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(54) **Waste-compacting machine**

Müllverdichtungsmaschine

Machine de compactage de déchets

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Description

[0001] The present invention relates to an improvement in a waste-compacting machine, particularly for urban solid waste.

[0002] Machines are known which compact urban solid waste by pressing it under very high pressure, thereby causing its humid fraction, which can be recycled for production of fertilizers, to be separated from its dry fraction, which can be recycled as fuel.

[0003] In one such machine, disclosed in FR-A-2 615 443, waste material is pressed within a perforated barrel supported on a cradle having passages for draining the matter through the holes of the barrel. WO-A-92/13710 discloses a compression screw device for consolidating and possibly dewatering material such as fibre or cellulosic material, although the pressures involved are much smaller than in a waste-compacting machine.

[0004] EP-A-684 117 discloses a waste-compacting machine according to the preamble of claim 1 which comprises three perforated cylinders supported on a revolving drum and arranged to be cyclically filled with the material to be compacted. The drum is driven to rotate by steps so that all the cylinders are successively conveyed in front of a plunger, which penetrates into the cylinder and squeezes the material contained therein, thereby causing the fluid fraction to be drained through the holes.

[0005] However, it has been found that the drained fluid has a high abrasive power, mainly in consideration of the very high pressure reached during squeezing, so that the radial holes in the cylinders are abraded and become larger in a short time, thereby affecting the effectiveness of squeezing.

[0006] With the intention of overcoming this drawback, FR-A-2 792 570 shows how to line the holes with inserts of an abrasionproof material, such as marketed under the trademark "widia".

[0007] However, the above inserts are liable to precocious loosening, due both to wear which, by spreading over the inner wall of the cylinder, weakens their seats in the holes, and to accidental circumstances, e.g., to rigid bodies getting stuck in the holes, which, when eventually released after repeated passages of the pressing member, take the insert away therewith.

[0008] This drawback would be effectively overcome by lining the inner surface of the cylinder with a jacket of a very hard material, such as manganese steel. However, machining manganese steel is difficult, and this circumstance has prevented such jacket from being manufactured till now. In fact, the high hardness of this material only allows the latter to be worked by superficial grinding, while machining with chip removal, such as drilling the jacket at the holes in the cylinder, cannot be carried out. Therefore, the perforation should be obtained by molding but, as well known to those persons skilled in the art, such operation is critical to put into practice, as well as very expensive.

[0009] It is now the object of the invention to provide

an improved waste-compacting machine in which the perforated cylinder is more resistant to abrasion, so that the service time of the machine between replacements is substantially longer, without increasing the overall cost of the perforated cylinder.

[0010] Another object of the invention is that an existing machine may be provided with the lining without any alteration to it, thereby reducing the costs of the improvement.

[0011] The above and other objects and advantages of the invention, which will better appear below, are achieved by a waste-compacting machine having the features recited in claim 1, while the other claims state other advantageous, though secondary features.

[0012] The invention will be now described in more detail with reference to a preferred, non-exclusive embodiment, shown by way of non-limiting example in the attached drawings,

Fig. 1 is a side view of the waste-compacting machine according to this invention;

Fig. 2 is a plan view of the machine of Fig. 1;

Fig. 3 is a diagrammatical cross-section view along line III-III of Fig. 2 of a portion of the machine according to the invention;

Fig. 4 is a diagrammatical, cross-section view along line IV-IV of Fig. 2 of a portion of the machine according to the invention;

Fig. 5 is a diagrammatical, cross-section view along line V-V of Fig. 2 of a portion of the machine according to the invention;

Fig. 6 is a perspective view of a part of the machine according to this invention;

Fig. 7 is a perspective view of the part of Fig. 6 coupled with another part of the machine according to the invention.

[0013] With reference to the above Figures, a waste-compacting machine 10 comprises a stationary frame 12 which pivotally supports a drum 14 having a horizontal axis A (Fig. 4).

[0014] Drum 14 supports three cylinders 16 which are open at their ends and also have horizontal axes. The cylinders are spaced at equal angles from each other around the axis A of the drum, and are provided with a plurality of radial holes 18.

