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- (73) Patenthaver: **Schwelling, Hermann, Hartmannweg 5, 88682 Salem, Tyskland**
- (72) Opfinder: **Schwelling, Hermann, Hartmannweg 5, 88682 Salem, Tyskland**
- (74) Fuldmægtig i Danmark: **Zacco Denmark A/S, Arne Jacobsens Allé 15, 2300 København S, Danmark**
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The invention relates to a method for compressing voluminous, bulky and / or compressible waste materials into a compact pressed material in a baling press according to claim 1. The invention furthermore relates to a baling press for performing the method according to the preamble of claim 5.

5

Most modern baling presses which are substantially provided for continuous operations require uninterrupted time and/or labor saving automatic operations of the baling press in particular when different voluminous and bulky waste materials like paper, cardboard, synthetic materials and similar materials have to be processed into pressed compact

10 bales.

In order to gain efficiency baling presses are constructed ever larger because a pressing cart has to be pulled back behind a first edge of a fill in opening when filling the press channel of the baling press.

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Since the pressed material is typically elastic it may spring back into the portion of the fill in opening after pressing which would reduce a receiving capacity of the fill in opening. In order to prevent this the pressing cart has to move significantly beyond a second edge of the fill in opening during pressing when this is implemented by only one

20 hydraulic cylinder the baling press would be configured very long at an end where a drive is located. Telescoping cylinders, thus cylinders with at least two deployable stages would be rather thin at their inner stage. This would induce risk of a high kinking load. Furthermore telescoping cylinders would be disadvantageous because they are very expensive.

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The German publication document 1 924 389 discloses a horizontally arranged trash compactor which operates with two single stage hydraulic cylinders. Both cylinders are connected with one another by lobes at their housings. A first piston rod thus impacts a support that is fixed in place, whereas the second piston rod presses against a press

30 plate. A total length of the hydraulic drive thus essentially only corresponds to a length

of one cylinder. Thus the hydraulic connections are thus arranged so that both cylinders operate simultaneously during an operating stroke or during an idle stroke.

5 From the German utility model DE 87 17 589 U1 a baling press is known where one or plural cylinders are supported at a first end of a fixed support and at a second end at a yoke. When there are plural cylinders they can be arranged rotation symmetrical about a center axis of a press plate or of a pressing cart. At the yoke a cylinder is attached in turn which impacts a center of the press plate. The free end of the cylinder is additionally supported laterally by support grooves and sliders. The yoke, however is
10 provided with running rollers like the press plate wherein the running rollers have a running surface on a base of the baling press. It is furthermore described that the cylinders are simultaneously loaded with a pressure medium in front and behind the yoke.

15 The prior art configurations are characterized in that they impact high bending forces upon the piston rods. Because the hydraulic conduits simply branch off after the valve without having an oil flow divider or similar a first cylinder or a cylinder group can extend or retract during strokes and the next time the second cylinder or the second cylinder group. This causes undefined operation sequences.

20 Furthermore a channel baler is known from WO 97/26129 in which the hydraulics are configured in two stages and a yoke or intermediary plate is arranged between the hydraulic cylinders of the first stage and the hydraulic cylinders of the second stage and supported at inner surfaces of the press channel walls.

25 A solution of this type is also shown in GB 1 062 641 which discloses a method according to the preamble of claim 1 and a baling press according to the preamble of claim 5.

30 FR 2 613 664 furthermore discloses a trash compactor where a press plate is loaded with a compacting pressure by a single telescoping cylinder.

Thus it is an object of the invention to provide a baling press which does not have the recited disadvantages of the prior art.

5 The object is achieved by a method for compressing voluminous waste materials with the features of claim 1; in order to perform the method a baling press according to the invention with the features of claim 5 is provided. Advantageously embodiments of the method and the baling press are defined by the features 2 through 4 or 6 through 13.

10 According to the method according to the invention the cylinders or the groups of cylinders, the so called cylinder units are controlled so that they are deployed in sequence. This has the advantage that defined piston movements are facilitated. This is advantageous among other things also for other functions of the baling press. This can also be used for controlling cover plates for the fill in opening as will be stated in more detail infra.

