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(54) ROTARY PRESS FOR TREATING HIDES

(57) Rotary press for treating hides, which comprises a support structure (10), a first and a second counter-rotating superimposed cylinder (2, 3), of which an upper cylinder (2) and a lower cylinder (3), which are rotatably mounted on the support structure (10). The press (1) further comprises at least one cushioning layer (4), which covers the lateral surface of at least one of the aforementioned upper and lower cylinders (2, 3), and such cushioning layer is made of a polymeric foam having a residual permanent deformation value after compression of less than 15%.

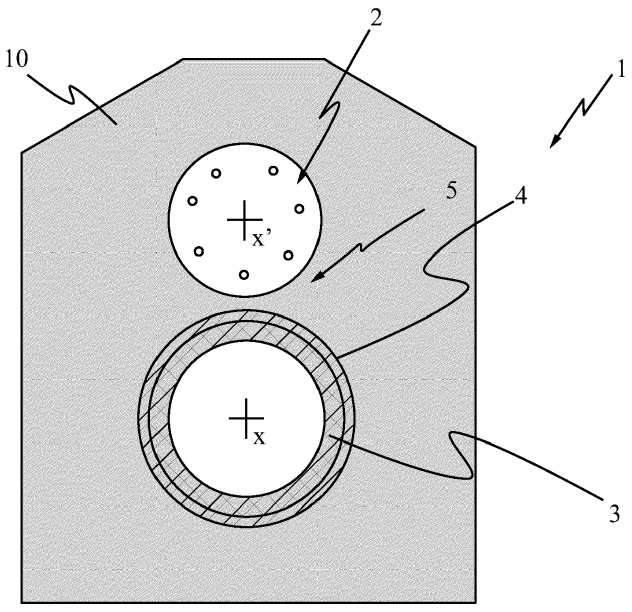

Fig. 1

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Description

Field of application

[0001] The present invention relates a rotary press for treating hides according to the preamble of the independent main claim.

[0002] Rotary presses are commonly used in the tanning industry for hide finishing treatments and in particular for the drying, ironing and/or molding of hides and the like.

[0003] The press in question, in addition to the tanning industry, can also be advantageously used to treat other sheet-like materials such as imitation leather, fabrics or synthetic materials.

Prior art

[0004] Traditionally in the tanning industry sector, presses for treating hides are substantially similar to calendars comprising two cylinders with parallel, counter-rotating axes delimiting a slit between them, which is passed through by the hides to be treated. Preferably the upper cylinder is heated and is provided with a smooth (chromed) or engraved (for example with knurling) lateral surface depending on the treatment to which the hides must be subjected.

[0005] The lower cylinder can be wrapped by a cushioning layer, as for example described in documents DE 202020102760, IT 201900024370, GB 740194 and CN 203728855.

[0006] For example, in the presses described in documents DE 202020102760 and IT 201900024370, the press includes a feeding belt, usually made of felt, which is wound in a ring on the lower cylinder and on a tensioning cylinder placed upstream of the pair of cylinders that compress the hides.

[0007] Such belt also has the function of gradually and uniformly transferring the pressure exerted by the two cylinders to the hides, preventing them from undergoing excessive stress.

[0008] This material, substantially made up of a cloth made of compressed non-woven wool material soaked in glue, has proven in practice to have excellent mechanical features, in particular being adequately soft and porous to cushion the action of the cylinders on the hides.

[0009] However, rotary presses which use such felt belt wound in a ring on the lower cylinder have proven to be not without drawbacks.

[0010] The main drawback lies in that the felt belt subjected to cyclic pressures and the temperature transmitted to it by the upper cylinder quickly degrades its mechanical features by compacting into a thinner thickness and consequently reducing its elastic response and ultimately the cushioning effect on the hides. In particular, this progressive loss of the mechanical features of the felt is also attributable to the pressure impulses which are transmitted by the folds of the hides and which determine concentrated stresses which locally damage the felt belt. The deterioration of the felt belt results in a less than optimal finishing treatment of the hides which appear less soft and rougher. A further drawback lies in that the preparation of a felt belt determines a high number of machine downtimes, due to the need to replace the belt following its deterioration, which cause a reduction in productivity due to the downtime necessary for the machine downtime as well as entailing an increase in costs both for the personnel employed and for the belts to be replaced frequently.