[0015] A loading station 20, a squeezing station 22 and an unloading station 24 are arranged in front of the drum and are angularly spaced from each other around the axis A, correspondingly to cylinders 16. The drum is driven to rotate by steps by a motor (not shown), in order to cyclically convey one cylinder in front of the loading sta-

tion, another cylinder in front of the squeezing station, and the last cylinder in front of the unloading station.

[0016] Loading station 20 comprises a screw feeder 26, or any other suitable feeding device such as, e.g., a pressing member, which is coaxial to cylinder 16 when the latter is positioned in front of the loading station, and is driven to rotate for conveying the material from a hopper 28 to the cylinder.

[0017] A wall 30 integral with stationary frame 12 is arranged in front of the base of drum 14 on the side of hopper 28, and is provided with three openings which are aligned to cylinders 16 when they are positioned in front of stations 20, 22, 24. Another wall 32 integral with stationary frame 12 is arranged in front of the opposite base of the drum, and is provided with two openings which are aligned to those cylinders 16 which are positioned in front of squeezing station 22 and unloading station 24. On the contrary, wall 32 shuts the end of that cylinder which is arranged in front of loading station 20.

[0018] In a way known per se, squeezing station 22 comprises an auxiliary piston 34, which is coaxial to the cylinder positioned in front of such station and sealingly closes one of its ends, as well as a plunger 36 that is operable to penetrate into cylinder 16 through the other end, thereby causing the material contained therein to be squeezed and the humid fraction to be drained through holes 18. The plunger is driven by a hydraulic cylinder 38 supported on the frame.

[0019] In a way known per se, the unloading station comprises a knockout piston 40, which is coaxial to that cylinder positioned in front of such station, and is operable to penetrate cylinder 16 under control of a hydraulic actuator 42 for knocking the compacted material out through that opening cut in the wall on the opposite side with respect to the piston. The knocked-out material is unloaded onto a chute 43 for removal.

[0020] According to this invention, the inner surface of each cylinder 16 is lined with a cylindrical lining 44 of manganese steel, which is perforated in alignment with the holes 18 in the cylinder and consists of three adjacent, cylinder sectors 44a, 44b, 44c of a cylinder.

[0021] To this purpose, the longitudinal edges B of each sector matching with one edge of an adjacent sector, as well as the outer surface of the sector matching with the inner surface of the cylinder, are worked by grinding for accurately matching with each other.

[0022] One of the holes of the lining, hole 45 in Fig. 6, and a corresponding, aligned hole in the cylinder, are engaged by a centering screw 46 for locking any mutual rotation between the lining and the cylinder, thereby maintaining the holes aligned to each other.

[0023] The operation of the improved machine substantially corresponds to the operation of the machine described in EP-A-684 117. The drum is driven to rotate by steps of 120° for cyclically subjecting each cylinder to:

- a loading step, in which a part of the material in hopper 28 is conveyed into the cylinder aligned to the

loading station by screw feeder 26 or pressing member,

- a squeezing step, in which squeezing member 36 penetrates into that cylinder aligned to the squeezing station and causes the material contained therein to be squeezed, against auxiliary piston 34, the fluid fraction being drained through the holes in the cylinder,
- an unloading step, in which knockout piston 40 penetrates through one end of the cylinder aligned to the unloading station and pushes the compacted material out through the opposite end.

[0024] During squeezing, the lining resists to the abrasive action of the drained fluid and shields the cylinder from wear, while the cylinder has the task of resisting to the pressure of the material.

[0025] Each sector can be easily manufactured with its holes by molding, by means of conventional processes known in the field. For example, the radial holes can be obtained by providing the mold with a plurality of complementary studs of a refractory sand, which can be removed from the holes after molding, when the mold is open. Also, longitudinal edges B and the outer surface of the lining can be worked by grinding in a way known to those persons skilled in the art.