15

Because two cylinders are arranged between a support that is fixed in place and the common mounting plate, a yoke, this provides stability to the entire system so that the yoke does not require any lateral support. Thus, the cylinder between the yoke and the pressing cart of the baling press is also supported sufficiently. The yoke itself is
20 only supported within the pressing cart. Thus according to the invention it is not necessary that the cylinder actually presses in a center of the pressing plate. Depending on properties of the pressing material and the filling in the pressing channel a center point of pressure can also be arranged above or below a geometric center.

25 Subsequently the invention is described in more detail with reference to drawing figures, wherein:

FIG. 1 illustrates a longitudinal sectional view through the pressing channel of the baling press with the pressing cart in the filling position;

30 FIG. 2 illustrates a longitudinal sectional view through the pressing channel of a baling press with the pressing cart in the final pressing position;

FIG. 3 illustrates the pressing cart with the cylinders in the filling position of the baling press;

FIG. 4 illustrates the pressing cart with the cylinders in a center position of the baling press;

5 FIG. 5 illustrates the pressing cart with the cylinders in the final pressing position of the baling press; and

FIG. 6 illustrates a partial sectional view of the baling press in the portion of the cover plates.

10 It is appreciated with respect to the figure description that terms like "top", "bottom", "right" or "left" or similar only relate to representations in the figures and can deviate from orientations in embodiments of the invention.

FIG. 1 illustrates a pressing channel 1 or a press box of a baling press in a cut view. A
15 pressing cart 18 arranged therein with a press plate 2 arranged at the pressing cart on a pressing side however is illustrated in a non-cut view. The pressing cart 18 runs on lower running rollers 15 that are visible in FIG.1. The rails are kept clean by rail wipers 16. The pressing cart 18, however, also includes upper running rollers 17 that are supported at an upper running rail 20. When the pressing cart 18 is moved to the left in
20 a pressing direction 11 the pressing cart passes through the portion of the fill in opening 8. The pressing cart 18 includes a blade 19 at a left upper end of the pressing cart. The blade 19 cuts off upward protruding pressing material in cooperation with the blade 21 that is fixed in the pressing channel 1 during pressing. In the portion between the blade 21 and the outlet opening 9 or viewed in pressing direction 11 behind the outlet
25 opening 9 a band wrapping device can be arranged that is not illustrated herein. Further along the extension of the pressing device 11 an additional pressing device can be arranged which impacts at least two opposite surfaces of the bales which have already been in contact with side walls of the pressing channel 1. The pressing device is typically made from side surfaces that are arrangeable with a slight taper relative to
30 each other. This arrangement makes further sliding of the bales in the pressing direction 11 more difficult which helps to build up a desired pressure between the bales

and the pressing cart 18. This tapered pressing device can be connected by the attachment elements 22 with the pressing channel 1.

5 In FIG. 2, the pressing channel 1 is illustrated in a situation where the pressing cart 18 has already moved past the fixed blade 21. This is a left extreme position of the pressing cart 18 or the press plate 1. A definite passage of the press plate 1 is important since the possibly elastic pressing material springs back in a direction of the fill in opening 8 during a back ward movement of the pressing cart 18, but does not fill a portion of the fill in opening 8.

10

The dashed dotted line 24 only indicates a further output side configuration of the pressing channel 1 since it is not relevant for the description of the invention.

In FIG. 2 the additional elements become clearly visible since the components are moved apart. It is visible for example that a cylinder 3 is supported at a fixed support 6. The support 6 is turn in connected with the forward and rear plates of the press channel 1. An additional cylinder 4 is arranged lying flat behind the cylinder 3. The cylinders 3 and 4 terminate with their piston rods at a left side at a yoke 7 and are fixed thereon. An additional cylinder 5 is arranged between the cylinders 3 and 4 wherein a piston rod of the cylinder 5 is visible on a left side adjacent to the yoke 7. The piston rod is arranged at the pressing cart 18. It is clearly visible that the yoke 7 contrary to the cited prior art has no support at the base 10 of the baling press or at lateral walls. According to the invention the yoke is supported in the pressing cart 18.

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It is evident from FIG. 2 that two cover plates 12, 13 close the fill in opening 8. The cover plate 12 is connected on a left side with the press plate 2 or the pressing cart 18 and the cover plate 18 is connected by a holder 23 with the housing of the cylinder 5. Thus, the cover plate 13 is operatively connected with the yoke 7. The cover plates 12, 13 slide on each other at the overlap of the cover plates 12, 13 during a pressing stroke and during an idle stroke.