[0011] To partially overcome these drawbacks, a rotary press has been developed which involves covering the lower cylinder with a rubber cushioning layer, onto which the felt feeding belt is in turn wrapped. This allows the overall wear of the belt to be reduced, thus reducing machine downtime and therefore reducing the costs for the processes carried out using such rotary press. The rubber cushioning layer in fact allows the pressure exerted by the upper cylinder to be cushioned and consequently the strain localized on the felt belt due to any blemishes (wrinkles and/or imperfections) present on the hides to be treated to be reduced.

[0012] However, even rotary presses provided with such rubber cushioning layer have proven in practice to be not free from drawbacks.

[0013] The first drawback lies in that, even with reduced frequencies, there is always the need to carry out an operation to replace the worn felt with a new felt belt. This obviously involves an increase in time and costs for the manufacturer, as well as being extremely impacting from an environmental point of view as worn felt belts need to be subsequently correctly disposed of.

[0014] A further drawback lies in that these rotary presses do not allow obtaining treated hides with high aesthetic features, in which the motif (embossing) is transferred onto the hides with a high yield in a well-defined manner.

[0015] A further drawback lies in that the physical properties of the rubber cushioning layer do not allow the hides to be stretched in an optimal manner, such hides are therefore often not optimal to the touch.

Disclosure of the invention

[0016] In this situation, the problem underlying the present invention is to eliminate the drawbacks of the above-mentioned prior art by providing a rotary press for treating hides which requires reduced maintenance, and in particular which does not require frequent machine downtime operations due to the replacement of a felt belt.

[0017] A further object of the present invention is to provide a rotary press for treating hides which allows a surface finish of the hides to be achieved in an optimal manner and for a prolonged time.

[0018] A further object of the present invention is to provide a rotary press for treating hides which allows optimal ironing of the hides to be obtained.

[0019] A further object of the present invention is to provide a rotary press for treating hides which allows the environmental impact of the hides ironing and molding processes to be reduced.

[0020] A further object of the present invention is to provide a rotary press for treating hides which is simple and cost-effective to make and assemble, in particular by reducing the elements that compose it.

Brief description of the drawings

[0021] The technical features of the invention, according to the aforesaid aims, can clearly be seen in the content of the claims below, and its advantages will become more readily apparent in the detailed description that follows, made with reference to the accompanying drawings, which illustrate a preferred embodiment, which is purely exemplary and not limiting, in which:

- Fig. 1 shows a general schematic view of the rotary press for treating hides according to the present invention;
- Fig. 2 shows a detail of the rotary press of Figure 1 in perspective view relating to a lower cylinder covered with a cushioning layer of polymer foam;
- Fig. 3 shows a graph relating to a compression test carried out according to the ASTM D1621 standard, which shows the trend of the stress-strain curve for the different specimens subjected to test;
- Fig. 4 shows a graph relating to a test for the calculation of the Poisson coefficient, carried out according to the ASTM D1621 standard, which shows the trend of the force and a holding time for the different forces to which the specimens were subjected during the test.

Detailed description of a preferred embodiment example

[0022] With reference to the accompanying drawings, reference number 1 indicates as a whole the rotary press for treating hides object of the present invention.

[0023] The rotary press 1, according to the present invention, is intended to be used in the tanning industry for hide finishing treatments and in particular for the drying, ironing and/or molding of hides and the like.

[0024] The press 1 in question, in addition to the tanning industry, can also be advantageously used to treat other sheet-like materials such as imitation leather, fabrics or synthetic materials.

[0025] According to the invention, the rotary press 1 includes a support structure, indicated generically with 10, which is preferably provided with a base, not shown, intended to be placed on the ground.

[0026] The rotary press 1 further comprises two counter-rotating superimposed cylinders 2 and 3, of which an upper cylinder 2 and a lower cylinder 3, which are rotatably mounted on the support structure 10.

