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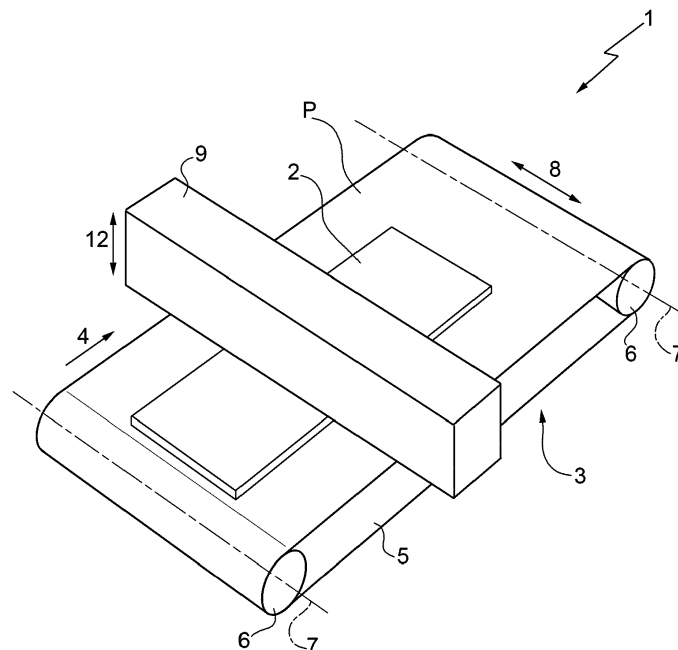
**10121 Torino (IT)**

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(54) **DEBURRING MACHINE FOR THE FINISHING OF ELEMENTS MADE OF WOOD, METAL, PLASTIC MATERIAL OR THE LIKE**

(57) In a deburring machine for the finishing of elements (2) made of wood, metal, plastic material or the like, each element (2) is fed through a deburring assembly (9), which is mounted crosswise to a feeding direction (4) of the element (2) and is provided with a plurality of

tool-holder spindles (15), each designed to receive and hold a respective finishing tool and mounted so as to rotate in a rotation direction that is the same as a rotation direction of the other tool-holder spindles (15).



**FIG.1**

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## Description

### CROSS-REFERENCE TO RELATED APPLICATIONS

**[0001]** This patent application claims priority from Italian patent application no. 102019000024631 filed on December 19, 2019.

### TECHNICAL FIELD

**[0002]** The invention relates to a deburring machine for the finishing of elements made of wood, metal, plastic material or the like.

**[0003]** In particular, the invention can be applied in a particularly advantageous manner to the removal of burrs from elements obtained by cutting sheet metal.

### PRIOR ART

**[0004]** When dealing with the finishing of elements made of wood, metal, plastic material or the like, a deburring machine is known, which comprises a conveyor belt, which has an upper transport branch defining a substantially horizontal support surface for at least one element and is designed to feed the element in a first direction; and a deburring assembly, which is mounted above the support surface crosswise to the first direction.

**[0005]** The deburring assembly generally comprises a plurality of tool-holder spindles, which are mounted so as to rotate around respective rotation axes parallel to one another and substantially perpendicular to the support surface and are designed to each receive and hold a respective finishing tool.

**[0006]** The rotation axes of the tool-holder spindles are aligned with one another in a second direction, which is transverse to the first direction and parallel to the support surface.

**[0007]** The tool-holder spindles are caused to rotate around the relative rotation axes by an operating device comprising, for each tool-holder spindle, a respective toothed pulley, which is angularly integral to the tool-holder spindle.

**[0008]** The operating device further comprises a drive belt, which is delimited by two toothed faces opposite one another and has a drive branch, which is wound in a zigzag shape around the toothed pulleys of the tool-holder spindles.

**[0009]** Since the drive branch is wound in a zigzag shape around the toothed pulleys and each tool-holder spindle is moved around the relative rotation axis in a rotation direction that is contrary to a rotation direction of each adjacent tool-holder spindle, known deburring machines of the type described above are affected by some drawbacks mainly due to the fact that each element processed by the finishing tools of two adjacent tool-holder spindles is subjected to respective concordant thrust forces, which can cause the movement of the element relative to the conveyor belt and jeopardize the precision

of the deburring processing.

**[0010]** Furthermore, known deburring machines of the type described above suffer from a further drawback lying in the fact that the opposite rotation directions of two adjacent tool-holder spindles compromise the uniformity of the deburring operations carried out on each element, in particular in the area of a front end and of a rear end of the element.