[0026] A preferred embodiment of the invention has been described herein, but of course many changes may be made by a person skilled in the art, depending on the circumstances, within the scope of the inventive concept. For example, the lining could also consist of a different number of sectors, e.g., four or five sectors, which also could have different angular extensions. Further, though the lining of the example illustrated herein is described in association with a known machine having three cylinders supported on a rotatable drum, of course it could also been incorporated in another machine, provided that compaction is performed by squeezing the material in a perforated cylinder.

Claims

1. A waste-compacting machine, in which wastes are compressed in a cylinder (16) perforated with a plurality of radial holes (18), a fluid fraction of the wastes being drained through the holes, **characterized in that** the cylinder is lined with a lining comprising several cylindrical sectors (44a, 44b, 44c) moulded in manganese steel, the respective sectors having outer surfaces ground to match the inner surface of the cylinder, longitudinal edges (B) ground flat to abut with the edges of adjacent sectors, and moulded radial holes (45) in alignment with the holes (18) of the cylinder (16).

2. The machine of claim 1, **characterized in that** said lining consists of three cylinder sectors.
3. The machine of claim 2, **characterized in that** said three cylinder sectors (44a, 44b, 44c) each substantially have an angular extension of 120°.
4. The machine of any of claims 1 to 3, **characterized in that** at least one of the sectors and the cylinders are provided with centering means adapted to cooperate with each other to lock against mutual rotation between the lining and the cylinder.
5. The machine of claim 4, **characterized in that** said centering means comprise a centering screw (46) engaging one hole in the cylinder and a corresponding, aligned hole in one of the sectors.

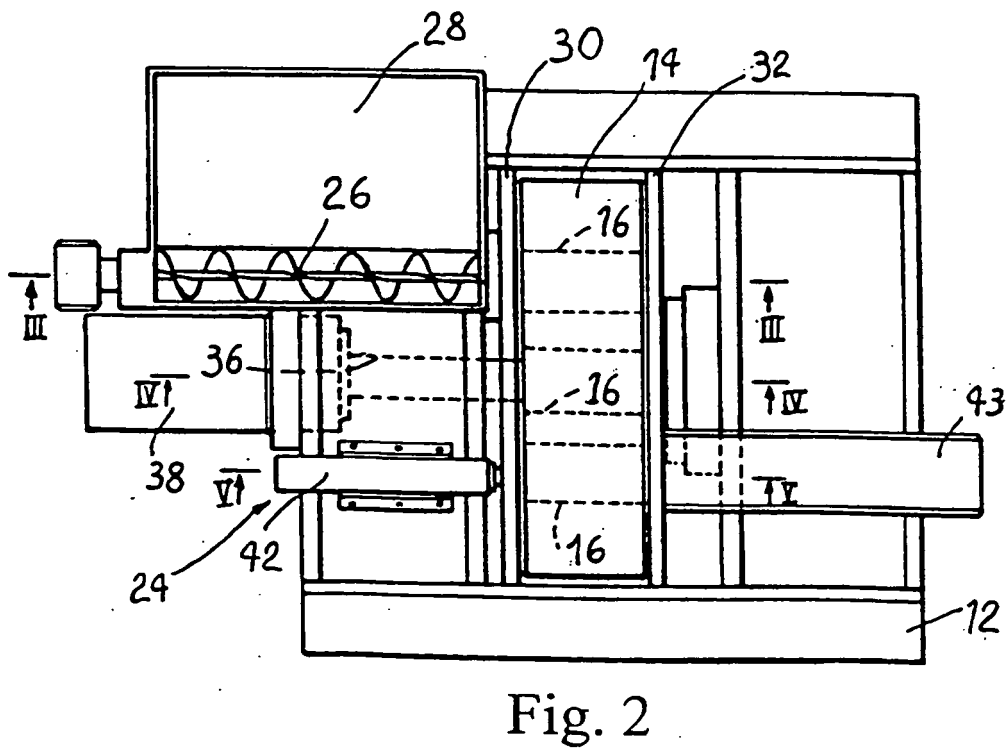
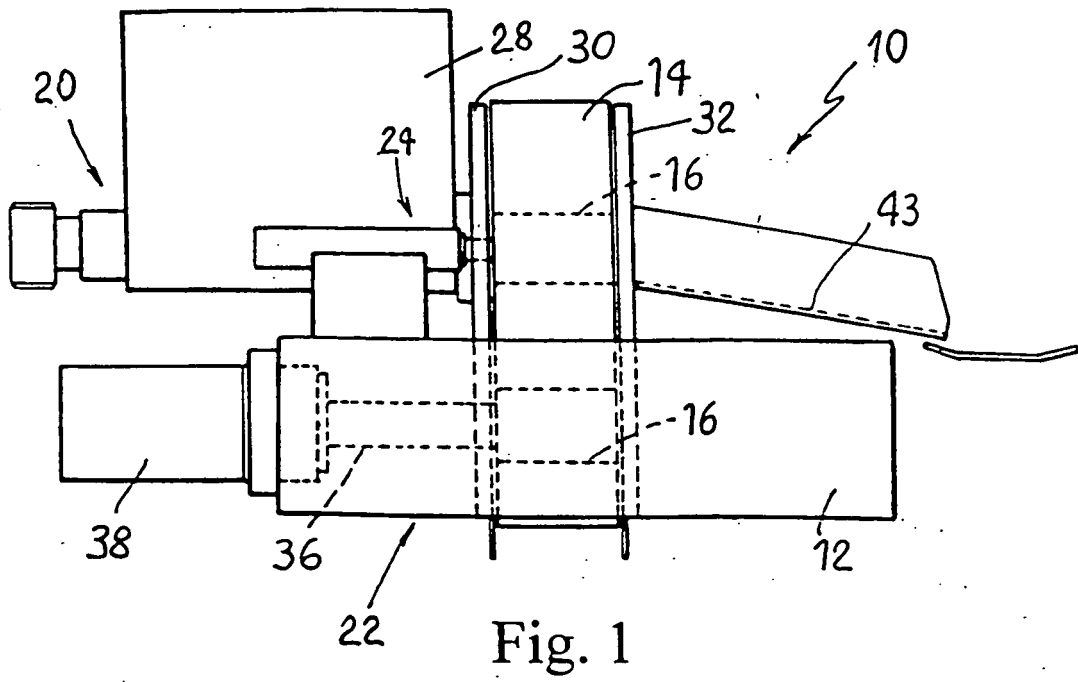
Patentansprüche