[0027] The two cylinders 2, 3 are provided with respective rotation axes X, X', preferably parallel to each other, and define a slit between them, preferably arranged horizontally, for crossing the hides to be treated.

[0028] Advantageously, at least one of the two cylinders 2, 3 is motorized to advance the hides through the slit 5 and thus be able to work them, in particular to carry out a pressing and molding operation.

[0029] Advantageously, at least the lower cylinder 3 is motorized and preferably the upper cylinder 2 is instead an idle cylinder, which is indirectly brought into rotation following the advancement of the hides inside the slit 5.

[0030] Advantageously, the upper cylinder 2 has a first diameter D1 of between 350 and 2000 mm and preferably the lower cylinder 3 has a second diameter D2, smaller than the first diameter D1 of the upper cylinder 2, in particular of between 350 and 2000 mm.

[0031] The press 1 further comprises at least one cushioning layer 4 which covers the lateral surface of at least one of the aforesaid cylinders 2, 3.

[0032] Advantageously, the cushioning layer 4 has a thickness of between 15 and 40 mm and preferably of between 20 and 30 mm. Advantageously, the cushioning layer 4 covers in a ring the entire lateral surface of the cylinder 2, 3 on which it is applied, according to a manufacturing methodology described in more detail below.

[0033] Advantageously, the press 1 does not include further layers of material placed onto the cushioning layer 4, such as for example the classic felt or an outermost rubber layer. In practice, the cushioning layer 4 wrapped around

one of the two cylinders 2, 3 defines a treatment face intended to cooperate with the hides to be treated.

[0034] More in detail, the cushioning layer 4 is provided with an internal face 40, facing the external surface of the cylinder 2, 3 that it covers, and an external face 41, facing externally and intended to directly receive the hides to be treated.

[0035] According to the preferential embodiment, the cushioning layer 4 covers the lateral surface of the lower cylinder 3, while the upper cylinder 2 is advantageously provided with a smooth (chromed) or engraved (for example with knurling) lateral surface depending on the treatment to which the hides must be subjected.

[0036] According to the idea behind the present invention, the cushioning layer 4 is made of a polymeric foam, which has a residual permanent deformation value after compression of less than 15%.

[0037] More in detail, the residual permanent deformation value after compression is measured using a test known as "compression set", and is carried out according to the ISO 815-1:2019 standard. In particular, the permanent deformation value measured at 24h (at a test temperature of 70 °C) is less than 15%, and preferably less than 12%.

[0038] According to the same ISO 815-1:2019 standard, the permanent deformation value measured at 70h (at a test temperature of 23 °C) is less than 6%, and preferably less than 4%.

[0039] The use of a polymeric foam allows not to use the felt belt normally used as a cushioning layer, and furthermore the use of a polymeric foam having the aforementioned residual permanent deformation values allows the life time of the cushioning layer to be considerably increased, thus reducing machine downtime and consequently the economic and environmental costs to be incurred for its replacement and disposal. Advantageously, the polymer foam of the cushioning layer 4 is selected from: polyurethane foam, neoprene foam, foam based on EPDM synthetic rubber and mixtures thereof, foam based on nitrile-butadiene-styrene rubber (NBR), ethylene-vinyl-acetate foam (EVA), silicone foam and preferably it is a polyurethane foam.

[0040] Advantageously, the cushioning layer 4 has a rebound resilience value of between 40 and 75%, and preferably between 50 and 65%.

[0041] In more detail, the rebound resilience value is measured using a test carried out according to the ISO 4662:2017 standard.

[0042] Advantageously, the polymeric foam of the cushioning layer 4 is a high-density foam, in particular having a density of between 300 and 800 kg/m^3, and preferably between 400 and 700 kg/m^3.

[0043] In more detail, the rebound resilience value is measured using a test carried out according to the ISO 845:2009 standard.

[0044] Advantageously, the polymeric foam of the cushioning layer 4 is at least partially closed cell foam, and in particular has a percentage of closed cells greater than 30%, and preferably greater than 50%.

[0045] Advantageously, the cushioning layer 4 has a hardness of between 65 and 95 ShoreA, and preferably of between 80 and 95 ShoreA.

