elst (NL)

(54) Device for compressing bulky materials by way of vacuum method

(57) A device for the compression of waste material which has a suction appliance consisting of a large area of flexible porous material so that air can be suctioned from a large area and, following compression, this suction appliance can still be removed through a small opening. This device also comprises a bag-sealing cylinder consisting of an inflatable flexible cylinder whereby the bag is hermetically sealed during compression.

Also, the vacuum pump is equipped with an airflow reversal appliance allowing the airflow, stirred up by the vacuum pump, to be reverted if needed from inflowing to outflowing air so that with the same pump the bag-sealing cylinder can be inflated and then the bag itself can be compressed.

fig I



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Description

[0001] The invention concerns a device intended for the compression of materials such as plastic waste, paper and bulky waste such as produced by fast-food shops. A large amount of air is trapped between the layers of waste causing an unfavourable volume/weight ratio during transport and storage. In order to compress this waste it is first collected into an airtight package, such as a plastic bag, and is then compressed with the aid of the device.

Until now compression of waste material has been done by means of a mechanical press as described in the Dutch patent specification no. 8200548. The disadvantage of this press is that it is very expensive.

Furthermore, the problem of the material taking on its original volume again having been compressed is not entirely solved by the present-day methods of compression. The waste packaging is bound together but small loose pieces of the material are not kept together with the main bulk or otherwise they are lost or hang out. Extra packaging is necessary in order to prevent this. Another disadvantage is that with polluted waste, for example from fast-food shops, liquid or partially-liquid substances are squeezed from the packaging.

A second method of compression is to create pressure around the plastic packaging containing the material as described in the WO patent specification no. 88/03892. The disadvantages of this method are the large dimensions of the machines, its unpractical operation and the fact that the material is compressed to an uneven package.

Furthermore, the problem of preventing the material regaining its original volume is only partially solved. This can only occur if the plastic packaging remains airtight, a condition which is hardly ever attainable when handling waste. Extra packing or provisions are necessary in this case.

If one intends to reduce the volume of a plastic bag of material by vacuum suction the following problems are encountered:

- The bag takes on an unpredictable shape which is not easy to secure;
- The suction part becomes blocked with the material being compressed. If the suction part is made bigger to prevent this blockage, one finds that either the bag cannot be secured or that the suction part cannot be removed.

[0002] A seal has to be created between the bag and the suction device which will remain airtight during the vacuum process but which will still allow the suction part to be removed without the bag regaining its original volume when it has been secured.

The aim of the invention is to provide a compression device able to compress waste material or other voluminous products to one quarter of their original volume but which does not have the disadvantages mentioned.

When using the existing types of vacuum-pumps equipped with air-inflow and outflow pipes, both these pipes are brought together in an airflow reversal appliance. This makes it possible, by way of a simple handgrip, to revert the airflow in the air-pipe connected to it. This means reverting the outgoing airflow into incoming airflow and vice versa.

The airpipe in which the airflow can be reverted ends in a locking device. To seal the opening of the bag during compression, a cylinder-formed part, a bag-sealing cylinder, is used to which the locking device is connected. The outside of the cylinder is covered with flexible material such as rubber. The cylinder has three valves. The bag is secured around the cylinder-formed part. By allowing the air to flow out of the suction-and-compression hose with the aid of the airflow-reversal appliance, the airflow is blocked by a valve and the space between the flexible material and the cylinder is inflated. The diameter then increases closing the opening of the bag tied around.

The actual suction part connected to the aforementioned cylinder consists of a flexible flat disc whose upper layer is made of smooth material and lower layer of porous tissue whilst the diameter is approximately the same as that of the opened waste bag. Spiral springs are fixed in a radial form at regular distances between these two layers which, because they do not press together, convey the air entering the porous material to the cylinder part. In this way the aim of sucking in air over the entire surface is achieved, whereby the bag is evenly reduced in size and takes on a manageable shape whilst at the same time preventing blockages.

The invention and the working method are described in the following examples and drawings.

