(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 053 862 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
22.11.2000 Bulletin 2000/47

(51) Int Cl.[7]: **B30B 9/30**, B65B 1/12

(21) Application number: **00830315.8**

(22) Date of filing: **28.04.2000**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **14.05.1999 IT MO990104**

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(54) A machine for forming bundles of compacted objects inside a sack

(57) A conveyor screw (7) conveys objects (2) to be compacted towards an outlet (5) of a tubular conduit (3), about which a sack (6) is fitted. The sack (6) is progressively unfolded from the conduit (3) by effect of the thrust of the objects (2) as they leave the outlet (5). A deformable truncoconical wall (8) is predisposed upstream of the outlet (5) to contrast an advancement of the objects (2), which are then forced against the wall (8) and forced to pass through a passage afforded at a centre of the wall (8). Before entering the sack (6) the objects (2) are crushed between the conveyor screw (7) and the wall (8). The machine is used for collecting and disposal of single-use bags made of a flexible material such as paper, sackcloth, jute or plastic, used for packing powder or granular materials.

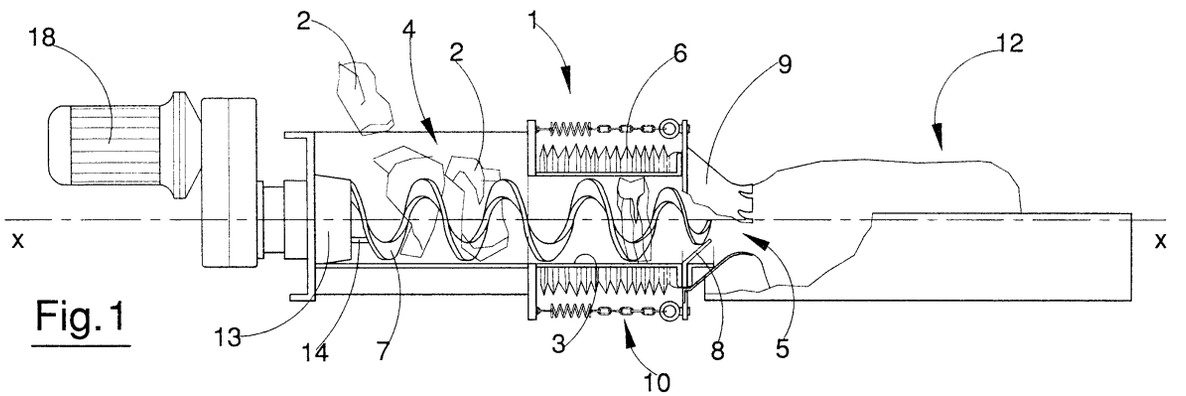

Fig.1

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Description

[0001] Specifically, though not exclusively, the invention can be usefully employed for disposal of waste products, especially sacks made of flexible materials (paper, sacking, jute, plastic etc.) which are used to pack powder or granular materials. Generally, the sacks are opened by laceration in a bag-breaking machine, which separates the sack from its contents, after which the broken sacks, by now waste material, are compacted into bundles and sent on for disposal.

[0002] The prior art teaches a compacting machine for forming bundles from loose objects, comprising a pressing chamber which is filled loosely with objects to be compacted. The known machine comprises a compacting organ, for example a conveyor screw, which conveys the objects and stows them progressively in the pressing chamber, up until a compact and fairly uniformly firm bundle is formed.

[0003] Known compacting machines exhibit, however, some drawbacks, especially if they are used to form bundles with the sacks discarded from a bag-breaking machine.

[0004] Firstly, the bundles formed using known-type compacting machines are not uniformly pressed, but rather there are parts of the bundles which are more greatly compacted than others.

[0005] Secondly, in order to obtain a sufficiently compact bundle the materials have to be packed with considerable pressure, leading to high energy consumption for the bundle formation. A further negative consequence of excessive bundle forming pressure is that subsequent waste-disposal operations become rather laborious.

[0006] The main aim of the present invention is to obviate the above-mentioned limitations and drawbacks in the prior art, by providing a machine able to form bundles the disposal of which is relatively rapid and economical.