[0046] Advantageously, the cushioning layer 4 has an elastic modulus of between 2 and 6 Mpa and preferably has a Poisson coefficient of between 0.10 and 0.35.

[0047] In particular, the aforementioned elastic modulus was measured using a test carried out according to the ASTM D1621 standard, in particular on cylindrical samples with a diameter of 60 mm and a height of 25 mm, at a test speed of 5 mm/min.

[0048] The aforementioned test for calculating the elastic modulus is shown in the stress-strain graph in Figure 3.

[0049] In particular, the aforementioned Poisson coefficient was measured using a test carried out according to the ASTM D1621 standard, in particular on cylindrical samples with a diameter of 60 mm and a height of 25 mm, at a test speed of 5 mm/min.

[0050] More in detail, the test for calculating the Poisson coefficient was carried out according to the procedure shown in the graph in Figure 4, which shows the applied force (gradually increasing) and the sample holding time for each of the applied forces. According to a preferential embodiment of the present invention, the press 1 is provided with a cushioning layer 4, arranged on the lower cylinder 3, which is made of a polyurethane foam, in particular a closed-cell elastomeric polyurethane foam, in which the percentage of closed cells is greater than 30%.

[0051] The cushioning layer 4 of the above example has a thickness of between 20 and 30 mm, for example 25 mm.

[0052] The polyurethane foam used in the aforementioned embodiment was characterized from a physical and mechanical point of view through various tests described in more detail below, and which are summarized in the following table.

[0053] More in detail, the foam was tested in accordance with the ISO 815-1:2019 standard, in order to identify the residual permanent deformation value after compression

[0054] (compression set test), and highlighted a permanent deformation value measured at 24h (at a test temperature of 70 °C) of between 12% and 8%, in particular 10%, and a permanent deformation value measured at 70h (at a test temperature of 23 °C) of between 4% and 3%.

[0055] Furthermore, the aforementioned elastomeric polyurethane foam was tested in accordance with the ISO 4662:2017 standard, in order to identify the rebound resilience value, which was found to be between 50% and 65%.

[0056] Furthermore, the aforementioned elastomeric polyurethane foam was tested in accordance with the ISO

845:2009 standard, in order to identify its density, which was found to be between 350 and 550 kg/m^3.

[0057] The elastomeric polyurethane foam of the aforementioned embodiment also has a hardness close to 70 ShoreA.

[0058] The elastomeric polyurethane foam of the aforementioned embodiment has an elastic modulus of approximately 4.5 Mpa, and an average Poisson coefficient of approximately 0.23.

[0059] In particular, the aforementioned elastic modulus and the Poisson coefficient were measured using a test carried out according to the ASTM D1621 standard, in particular on cylindrical samples with a diameter of 60 mm and a height of 25 mm, at a test speed of 5 mm/min.

Property	Value	Standard
Elastic modulus	4.5 [Mpa]	ASTM D1621
Poisson coefficient	0.23	ASTM D1621
Hardness	70	Shore A
Density	450 [kg/m^3]	ISO 845:2009
Permanent Residual Deformation at 24 hours	12-8 [%]	ISO 815-1:2019
Permanent Residual Deformation at 70 hours	4-3 [%]	ISO 815-1:2019
Rebound Resilience	50-65 [%]	ISO 4662:2017

[0060] Furthermore, the object of the present invention is a method for producing a cushioning layer 4 of the type described above, and in particular of the polymeric foam type to be applied externally to a cylinder of a rotary press.

[0061] More in detail, the method for producing the cushioning layer 4 involves preparing one of the two cylinders 2, 3, and preferably the lower cylinder 3, inside a cylindrical mold and subsequently injecting a polymeric mixture inside the aforementioned cylindrical mold. In particular, according to the preferential embodiment of the present invention, the polymeric mixture is a polyurethane mixture which preferably includes foaming agents, in order to induce foaming of the polymer chemically.

[0062] In this way, therefore, the cushioning layer 4 is obtained directly over-injected onto the corresponding cylinder 2, 3.