[0003] An airtight plastic bag (19) filled with waste is brought to the device. The cylindrical bag-sealer (10) with an expanded flexible suction part (16) underneath is placed on top of the waste in the bag. The bag is then closed around the cylinder (10). By allowing outgoing air into the suction-and-compression hose (8), air is pumped between the flexible band (11) and the cylinder (10). In this way the opening of the bag is sealed airtight. Having inflated the band (11) round the cylinder (10) the airflow is reversed and the bag is compressed. When the bag is sufficiently reduced in volume it is then tied up with cord or straps. The locking device (9) is then turned to the right thereby opening valve (14) and the air between the cylinder and the band flows away. Through this opening the flexible suction appliance (16) is pulled out of the bag. This is possible as the compressed (waste) material springs only slowly back into shape and a few seconds are therefore available to remove the suction appliance.

[0004] The airflow reversal appliance in fig. II consists of a smooth pipe (1), hermetically sealed in the middle by seal (2). There are several holes (3a and 3b) on either side of the seal. One side of the pipe is connected

to the suction part of the pump and the other to the compression part. Both sides of the pipe have a ridged part (4). The air reversal housing (5) is connected around the pipe between these ridges. This housing consists of a pipe cut to an angle at both ends and has a culvert (6) where the suction-and-compression hose (8) is connected and whereby two air-seals (7) ensure the pipe is airtight. By turning the reversal housing (5) from left to right and vice versa, it moves up and down. In this way both the upper openings (3a) and the lower openings (3b) come in turn in the smooth pipe (1) inside the air-seals (7) on the housing thus reversing the airflow direction in the suction-and-compression hose (8).

[0005] The bag-sealing cylinder (fig. III and IV) consists of a cylinder (10) covered on the outside with flexible material (11) and is equipped with valves (12, 13, 14). The locking device (9) is brought in the cylinder (10) and turned 10 degrees to the left and anchored by the ridges (15). When outflowing air is conveyed by the hose (8), valve (12) closes, valve (13) opens and the outer flexible band (11) is then inflated. If the airflow is now reversed then the cylinder acts as an air-conveyor. By turning the locking device (9) 30 degrees to the right, valve (14) is pressed in by the outer wall of the locking device (9) causing the air between the afore-mentioned cylinder and the flexible material to escape.

The suction piece (16) in fig. III, IV and V consists of a flat rubber disc whose upper layer consists of smooth material and lower layer of porous tissue. Spiral springs (17) are fixed in a radial form between these two layers. By fixing the ends of the springs (17) around the ring (18) they become hinged.

Claims

1. A device for compressing voluminous waste with the aid of a vacuum pump whose suction-and-compression hose (8) is equipped at the end with a suction appliance characterised in that this suction apliance consists of a disc (16) with a diameter almost the same as the diameter of the airtight packaging of waste (19) to be compressed whilst this disc consists of porous material through which air is sucked over the entire surface allowing a uniform reduction of the whole bag and the suction openings do not become blocked by surrounding or compressed waste or packaging and in that the disc is made of highly flexible material with a frame (17) which, although flexible and not airtight, nevertheless is strong enough to convey suctioned air and is hinged in such a way that the disc can easily be changed from its spread-out shape into a conical one (fig. IV) so that the suction appliance can be easily removed from a small opening in the waste packaging after the waste and the packaging have been secured in a compressed state.

2. A device as described above characterised in that a cylinder (10) fixed above the suction appliance (16) is fitted with a flexible band (11) around its outside and is equipped with valves (12, 13, 14) and by allowing the flow of air to enter, valve (12) closes and valve (13) opens so that the air between cylinder (10) and the flexible band (11) on the outside of the cylinder (10) is inflated, therefore increasing the diameter of the cylinder so that the opening of the packaging fixed around the same is rendered airtight. By turning the locking device (9) valve (14) opens allowing air from the flexible band (11) around the cylinder to flow away, causing the diameter of the cylinder to decrease again, allowing its easy removal from the opening.