[0007] An advantage of the invention is that it makes available a machine for forming highly-compacted bundles which are also highly resistant and firm, without excessively compressing the materials.

[0008] A further advantage of the invention is that it enables uniform compaction of the bundles.

[0009] A further advantage of the invention is that it makes available a constructionally simple and economical machine.

[0010] Further advantages of the machine of the invention are its operational reliability and its relatively high productivity.

[0011] These aims and advantages and more besides are all attained by the invention, as it is characterised in the appended claims.

[0012] Further characteristics and advantages of the present invention will better emerge from the detailed description that follows, of a preferred but not exclusive embodiment thereof, illustrated purely by way of example in the accompanying figures of the drawings, in which:

figure 1 is a schematic side view in vertical elevation, partially sectioned, of a machine made according to the invention, with some parts removed better to evidence others;
figure 2 is a plan view from above of figure 1;
figure 3 is an enlarged detail of figure 1;
figure 4 is a detail of figure 3 in a different operational configuration.

[0013] With reference to the figures of the drawings, l denotes in its entirety a machine for forming bundles of elongate shape, basically cylindrical and made up of compacted objects inside a sack. The machine l is especially suitable for use in the processing of objects 2 comprising waste materials coming from a bag-breaking machine. The compacting-packing machine 1 can be associated to a bag-breaking machine and receive the waste material therefrom, which waste material can be slashed bags made of paper, sacking, jute, plastic or another flexible material used for making sacks for packing granular and/or powder material. The machine 1 compacts the waste bags coming from the bag-breaking machine and packs the bags into an elongate cylindrical bundle. The compacting-packing machine l comprises a tubular conduit 3 having an inlet 4 and an outlet 5 for the objects 2 to be compressed and packed in bundles. The conduit 3 is longitudinally extended in a horizontal direction. The inlet 4 comprises an upper opening through which the objects can be introduced into the conduit 3. At least a part of the end of the conduit 3 is cylindrical. A sack 6 can be attached about this cylindrical part; the sack 6 can be made of plastic, be tubular in shape and can have an opening at one end while the other end, the bottom end, is closed. The sack 6 can be fitted on the conduit 3 so that the bottom of the sack 3 is up against the outlet 5 of the conduit 3.

[0014] An advancement device is predisposed inside the conduit 3, for conveying the objects introduced in the conduit 3 towards the outlet 5 and therefore towards the bottom of the sack 6 fitted about the conduit 3. The advancement device comprises a conveyor screw 7, coaxial to the tubular conduit 3 and made to rotate about its own axis x-x by a motor 18. At least a tract of the conveyor screw 7 preferably comprises a self-supporting spiral, with no central support shaft but having at its centre an axially-extending empty space.

[0015] The first tract of the conveyor screw 7 is surrounded by a deformable and flexible guard 13, comprising a truncoconical wall made of an elastomer. The guard 13 has been seen to prevent (or at least considerably reduce the risk of) the objects' stalling in the conduit 3, i.e. a situation in which the conveyor screw 7 rotates without being able to advance the objects in the conduit 3. One of more ribs 14 are also provided for the same reason; the ribs 14 are extended in axial direction

and are solid in rotation with the conveyor screw 7.

[0016] At least one striker element is located close to the outlet 5 of the conduit 3; in the example this striker element is constituted by a truncoconical wall 8 converging towards the axis of the conduit 3. The wall 8 has at its centre an opening for the passage of the objects. The wall 8, which is made of an elastomer material, is deformable when the objects pass through the outlet 5. The truncoconical wall 8 comprises an annular diaphragm which is elastically deformable when the objects pass through it, i.e. it is a diaphragm which does not completely obstruct the outlet 5 of the conduit 3, but allows the objects 2 to exit from the conduit 3 by effect of a pressure exerted by the advancement device. As they exit from the conduit 3 the objects 2 are crushed between the conveyor screw 7 and the striker element. The truncoconical wall 8 can exhibit on its periphery a plurality of cuts arranged circumferentially to increase the deformability of the wall 8. The wall 8 is situated immediately before the conduit outlet 5. The conveyor screw 7 terminates at the central opening of the wall 8. The terminal tract of the screw 7 converges.