[0063] The invention thus conceived therefore achieves the intended objects.

Claims

1. Rotary press for treating hides, which comprises:

   - a support structure (10);
   - a first and a second counter-rotating superimposed cylinder (2, 3), of which an upper cylinder (2) and a lower cylinder (3), which are rotatably mounted on said support structure (10);
   - at least one cushioning layer (4), which covers the lateral surface of at least one of the aforesaid upper and lower cylinders (2, 3);

   said press being **characterized in that** said cushioning layer is made of a polymer foam having a residual permanent deformation value after compression, measured according to the ISO 815-1:2019 standard, of less than 15%.

2. Rotary press for treating hides according to claim 1, **characterized in that** the polymer foam of said cushioning layer (4) is selected from among: polyurethane foam, neoprene foam, foam based on EPDM synthetic rubber and mixtures thereof, foam based on nitrile-butadiene-styrene rubber (NBR), ethylene-vinyl-acetate foam (EVA), silicone foam.

3. Rotary press for treating hides according to claim 2, **characterized in that** the polymer foam of said cushioning layer (4) is a polyurethane foam.

4. Rotary press for treating hides according to any one of the preceding claims, **characterized in that** said cushioning layer (4) has a rebound resilience value, measured according to the ISO 4662:2017 standard, of between 45 and 70%.

5. Rotary press for treating hides according to any one of the preceding claims, **characterized in that** said cushioning

layer (4) has a density of between 350 and 750 kg/m^3.

6. Rotary press for treating hides according to any one of the preceding claims, **characterized in that** said cushioning layer (4) is made of a foam having a percentage of closed cells greater than 30%, and preferably greater than 50%.

7. Rotary press for treating hides according to any one of the preceding claims, **characterized in that** said cushioning layer (4) has a thickness of between 15 and 40 mm.

8. Rotary press for treating hides according to any one of the preceding claims, **characterized in that** said cushioning layer (4) has a hardness of between 65 and 95 ShoreA, preferably of between 80 and 95 ShoreA.

9. Rotary press for treating hides according to any one of the preceding claims, **characterized in that** said cushioning layer (4) has an elastic modulus of between 2 and 6 Mpa and a Poisson coefficient of between 0.10 and 0.35, said elastic modulus and said Poisson coefficient being measured according to the ASTM D1621 standard.

10. Rotary press for treating hides according to any one of the preceding claims, **characterized in that** said cushioning layer (4) covers the lateral surface of said lower cylinder (2).

