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Remarks:
Amended claims in accordance with Rule 86 (2) EPC.

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(54) **Apparatus for drying metal pieces**

(57) Apparatus for drying metal pieces, which comprises one or more drying devices (3, 5, 6) provided with a conveyor belt (3) passing through a duct (5), so that the portion of the conveyor belt (3) comprised in this duct

is curved for forming a concave canal suitable for containing the metal pieces, said duct (5) being arranged in the turns of an inductor (6) for generating an electromagnetic field suitable for heating by induction the metal pieces transported by the conveyor belt (3).

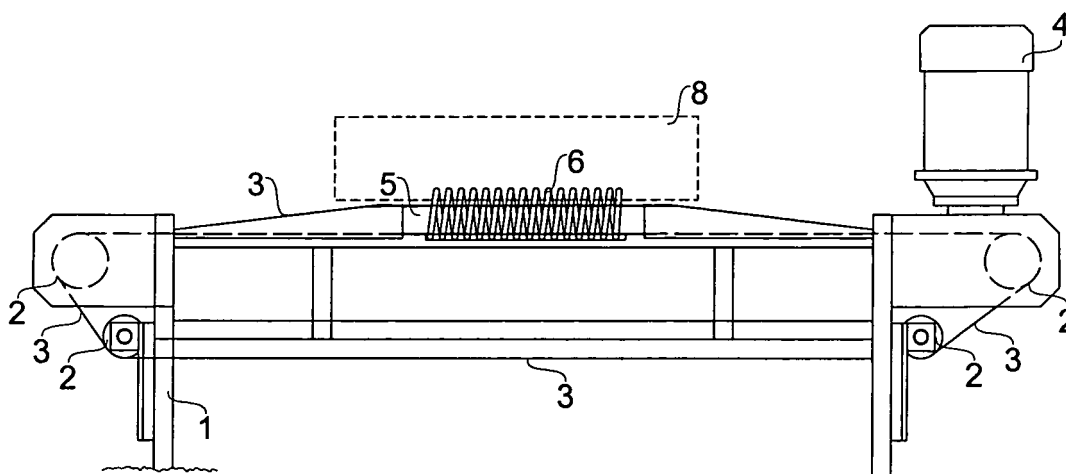


Fig. 1

Description

[0001] The present invention relates to an apparatus for drying metal pieces, and in particular metal pieces coming for example from a finishing machine.

[0002] Known apparatuses for drying metal pieces comprise vibrating machines suitable for separating wet sawdust from the metal pieces, after the latter have been mixed with said sawdust for absorbing the liquids used for their surface treatment, for example in a finishing machine. These known apparatuses require high drying times and energy consumptions, since it is difficult to clean the metal pieces from the sawdust, especially if said pieces are small. Other known apparatuses employ hot air, so that they require even higher drying times and energy consumptions.

[0003] It is therefore an object of the present invention to provide a drying apparatus free from said disadvantages. Said object is achieved with an apparatus, the main features of which are disclosed in the first claim, while other features are disclosed in the subsequent claims.

[0004] Thanks to its particular drying devices, the apparatus according to the present invention can dry in a short time and with a relatively low energy consumption a large amount of metal pieces. Said drying devices comprise particular conveyor belts, ducts and inductors, the peculiar technical features of which improve the efficiency, the safety and the reliability of the apparatus.

[0005] The apparatus according to the present invention is preferably provided with one or two vibrating chutes for adjusting the flow of metal pieces toward the drying devices, even when these pieces are loaded in a discontinuous manner.

[0006] Further advantages and features of the apparatus according to the present invention will become clear to those skilled in the art from the following detailed and non-limiting description of an embodiment thereof with reference to the attached drawings, wherein:

- figure 1 shows a side view of the drying device of the apparatus;
- figure 2 shows a front view of the drying device of figure 1;
- figure 3 shows a top view of the drying device of figure 1;
- figure 4 shows a side view of the apparatus; and
- figure 5 shows a top view of the apparatus.