### 10 SUBJECT-MATTER OF THE INVENTION

**[0011]** The object of the invention is to provide a deburring machine for the finishing of elements made of wood, metal, plastic material or the like, which does not suffer from the aforementioned drawbacks and can be manufactured in a simple and economic fashion.

**[0012]** According to the invention, there is provided a deburring machine for the finishing of elements made of wood, metal, plastic material or the like according to the appended claims.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0013]** The invention will now be described with reference to the accompanying drawings, showing a non-limiting embodiment thereof, wherein:

figure 1 is a schematic perspective view, with parts removed for greater clarity, of a preferred embodiment of the deburring machine according to the invention;

figure 2 is a schematic perspective view, with parts removed for greater clarity, of a detail of the deburring machine of figure 1;

figure 3 is a schematic perspective view, with parts removed for greater clarity, of a detail of figure 2; and figure 4 is a longitudinal section, with parts removed for greater clarity, of the detail of figure 3.

### 40 PREFERRED EMBODIMENT OF THE INVENTION

**[0014]** With reference to figure 1, number 1 indicates, as a whole, a deburring machine for the finishing of elements 2 made of wood, metal, plastic material or the like.

**[0015]** The deburring machine 1 comprises a feeding device 3 to feed the elements 2 one after the other in a horizontal direction 4.

**[0016]** The device 3 comprises a conveyor belt 5, which has an upper transport branch defining a horizontal support surface P for the elements 2 and is wound in a ring shape around a pair of motor-driven pulleys 6, which are mounted so as to rotate around respective longitudinal axes 7, which are parallel to one another and to a horizontal direction 8, which is transverse to the direction 4.

**[0017]** The deburring machine 1 is further provided with a deburring assembly 9 comprising a gantry frame 10, which is mounted above the conveyor 5 and extends

in the direction 8.

**[0018]** The frame 10 supports a vertical slide 11, which is coupled to the frame 10 in a known manner so as to make, relative to the frame 10, straight movements in a vertical direction 12, which is orthogonal to the directions 4 and 8.

**[0019]** The assembly 9 further comprises a substantially flat horizontal plate 13, which extends above the plane P in the direction 8, is coupled to the slide 11 in a sliding manner and is moved, relative to the slide 11 and due to the thrust of a known operating device 14, with an oscillatory motion in the direction 8.

**[0020]** The plate 13 supports a plurality of tool-holder spindles 15, which extend through the plate 13 parallel to the direction 12 and are aligned with one another in the direction 8.

**[0021]** The spindles 15 are mounted so as to rotate, relative to the plate 13 and in ways that are better described below, around respective rotation axes 16 parallel to one another and to the direction 12 and are designed to each receive and hold a respective known finishing tool, which is not shown herein.

**[0022]** Each spindle 15 carries, by means of a spline, a toothed pulley 17 mounted coaxially to the relative axis 16 and is engaged in a rotary manner through an idler pulley 18, which is delimited by a smooth side face coaxial to the relative axis 16 and is mounted so as to rotate, relative to the spindle 15, around the relative axis 16.

**[0023]** The toothed pulley 17 of each spindle 15 faces in a radial manner, namely crosswise to the relative axis 16 and in the direction 8, the idler pulley 18 of each adjacent spindle 15 and the idler pulley 18 of each spindle 15 faces in a radial manner, namely crosswise to the relative axis 16 and in the direction 8, the toothed pulley 17 of each adjacent spindle 15.

**[0024]** The toothed pulleys 17 and the idler pulleys 18 define part of a belt transmission system 19, which is designed to move the spindles 15 around the relative axes 16.

**[0025]** The system 19 further comprises two toothed pulleys 20 extending in two containing planes, which are parallel to one another and perpendicular to the direction 12.

**[0026]** Each belt 20 has a toothed face and is wound in a zigzag shape around a relative group of toothed pulleys 17 and idler pulleys 18.

**[0027]** In other words, each belt 20 is alternatively wound in a zigzag shape around a toothed pulley 17 and an idler pulley 18 so as to allow a relatively small distance between adjacent axes 16.

**[0028]** Furthermore, each belt 20 is wound around a pair of further toothed pulleys 21, 22, which are mounted on the outside of the plate 13 and are coupled to the slide 11 in a rotary manner so as to rotate, relative to the slide 11, around respective rotation axes 23, 24, which are parallel to one another and to the axes 16.

**[0029]** The two toothed pulleys 21 are mounted on a first transmission shaft 25, which is coaxial to the axis

23, and the two toothed pulleys 22 are mounted on a second transmission shaft 26, which is coaxial to the axis 24.