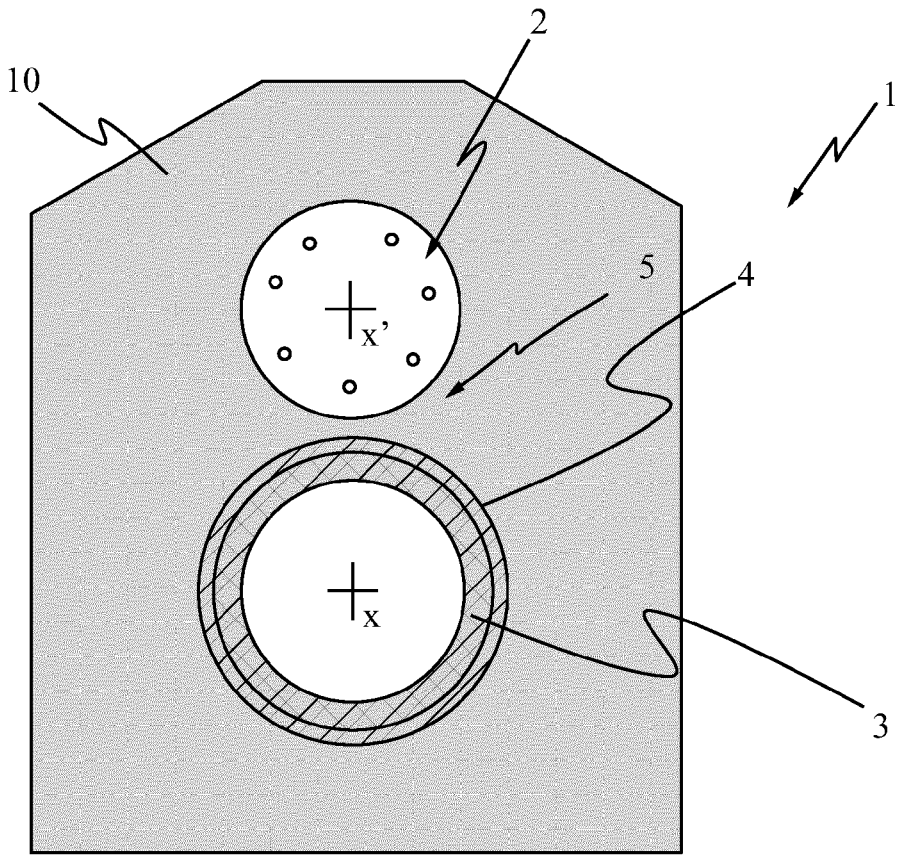


Fig. 1

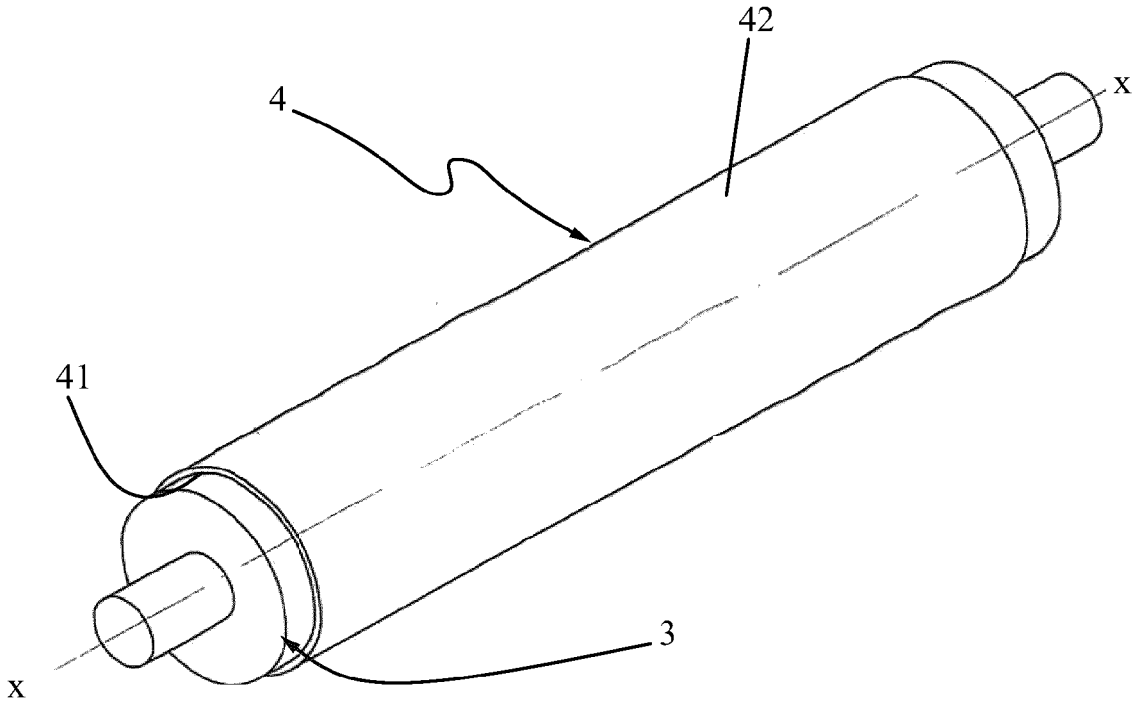
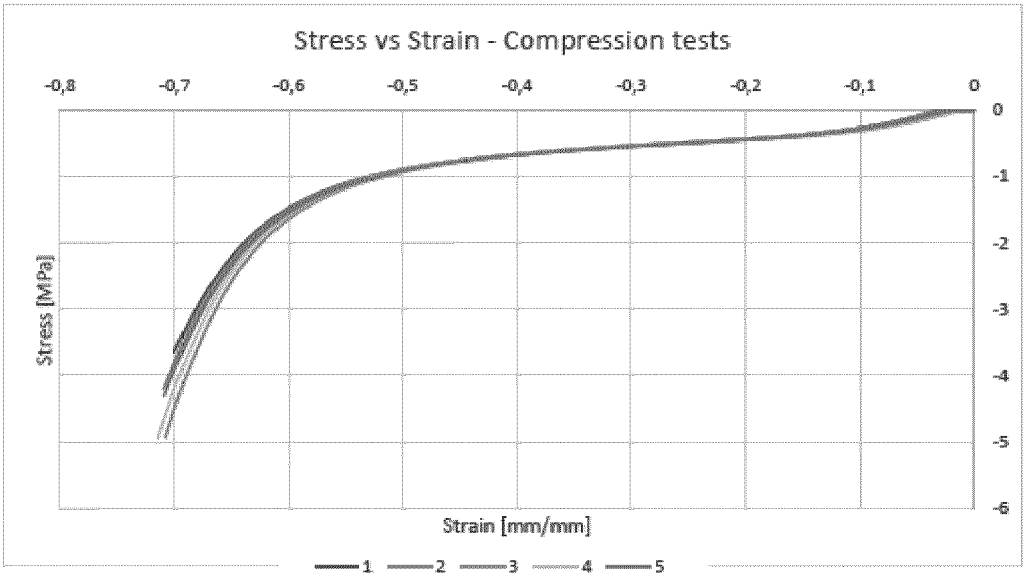