[0007] Referring to figures 1 to 3, it is seen that the apparatus according to the present invention comprises one or more drying devices provided with a frame 1 which supports in a rotating manner a plurality of wheels or rollers 2 suitable for rotating around a substantially horizontal axis for driving a conveyor belt 3 by means of at least one motor 4. The upper portion of the conveyor belt 3 passes through a duct 5, so that the portion of the conveyor belt 3 comprised in this duct is curved by the inner

walls of duct 5 for forming a concave canal suitable for containing metal pieces. The conveyor belt 3 is made of a flexible and electrically insulating material, in particular Teflon® or silicone rubber. Duct 5 has a substantially cylindrical shape, in particular with a circular cross-section, is made of an electrically insulating material with a low-friction, in particular Teflon®, and is provided with a plurality of holes along at least its upper portion. The diameter of said holes is comprised between 0,5 and 2 mm. Duct 5 is suitably arranged in the turns of an inductor 6 which is connected to an electric control unit 7 for generating an electromagnetic field suitable for heating by induction the metal pieces transported by the conveyor belt 3. The electromagnetic field generated by inductor 6 is preferably aperiodic with a frequency comprised between 100 and 400 kHz and a maximum useful power of 10 kW. Duct 5 and inductor 6 are preferably coaxial. At least one thermal sensor measures the temperature in duct 5 and is connected to the electric control unit 7 for automatically adjusting the power of inductor 6, i.e. the temperature of the metal pieces, so as to avoid an overheating thereof. The speed of the conveyor belt 3 is comprised between 0,05 and 0,5 m/s according to the power transmitted by inductor 6 and to the size of the metal pieces. An exhaust hood 8 (shown only in figure 1 with a broken line) is arranged above duct 5 for sucking the water vapor generated by the heating of the metal pieces.

[0008] Figures 4 and 5 show the apparatus according to the present embodiment, which comprises two drying devices arranged side by side downstream of a first vibrating chute 9 suitable for uniformly distributing the metal pieces before letting them fall onto the conveyor belts 3 of these drying devices. A second vibrating chute 10 is arranged upstream of the first vibrating chute 9 and is larger than the latter for accumulating the metal pieces and letting them fall into the first vibrating chute 9 with a substantially constant flow, even when the metal pieces are loaded in the second vibrating chute 10 in a discontinuous manner.

[0009] Possible variations and/or additions may be made by those skilled in the art to the hereinabove described and illustrated embodiment of the invention while remaining within the scope of the following claims.

Claims

1. Apparatus for drying metal pieces, **characterized in that** it comprises one or more drying devices (3, 5, 6) provided with a conveyor belt (3) passing through a duct (5), so that the portion of the conveyor belt (3) comprised in this duct is curved for forming a concave canal suitable for containing the metal pieces, said duct (5) being arranged in the turns of an inductor (6) for generating an electromagnetic field suitable for heating by induction the metal pieces transported by the conveyor belt (3).

2. Apparatus according to the previous claim, **characterized in that** said duct (5) has a substantially cylindrical shape, in particular with a circular cross-section.
3. Apparatus according to one of the previous claims, **characterized in that** said duct (5) is made of Teflon®.
4. Apparatus according to one of the previous claims, **characterized in that** said duct (5) is provided with a plurality of holes along at least its upper portion.
5. Apparatus according to one of the previous claims, **characterized in that** the diameter of said holes is comprised between 0,5 and 2 mm.
6. Apparatus according to one of the previous claims, **characterized in that** the conveyor belt (3) is made of Teflon® or silicone rubber.
7. Apparatus according to one of the previous claims, **characterized in that** the duct (5) and the inductor (6) are coaxial.
8. Apparatus according to one of the previous claims, **characterized in that** the electromagnetic field generated by the inductor (6) is aperiodic.
9. Apparatus according to one of the previous claims, **characterized in that** the frequency of the electromagnetic field generated by the inductor (6) is comprised between 100 and 400 kHz.
10. Apparatus according to one of the previous claims, **characterized in that** at least one thermal sensor measures the temperature in the duct (5) for automatically adjusting the power transmitted by the inductor (6).
11. Apparatus according to one of the previous claims, **characterized in that** the speed of the conveyor belt (3) is comprised between 0,05 and 0,5 m/s.
12. Apparatus according to one of the previous claims, **characterized in that** an exhaust hood (8) is arranged above the duct (5).
13. Apparatus according to one of the previous claims, **characterized in that** one or more drying devices (3, 5, 6) are arranged downstream of a first vibrating chute (9) suitable for uniformly distributing the metal pieces before letting them fall onto the conveyor belts (3) of these drying devices (3, 5, 6).
14. Apparatus according to the previous claim, **characterized in that** a second vibrating chute (10) is arranged upstream of the first vibrating chute (9) and

is larger than the latter for accumulating the metal pieces and letting them fall into the first vibrating chute (9) with a substantially constant flow.