3. The device in claims 1 and 2 characterised in that the vacuum pump is equipped with an airflow reversal appliance (fig. II). This appliance has a smooth pipe (1) connected at one side to the air inlet and at the other side to the air outlet of the pump and pipe (1) has openings (3a and 3b) on either side of a seal (2) whilst pipe part (5) which is cut at an angle at either end and has at both ends air-seals (7) and a connection for the suction-and-compression hose (6) ia placed around the first mentioned pipe, whilst on either side of this part ridges (4) are fitted around the pipe so that, if pipe part (5) moves from left to right or from right to left, it moves upwards or downwards so that both openings (3a) as well as openings (3b) on the pipe (1) come in turn within the seals of the pipe part (5).

fig II

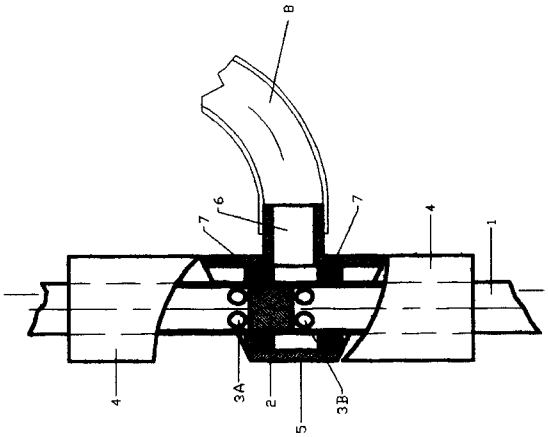


fig III

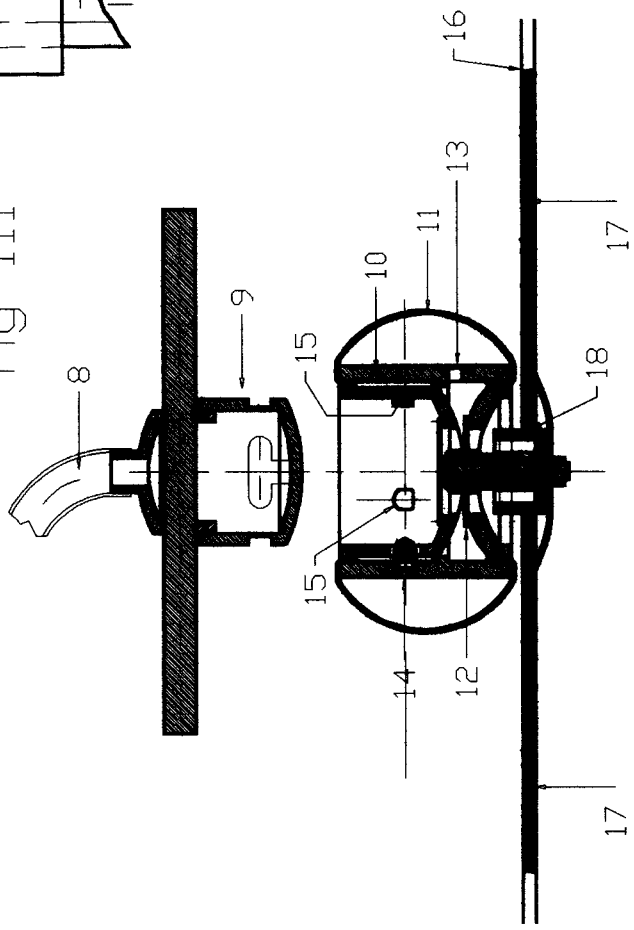


fig I

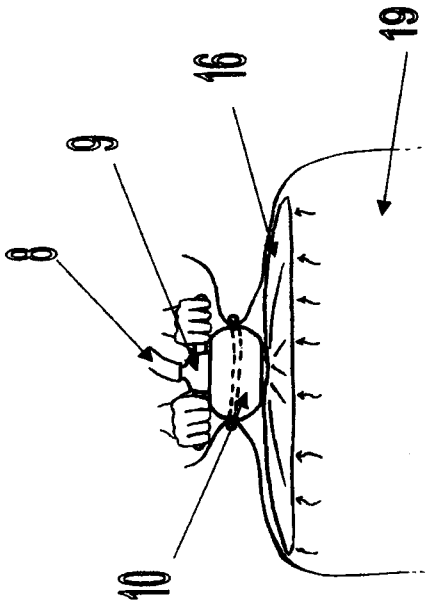


fig V

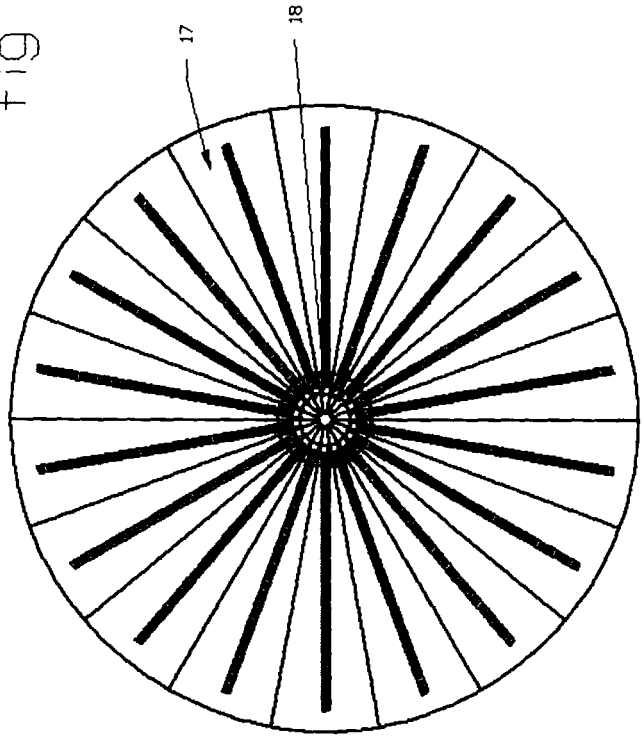