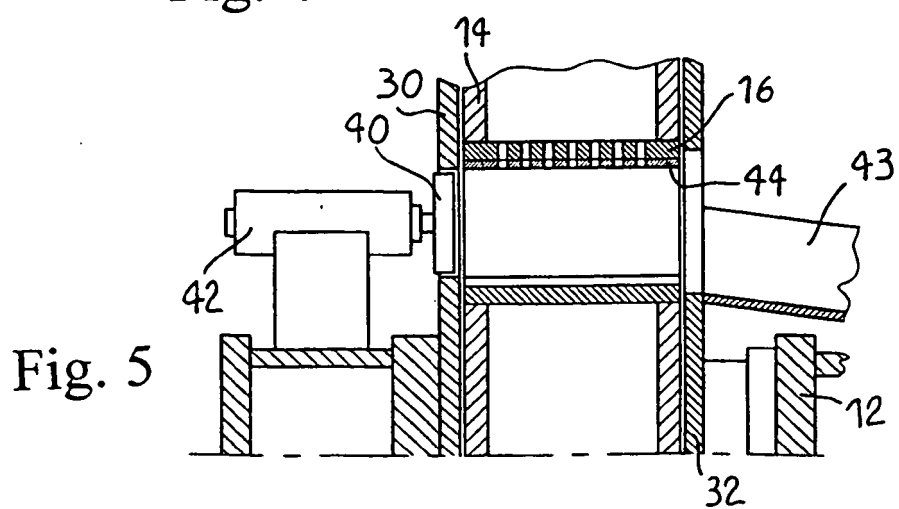
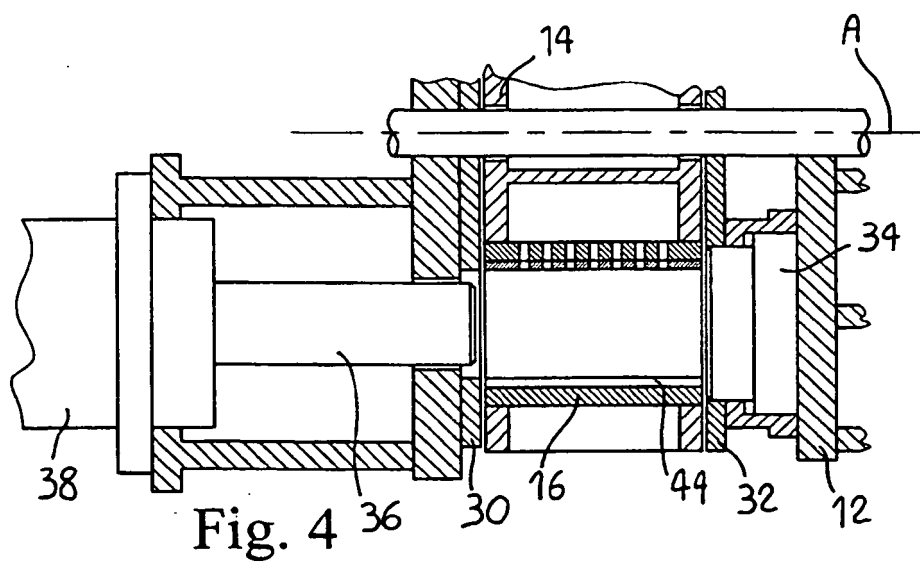
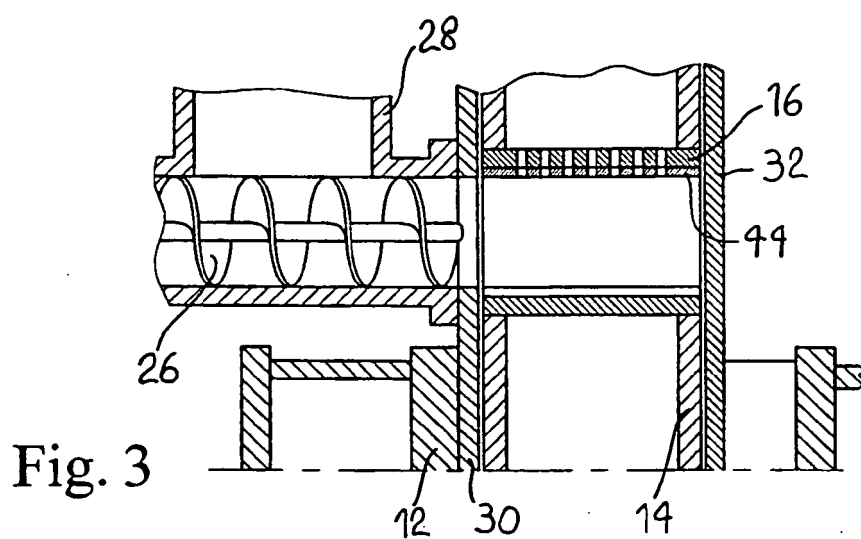
1. Müllverdichtungsmaschine, in der Abfälle in einem Zylinder (16) komprimiert werden, der mit einer Vielzahl radialer Löcher (18) perforiert ist, wobei ein Flüssigkeitsanteil der Abfälle durch die Löcher abfließt,
dadurch gekennzeichnet, dass der Zylinder ausgekleidet ist mit einer Innenverkleidung, die mehrere aus Manganhartstahl gegossene zylindrische Sektoren (44a, 44b, 44c) aufweist, wobei die entsprechenden Sektoren Außenflächen, die zur Innenfläche des Zylinders passend geschliffen sind, Längsränder (B), die plan geschliffen sind, um mit den Rändern benachbarter Sektoren aneinanderzustößen, und gegossene radiale Löcher (45) haben, die mit den Löchern (18) des Zylinders (16) fluchten.
2. Maschine nach Anspruch 1,
dadurch gekennzeichnet, dass die Innenverkleidung aus drei Zylindersektoren besteht
3. Maschine nach Anspruch 2,
dadurch gekennzeichnet, dass die drei Zylindersektoren (44a, 44b, 44c) jeweils eine Winkelerstreckung von im Wesentlichen 120° haben.
4. Maschine nach einem der Ansprüche 1 bis 3,
dadurch gekennzeichnet, dass zumindest die Sektoren oder der Zylinder mit einer Zentriereinrichtung versehen ist, die zum gegenseitigen Zusammenwirken ausgeführt ist, um eine Relativdrehung zwischen der Innenverkleidung und dem Zylinder zu blockieren.
5. Maschine nach Anspruch 4,