**[0030]** The toothed pulleys 21, 22 and, hence, the belts 20 are caused to rotate by an electric motor 27, which is mounted on the slide 11 parallel to the direction 12 and has an output shaft 28 connected to the shaft 25 by means of a transmission belt 29, which is wound in a ring shape around a pair of toothed pulleys 30 splined on the shafts 25 and 28.

**[0031]** With regard to the description above, it should be pointed out that each belt 20 is further wound around at least one idler roller 31, which is fitted, in a rotary manner, on a support pin 32 mounted on the plate 13 parallel to the direction 12.

**[0032]** Each roller 31 of each belt 20 is mounted coaxially to a corresponding roller 31 of the other belt 20 and is arranged between one of the shafts 25, 26 and the adjacent spindle 15. As a consequence, each belt 20 comprises, for each idler roller 31, a curved segment 20a extending around the roller 31 and two straight segments 20b, which are parallel to one another and are connected to the free ends of the curved segment 20a.

**[0033]** The deburring machine 1 has some advantages which mainly arise from the fact that the arrangement and the configuration of the belts 20 allow each spindle 15 to be moved around the relative axis 16 with a rotation direction that is the same as the rotation direction of all the other spindles 15.

**[0034]** As a consequence:

the thrust forces exerted upon each element 2 by the finishing tools (not shown) of two adjacent spindles 15 are oriented according to opposite and parallel directions and, therefore, substantially balance each other out, thus preventing the element 2 from being moved relative to the conveyor 5 and avoiding jeopardizing the precision of the deburring processing; and the deburring operations carried out on each element 2, in particular in the area of a front end and of a rear end of the element 2, have a relatively high uniformity and homogeneity.

## Claims

1. A deburring machine for the finishing of elements (2) made of wood, metal, plastic material or the like, the deburring machine comprising a feeding device (3), which defines a support surface (P) for at least one element (2) and is designed to feed the element (2) in a first direction (4); and a deburring assembly (9), which is mounted above the support surface (P) crosswise to the first direction (4) and comprises, in turn, a plurality of tool-holder spindles (15), which are mounted so as to rotate around respective rotation axes (16) parallel to one another and substan-

- tially perpendicular to the support surface (P) and are designed to each receive and hold a respective finishing tool; and being **characterized in that** the deburring assembly (9) further comprises an operating device (19) to move each tool-holder spindle (15) around the relative rotation axis (16) in a rotation direction that is the same as a rotation direction of the other tool-holder spindles (15).
2. A deburring machine according to claim 1, wherein the operating device (19) comprises, for each tool-holder spindle (15), a respective toothed pulley (17), which is angularly integral to the tool-holder spindle (15), and a respective idler pulley (18), which is fitted on the tool-holder spindle (15) in a rotary manner.
  3. A deburring machine according to claim 2, wherein the toothed pulley (17) of each tool-holder spindle (15) is aligned, crosswise to the relative rotation axis (16), with the idler pulley (18) of each adjacent tool-holder spindle (15), and wherein the idler pulley (18) of each tool-holder spindle (15) is aligned, crosswise to the relative rotation axis (16), with the toothed pulley (17) of each adjacent tool-holder spindle (15).
  4. A deburring machine according to claim 3, wherein the operating device (19) comprises two toothed belts (20), which extend in respective containing planes parallel to one another and perpendicular to the rotation axes (16) of the tool-holder spindles (15); each toothed belt (20) being wound around a relative plurality of toothed pulleys (17) and idler pulleys (18) of the tool-holder spindles (15).
  5. A deburring machine according to claim 4, wherein each toothed belt (20) has a branch, which is wound in a zigzag shape around the relative toothed pulleys (17) and idler pulleys (18).
  6. A deburring machine according to any one of the claims from 2 to 5, wherein each idler pulley (18) is delimited by a smooth side surface, which is coaxial to the relative rotation axis (16).
  7. A deburring machine according to any one of the preceding claims, wherein the rotation axes (16) of the tool-holder spindles (15) are aligned with one another in a second direction (8), which is substantially transverse to the first direction (4) and parallel to the support surface (P).
  8. A deburring machine according to any one of the preceding claims, wherein the deburring assembly (9) further comprises a support frame (10, 11) and an oscillating plate (13), which is mounted so as to oscillate, relative to the support frame (10, 11), in a second direction (8), which is substantially transverse to the first direction (4) and parallel to the support surface (P); the tool-holder spindles (15) being engaged in a rotary manner through the oscillating plate (13).
  9. A deburring machine according to claim 8, when it depends on claim 4 or 5, wherein the operating device (19) further comprises, for each toothed belt (20), two respective further toothed pulleys (21, 22), which are arranged on opposite sides of the tool-holder spindles (15) in the second direction (8), are mounted on the outside of the oscillating plate (13) and are coupled to the support frame (10, 11) in a rotary manner so as to rotate around respective further rotation axes (23, 24), which are parallel to one another and to the rotation axes (16) of the tool-holder spindles (15).
  10. A deburring machine according to claim 9, wherein each toothed belt (20) comprises, for each further toothed pulley (21, 22), a respective curved segment (20a) extending around the further toothed pulley (21, 22) and two respective straight segments (20b), which are parallel to one another and are connected to the free ends of the curved segment (20a).
  11. A deburring machine according to claim 9 or 10, wherein each further toothed pulley (21, 22) of each toothed belt (20) is coaxial to a further toothed pulley (21, 22) of the other toothed belt (20).
  12. A deburring machine according to any one of the claims from 9 to 11, wherein the operating device (19) further comprises an electric motor (27), a driving pulley (30), which is coaxial to a further rotation axis (23), and a transmission belt (29), which is interposed between an output shaft (28) of the electric motor (27) and the driving pulley (30).