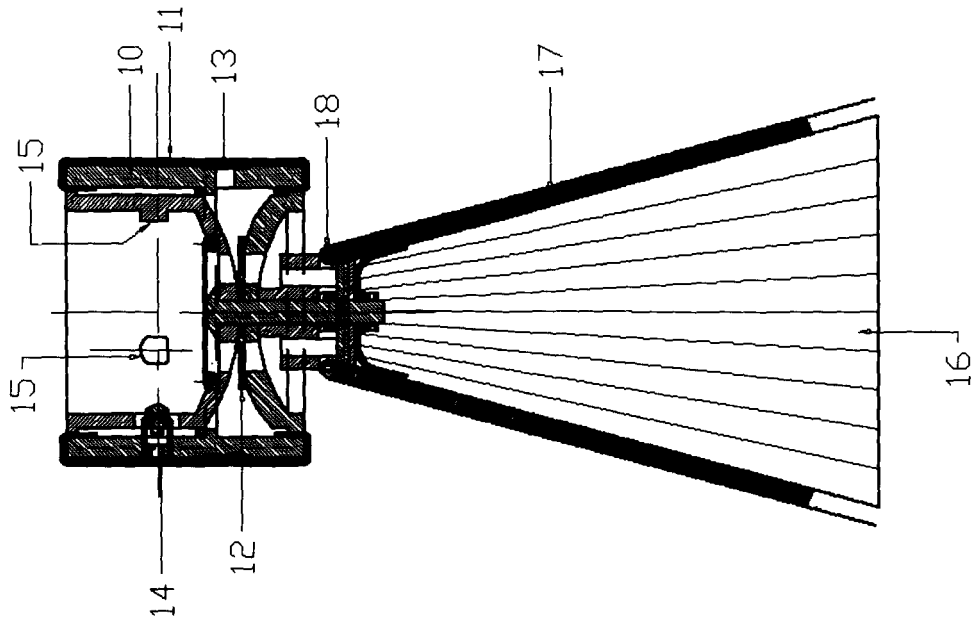


fig IV



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EUROPEAN SEARCH REPORT

Application Number
EP 98 20 3017

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	DE 90 13 183 U (QUARZWERKE) 10 January 1991 * claim 1; figure 1 *	1	B65B1/26
A	US 2 764 859 A (HANSELMANN) 2 October 1956 * column 2, paragraph 5; figure 5 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	25 February 1999	Claeys, H

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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O : non-written disclosure
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
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& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 98 20 3017

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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25-02-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 9013183 U	10-01-1991	NONE	
US 2764859 A	02-10-1956	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82