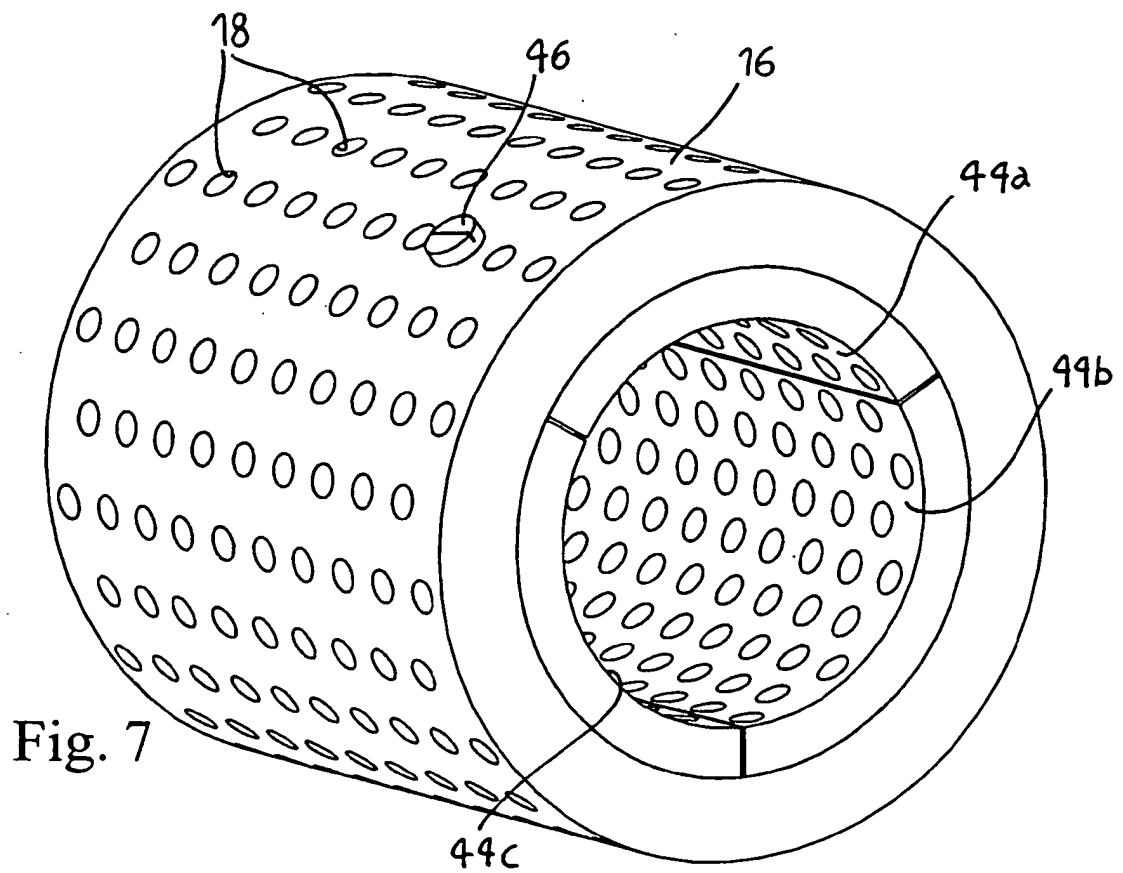
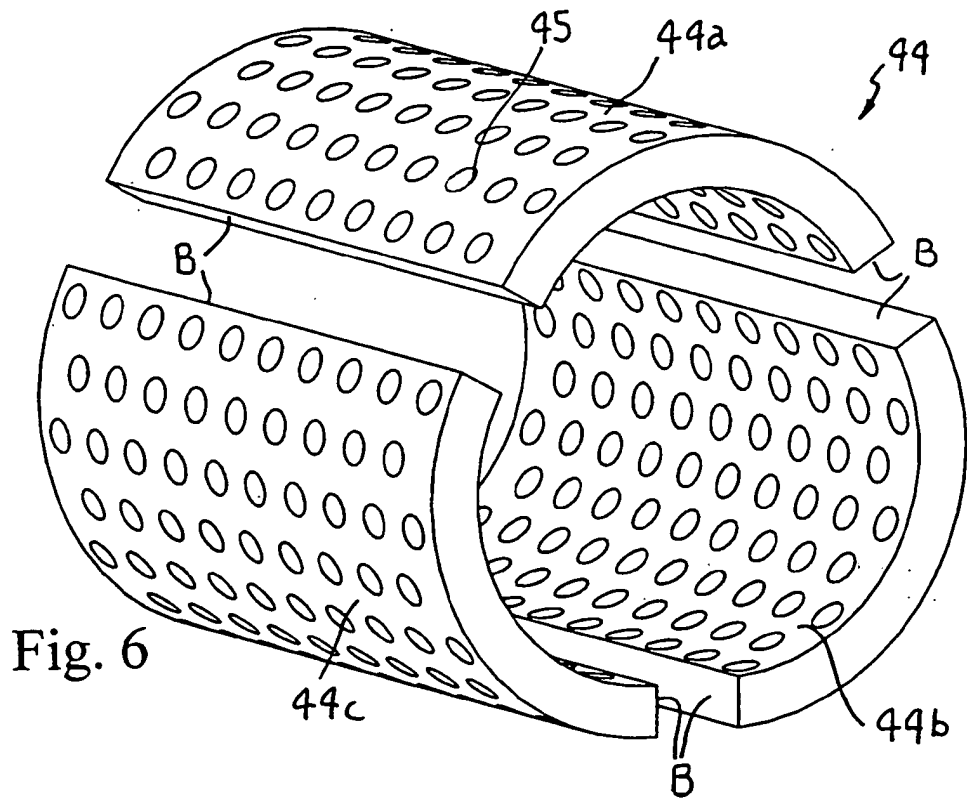
des, fluchtendes Loch in einem der Sektoren eingreift.