Fig. 2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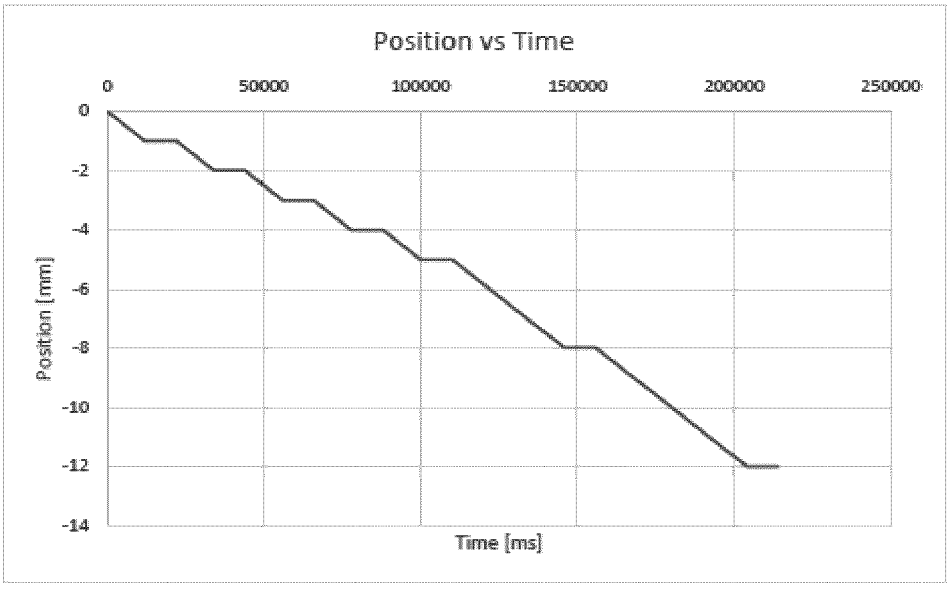
-0,6
-0,5
-0,4
-0,3
-0,2
-0,1
0
0
-1
-2
-3
-4
-5
-6
Stress [MPa]
Strain [mm/mm]
1
2
3
4
5

Fig. 3


Position vs Time
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-4
-6
-8
-10
-12
-14
Position [mm]
Time [ms]

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 23 20 1489

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

C14B
B41L
B41F
D06C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 February 2024	Iamandi, Daniela

CATEGORY OF CITED DOCUMENTS

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14-02-2024

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

REFERENCES CITED IN THE DESCRIPTION

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- IT 201900024370 **[0005] [0006]**
- GB 740194 A **[0005]**
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