[0017] The machine 1 is provided with a tubular or annular element, constituted in the example by a collar 9, located after the conduit outlet 5, coaxially with respect to the outlet 5. The collar 9 is positioned immediately after the outlet 5 of the conduit and externally of the sack 6 fitted about the conduit 3. The collar 9 is stretchable to allow a widening thereof, is truncoconical and has a plurality of circumferential cuts made in its peripheral edge to increase its deformability. The collar 9 is constrained by elastic means predisposed in order to enable the collar 9 to make axial distancing movements from the outlet 5 in the direction indicated by the arrows G. In the illustrated embodiment the collar 9 is connected to a fixed part of the machine (the conduit 3 or a frame, for example) by a plurality of elastic springs 10 having an end removably hooked to the fixed part. The axial movements in direction G enable the collar 9 to adapt itself to the bundle under formation, as will be better explained herein below.

[0018] A channel 11 is located downstream of the collar 9, and consists of a support plane, delimited by lateral edges, along which the forming bundle drags as it fills.

[0019] During operation the sack 6 fitted about the conduit 3 is progressively unfolded from the conduit 3 by effect of the advance of the objects 2 pushed by the conveyor screw 7. The objects 2 exiting from the conduit are shoved by the screw 7 against the wall 8 and forced to pass through the opening at the centre of the wall 8. The objects 2 are then crushed between the conveyor screw 7 and the wall 8, then to be pushed into the sack 6. The mass of the compacted objects 2 introduced into the sack 6 forms a cylindrical and elongate bundle 12.

[0020] The collar 9 interacts contactingly with the external lateral surface of the sack 6 as it is unfolded from the conduit 3, laterally stretching the bundle 12 as it is being formed. The collar 9 makes sure that the unfolding of the sack 6 from the conduit 3 is ordered and regular. Further, the collar 9 contributes to making the bundle 12 regular in shape the objects 2 uniformly compacted. By effect of the thrust of the bundle 12 under formation, the collar 9 can move axially in direction G (figure 4), distancing from the outlet 5 of the conduit 3, thanks to the springs which constrain it to the machine.

[0021] The striker element is, in the illustrated embodiment, a truncoconical wall 8 or flexible diaphragm which is open in its centre; but it could be made differently, for example it could be constituted by a diaphragm with cuts in the centre, with the flaps created by the cuts being reciprocally distanced by the thrust of the objects 2, in effect opening the diaphragm and allowing the objects 2 to pass through.

Claims

1. A machine for forming bundles of compacted objects inside a sack, characterised in that it comprises:

   a tubular conduit (3), having an inlet (4) and an outlet (5) for the objects (2), about which a sack (6) can be fitted, a bottom of the sack (6) being close up against the outlet (5) of the conduit (3);
   means (7) for advancing the objects (2), predisposed internally of the conduit (3), for conveying the objects (2) introduced into the conduit (3) towards the outlet (5) and thus towards the bottom of the sack (6), the sack (6) progressively unfolding away from the conduit (3) by effect of a pushing force of the objects (2);
   at least one striker element, predisposed in proximity of the outlet (5) of the conduit (3), for checking the advance of the objects (2); the striker element having at least one passage for the objects (2), the objects (2) exiting from the conduit (3) being pushed against the striker element and being forced to pass through the passage by the means (7) for advancing.

2. The machine of claim 1, characterised in that the striker element comprises an annular wall (8) having an aperture at a centre thereof for passage of the objects (2).

3. The machine of claim 2, characterised in that the wall (8) converges towards an axis (x-x) of the conduit (3).

4. The machine of any one of the preceding claims, characterised in that the striker element is deformable.

5. The machine of any one of the preceding claims, characterised in that the means for advancing the

objects (2) comprise a conveyor screw (7) terminating at the striker element.