25

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FIGs. 3 through 5 illustrate the pressing cart 18 together with the cylinders 3, 4, 5 and the cover plates 12, 13 in various positions of the cylinders 3, 4, 5. The perspective illustration also clearly shows the relative arrangement of the cylinders 3, 4, 5. In FIG. 3 all three cylinders are in a retracted condition, this means this is the position which is provided during filling of the press channel.

In FIG. 4 the cylinders 3, 4 are completely extended and the cylinder 5 is slightly extended.

In FIG. 5 however the press plate 2 or the pressing cart 18 are completely extended. Only in this figure it is visible that the yoke 7 is supported on a surface 25 within the pressing cart 18. Thus, the entire cylinder system has a stiffness so that the yoke 7 does not require additional support for example at the walls or at the base of the baling press.

From a comparison with FIG. 3 it is evident that it is advantageous when the cover plates 12, 13 are configured telescoping because then the cover plates 12, 13 in the longitudinal direction of the press channel 1 are not longer than the retracted cylinders 3, 4, 5. This facilitates a compact configuration of the baling press according to the invention.

FIG. 6 illustrates both cover plates 12 and 13. At the upper cover plate 13 a so called triangular bar 26 is arranged which can scrape deposits from the lower cover plate 12. In case this triangular bar 26 is not provided material that is particularly stiff can slide between the plates 12, 13 so that the upper cover plate lifts off which can then cause a collision. Advantageously the triangular bar 26 is made from a wear resistant plastic material or from a non-ferrous metal in order to keep friction between the cover plates 12, 13 low.

In one embodiment of the invention a stroke of the initially extending cylinders 3, 4, 5 provides approximately 35 – 70% of the entire stroke. Thus according to the invention a first partial stroke of the press stroke, thus when the filled in waste material, in particular cardboard and similar voluminous waste material is compressed initially, thus air is

pressed out, can be provided as a quick stroke. Thus, cycle time for producing a bale is significantly reduced. Furthermore an energy requirement for this partial stroke is lower.

- 5 It is appreciated in a context with the invention that the baling press according to the invention can also be used for vertical applications due to its short build length.

REFERNCE NUMERALS AND DESIGNATIONS

	1	pressing channel
	2	press plate
	3	cylinder
5	4	cylinder
	5	cylinder
	6	support
	7	yoke
	8	fill in opening
10	9	outlet opening
	10	base of press channel
	11	pressing direction
	12	cover plate
	13	cover plate
15	14	base
	15	lower running rollers
	16	rail wiper
	17	upper running rollers
	18	pressing cart
20	19	blade at press plate
	20	upper running rail
	21	fixed blade
	22	attachment elements
	23	support
25	24	subsequent configuration of press channel
	25	surface
	26	triangular bar

Patentkrav

1. Fremgangsmåde til komprimering af voluminøse, omfangsrige og/eller komprimerbare affaldsstoffer til et kompakt pressemateriale i form af en balle i en ballepresse, med
- 5 - en pressekanal (1),
- en pressevogn (18), der kan bevæges i pressekanalens (1) langsgående udstrækning, hvorpå der på pressesiden er anbragt en presseplade (2),
- hvor pressevognen bevæges ved hjælp af flere hydrauliske cylindere (3, 4, 5), og
- 10 - cylindrene (3, 4, 5) danner en første cylinderenhed og en anden cylinderenhed, hvor
- den første cylinderenhed med de hydrauliske cylindere (3, 4) er anbragt mellem en stationær understøtning (6) og et åg (7),
- den anden cylinderenhed med en cylinder (5) er anbragt mellem åget (7) og pressepladen (2), hvor cylinderen (5) er anbragt mellem cylindrene (3, 4), og dens stempelstang er anbragt på pressevognen (18),
15 hvor den første og anden cylinderenhed arbejder serielt - dvs. efter hinanden,
kendetegnet ved, at
- åget (7) føres i pressevognen (18).
- 20
2. Fremgangsmåde ifølge krav 1,
kendetegnet ved, at
to cylindere (3, 4) fungerer mellem den stationære understøtning (6) og det bevægelige åg (7).
- 25
3. Fremgangsmåde ifølge krav 1 eller 2,
kendetegnet ved, at
først cylindre (3, 4) mellem understøtningen (6) og åget (7) og derefter cylindere (5) mellem åg (7) og presseplade (2) kører ud til presning.
- 30
4. Fremgangsmåde ifølge krav 3,
kendetegnet ved, at
først den anden cylinderenhed og derefter den første cylinderenhed kører ind ved tilbagekøring af pressevognen (18) til dens hvileposition.
- 35