Amended claims in accordance with Rule 86(2) EPC.

1. Apparatus for drying metal pieces, comprising one or more drying devices (3, 5, 6) provided with a conveyor belt (3) passing through a duct (5), said duct (5) being arranged in the turns of an inductor (6) for generating an electromagnetic field suitable for heating by induction the metal pieces transported by the conveyor belt (3), **characterized in that** the portion of the conveyor belt (3) comprised in said duct (5) is curved by the inner wall of the duct (5) so as to form a concave canal suitable for the containment of the metal pieces.

2. Apparatus according to the previous claim, **characterized in that** said duct (5) has a substantially cylindrical shape, in particular with a circular cross-section.

3. Apparatus according to one of the previous claims, **characterized in that** said duct (5) is made of Teflon®.

4. Apparatus according to one of the previous claims, **characterized in that** said duct (5) is provided with a plurality of holes along at least its upper portion.

5. Apparatus according to one of the previous claims, **characterized in that** the diameter of said holes is comprised between 0,5 and 2 mm.

6. Apparatus according to one of the previous claims, **characterized in that** the conveyor belt (3) is made of Teflon® or silicone rubber.

7. Apparatus according to one of the previous claims, **characterized in that** the duct (5) and the inductor (6) are coaxial.

8. Apparatus according to one of the previous claims, **characterized in that** the electromagnetic field generated by the inductor (6) is aperiodic.

9. Apparatus according to one of the previous claims, **characterized in that** the frequency of the electromagnetic field generated by the inductor (6) is comprised between 100 and 400 kHz.

10. Apparatus according to one of the previous claims, **characterized in that** at least one thermal sensor measures the temperature in the duct (5) for automatically adjusting the power transmitted by the inductor (6).

11. Apparatus according to one of the previous claims, **characterized in that** the speed of the conveyor belt (3) is comprised between 0,05 and 0,5 m/s.

12. Apparatus according to one of the previous claims, **characterized in that** an exhaust hood (8) is arranged above the duct (5). 5

13. Apparatus according to one of the previous claims, **characterized in that** one or more drying devices (3, 5, 6) are arranged downstream of a first vibrating chute (9) suitable for uniformly distributing the metal pieces before letting them fall onto the conveyor belts (3) of these drying devices (3, 5, 6). 10

14. Apparatus according to the previous claim, **characterized in that** a second vibrating chute (10) is arranged upstream of the first vibrating chute (9) and is larger than the latter for accumulating the metal pieces and letting them fall into the first vibrating chute (9) with a substantially constant flow. 15 20

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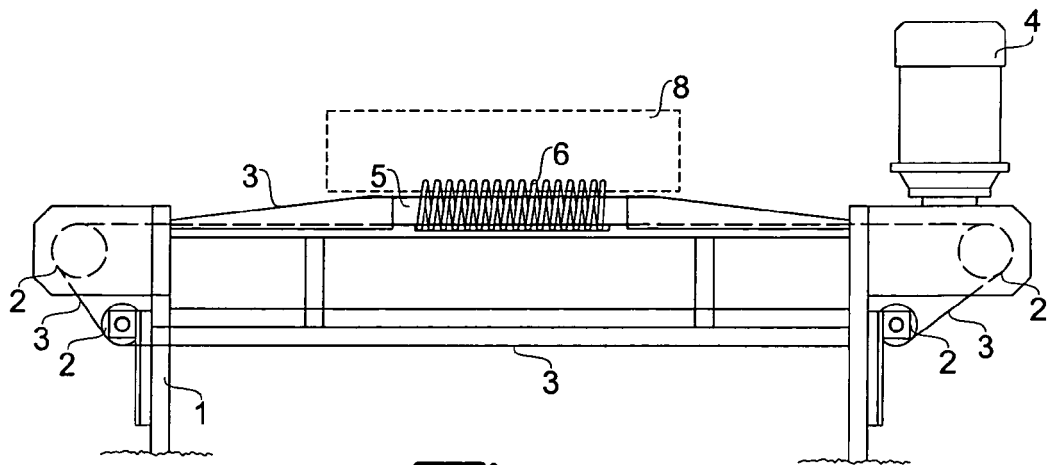