6. The machine of claim 5, characterised in that the striker element and an end tract of the conveyor screw (7) both converge towards the axis (x-x) of the conduit (3).

7. The machine of claim 5 or 6, characterised in that it comprises a preferably-deformable guard (13) arranged about an initial tract of the conveyor screw (7).

8. The machine of any one of the preceding claims, characterised in that it comprises an annular element (9) located downstream of the outlet (5) of the conduit in a coaxial position to the outlet (5) and externally of the sack (6) fitted about the conduit (3); the annular element (9) interacting contactingly with an external lateral surface of the sack (6) while the sack (6) is unfolding from the conduit (3) in order to squeeze the bundle (12) of objects (2) laterally while the bundle (12) is under formation.

9. The machine of claim 8, characterised in that the striker element is situated immediately upstream of the outlet (5) of the conduit (3) and in that the annular element (9) is located immediately downstream of the outlet (5).

10. The machine of claim 8 or 9, characterised in that the annular element (9) is deformable breadthwise.

11. The machine of claim 10, characterised in that the annular element (9) is truncoconical and has at a periphery thereof a plurality of cuts afforded circumferentially, in order to increase a deformability thereof.

12. The machine of any one of claims from 8 to 11, characterised in that the annular element (9) is constrained by springs (10) predisposed to enable the annular element (9) to be distanced from the outlet (5) of the conduit (3).

13. The machine of any one of the preceding claims, characterised in that the objects (2), when compacted and inside the sack (6), comprise waste material in outlet from a bag-breaking machine.