5 Revendications

1. Machine de compactage de déchets, dans laquelle les déchets sont comprimés dans un cylindre (16) perforé avec une pluralité de trous radiaux (18), une partie fluide des déchets étant évacuée par les trous, **caractérisée en ce que** le cylindre est doublé avec un revêtement comprenant plusieurs secteurs cylindriques (44a, 44b, 44c) moulés en acier de manganèse, les secteurs respectifs ayant des surfaces externes rectifiées pour correspondre à la surface interne du cylindre, des bords longitudinaux (B) moulés plats pour venir en butée contre les bords des secteurs adjacents, et des trous radiaux (45) moulés en alignement avec les trous (18) du cylindre (16).
2. Machine selon la revendication 1, **caractérisée en ce que** ledit revêtement se compose de trois secteurs cylindriques.
3. Machine selon la revendication 2, **caractérisée en ce que** lesdits trois secteurs cylindriques (44a, 44b, 44c) ont chacun sensiblement une extension angulaire de 120°.
4. Machine selon l'une quelconque des revendications 1 à 3, **caractérisée en ce qu'**au moins l'un des secteurs et des cylindres sont prévus avec des moyens de centrage adaptés pour coopérer entre eux afin d'empêcher la rotation mutuelle entre le revêtement et le cylindre.
5. Machine selon la revendication 4, **caractérisée en ce que** lesdits moyens de centrage comprennent une vis de centrage (46) mettant en prise un trou dans le cylindre et un trou aligné correspondant dans l'un des secteurs.







REFERENCES CITED IN THE DESCRIPTION

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