Fig. 1

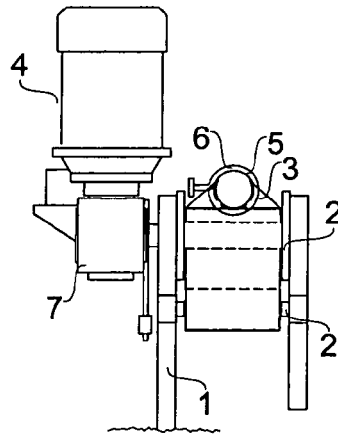


Fig. 2

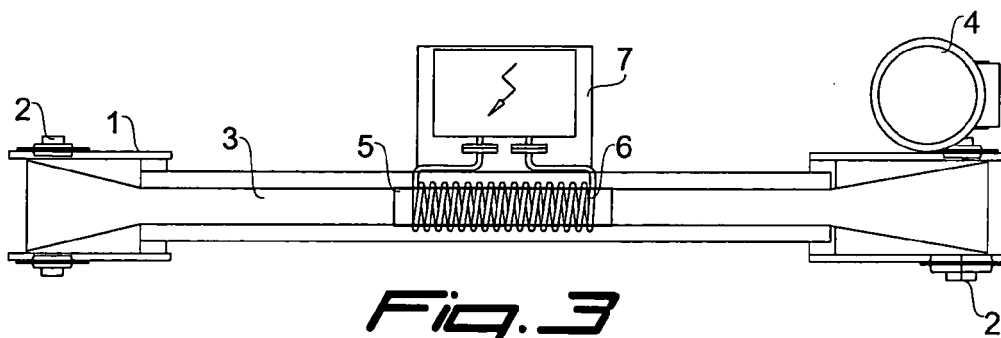


Fig. 3

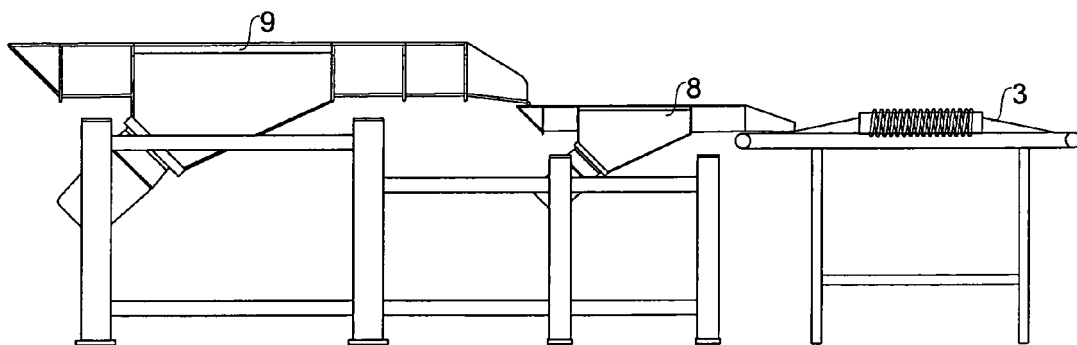


Fig. 4

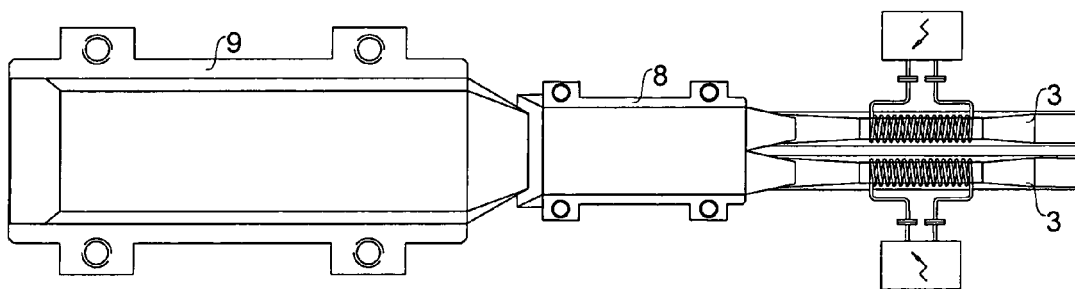


Fig. 5



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 42 5126

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Place of search The Hague		Date of completion of the search 31 July 2006	Examiner Silvis, H	
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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