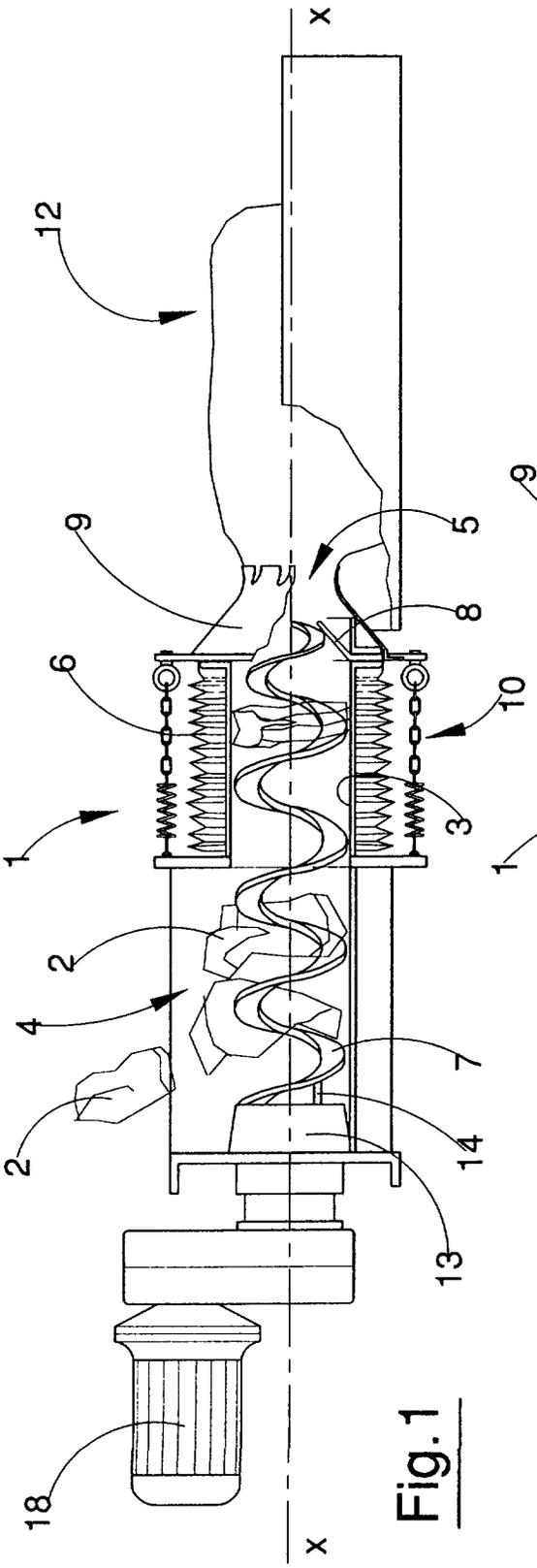


Fig.1

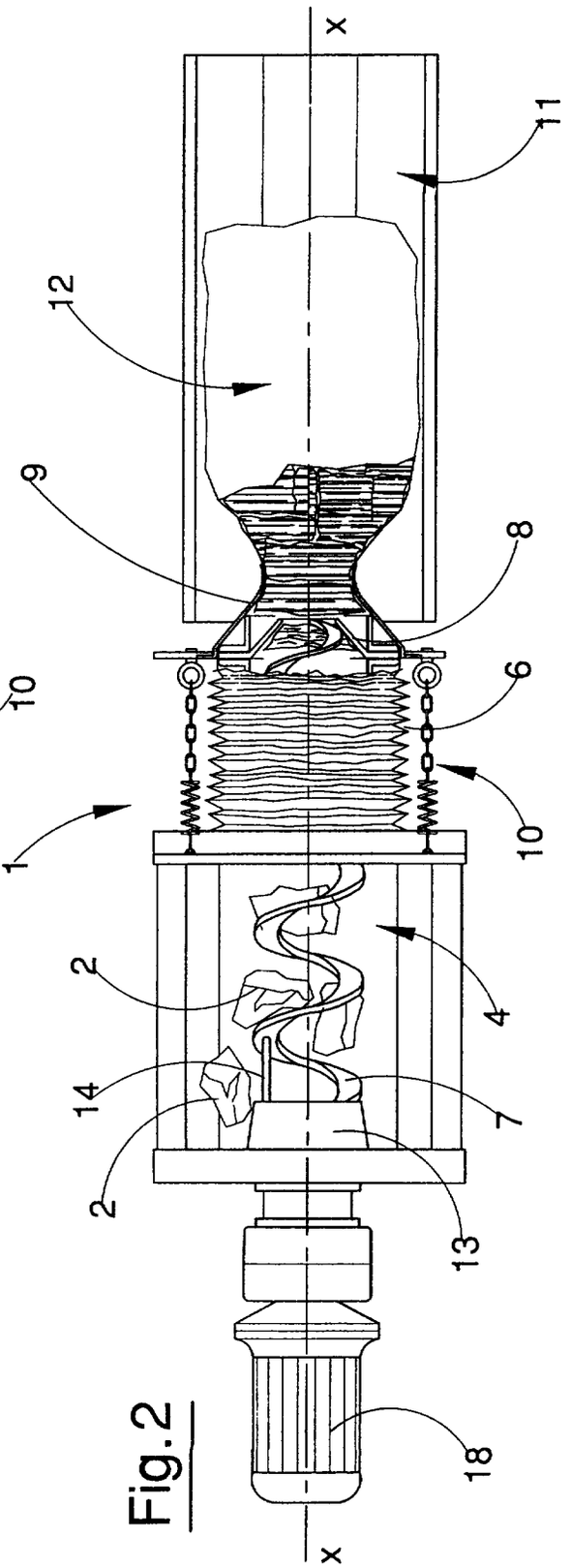


Fig.2

Fig.4

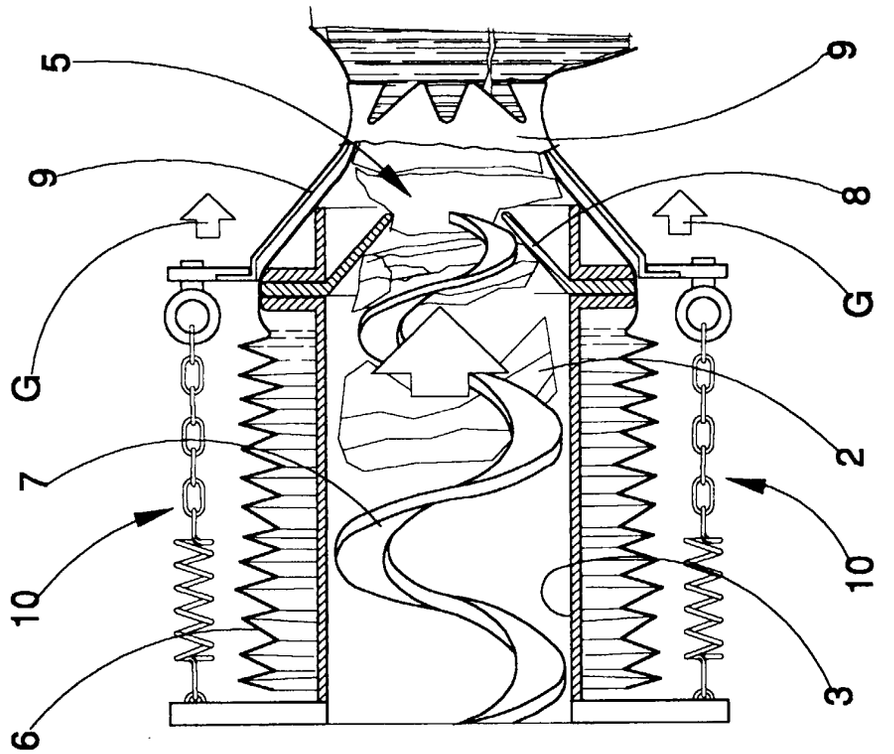
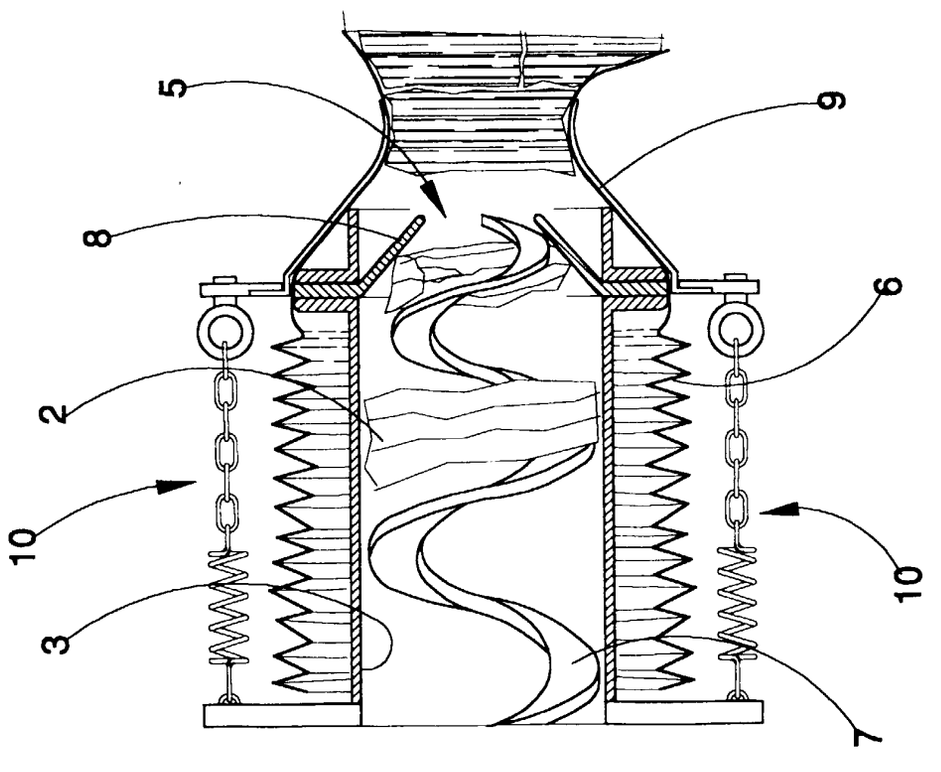


Fig.3



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EUROPEAN SEARCH REPORT

Application Number
EP 00 83 0315

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	31 August 2000	Smolders, R

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