5. Ballepresse til udførelse af fremgangsmåden ifølge et af kravene 1 til 4 med
- en pressekanal (1),
 - en påfyldningsåbning (8),
 - 5 - en udgangsåbning (9),
 - en presseplade (2), der befinder sig på pressesiden af en pressevogn (18),
 - flere cylindre (3, 4, 5) mellem en stationær understøtning (6) og pressepladen (2),
 - hvor der mellem understøtningen (6) og et åg (7) er anbragt to cylindre (3, 10 4), og
 - der mellem åget (7) og pressepladen (2) er anbragt mindst en yderligere cylinder (5) således, at cylinderen (5) er anbragt mellem cylindrene (3, 4), og dens stempelstang er anbragt på pressevognen (18),
- kendetegnet ved, at**
- 15 åget (7) er ført i pressevognen (18).
6. Ballepresse ifølge krav 5,
- kendetegnet ved, at**
- 20 begge cylindre (3,4) strækker sig parallelt med pressekanalens (1) langsgående akse og har samme afstand til pressekanalens (1) bund (10).
7. Ballepresse ifølge et af kravene 5 eller 6,
- kendetegnet ved, at**
- 25 en omviklingsindretning er anbragt i den ende af pressekanalen (1), der vender bort fra pressepladen (2).
8. Ballepresse ifølge et af kravene 5 til 7,
- kendetegnet ved, at**
- 30 en presseindretning er anbragt efter omviklingsindretningen set i presseretningen (11), hvilken presseindretning indvirker på mindst to flader af ballerne, der er anbragt på modsat beliggende sider, og som allerede har været i berøring med pressekanalens (1) indvendige overflader.
9. Ballepresse ifølge mindst et af kravene 5 til 8,
- 35 **kendetegnet ved, at**

påfyldningsåbningen (8) kan lukkes med mindst en dækplade (12,13).

- 5 **10.** Ballepresse ifølge krav 9,
kendetegnet ved, at
der er to dækplader (12,13), hvor en dækplade (12) er forbundet med pressepladen (2), og en dækplade (13) er forbundet med huset af cylinderen (5), der er anbragt mellem åg (7) og presseplade (2).
- 10 **11.** Ballepresse ifølge mindst et af kravene 5 til 10,
kendetegnet ved, at
pressekanalen (1) er anbragt horisontalt.
- 15 **12.** Ballepresse ifølge mindst et af kravene 5 til 11,
kendetegnet ved, at
den eller de cylindere (3, 4, 5), der er først kører ud, udgør ca. 35 % til 70 % af hele slaglængden.

Fig. 1

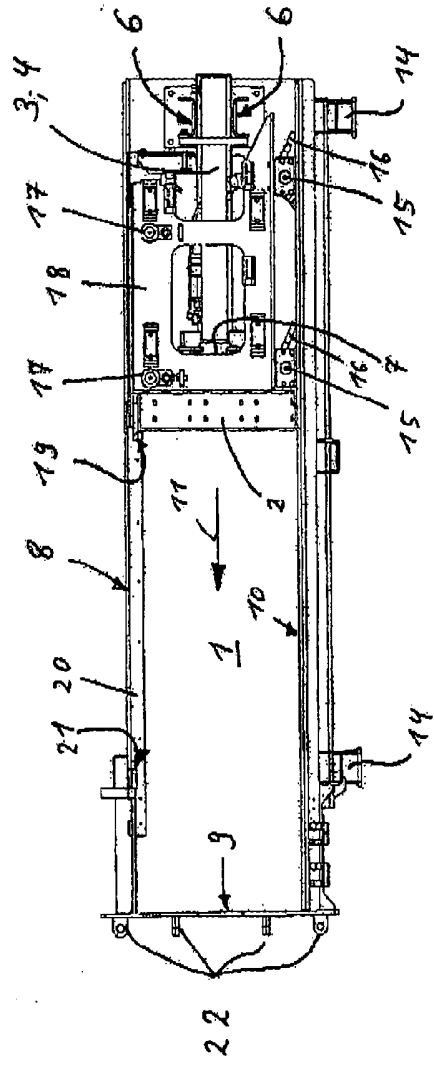


Fig. 2

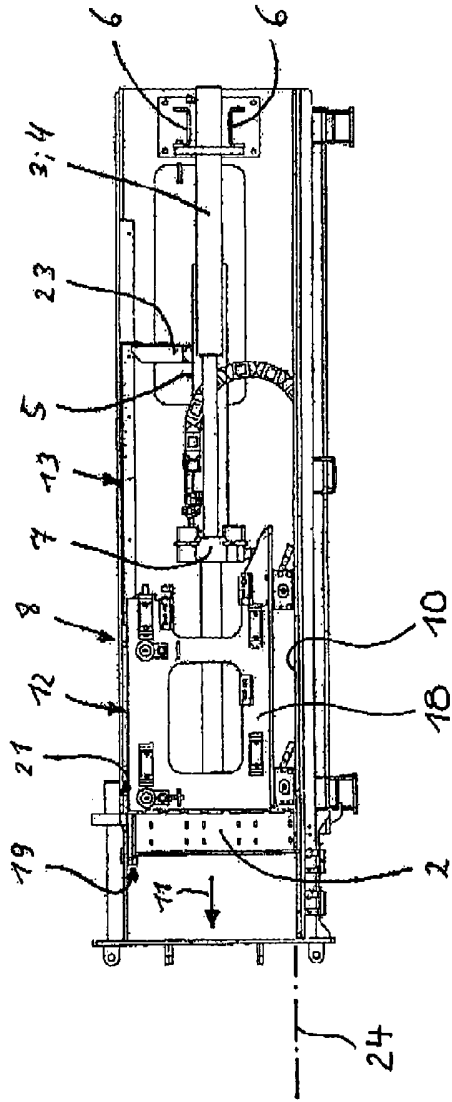


Fig. 3

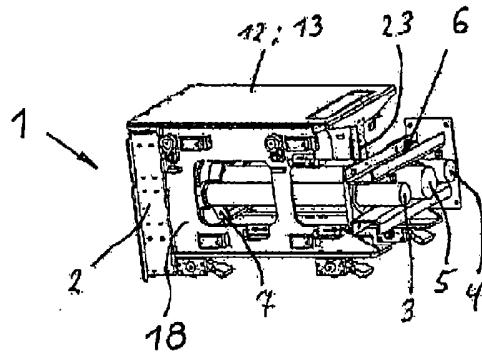


Fig. 4

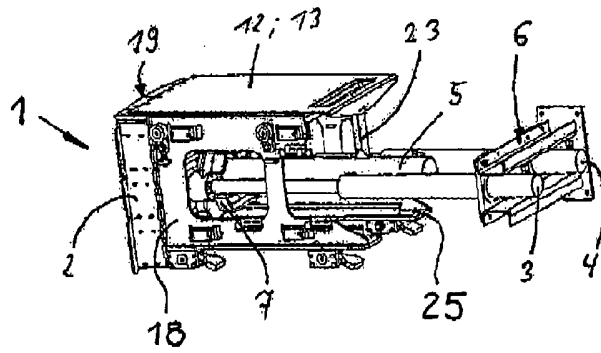


Fig. 5

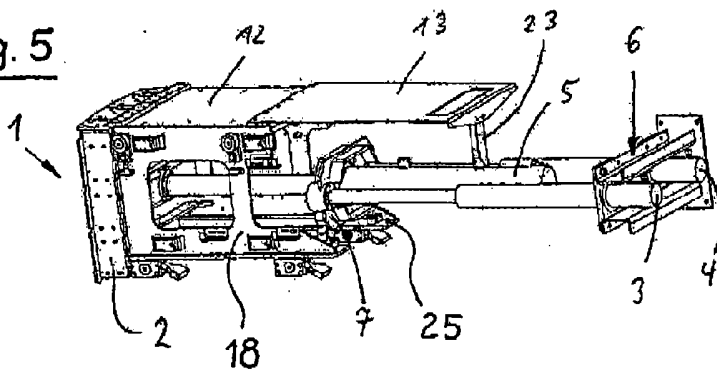


Fig.6