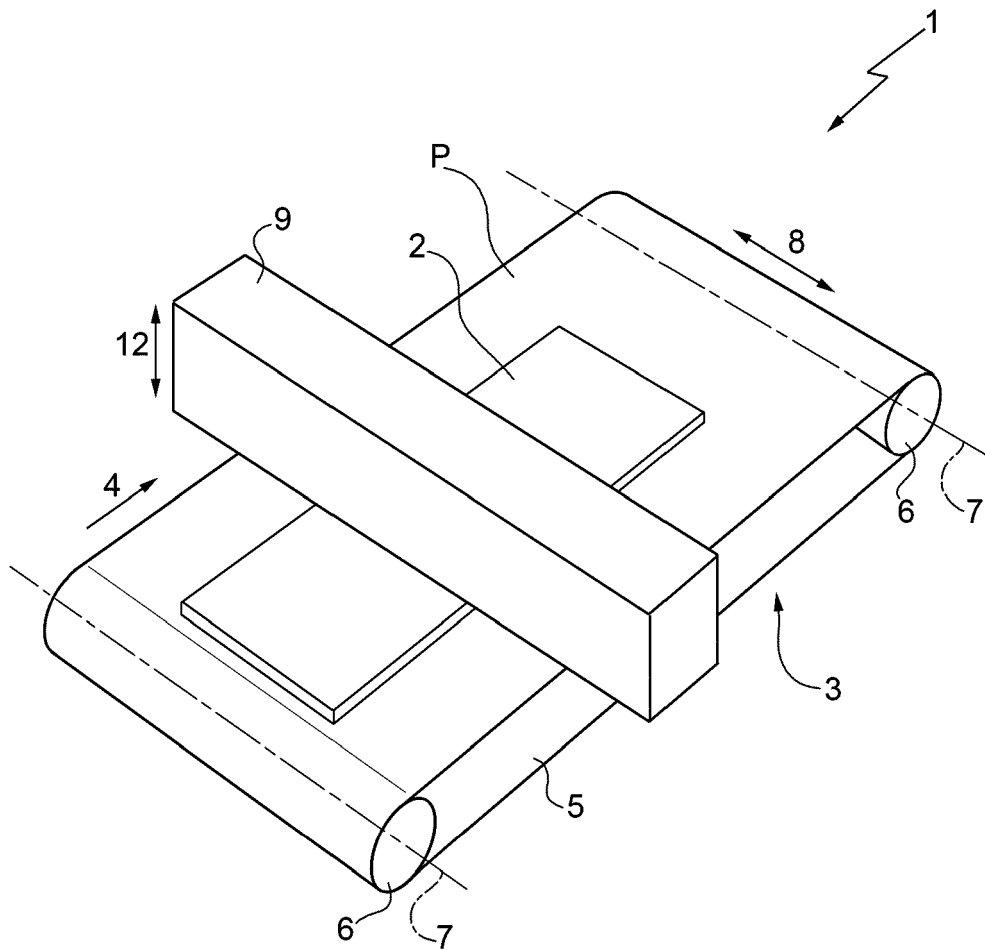


FIG.1

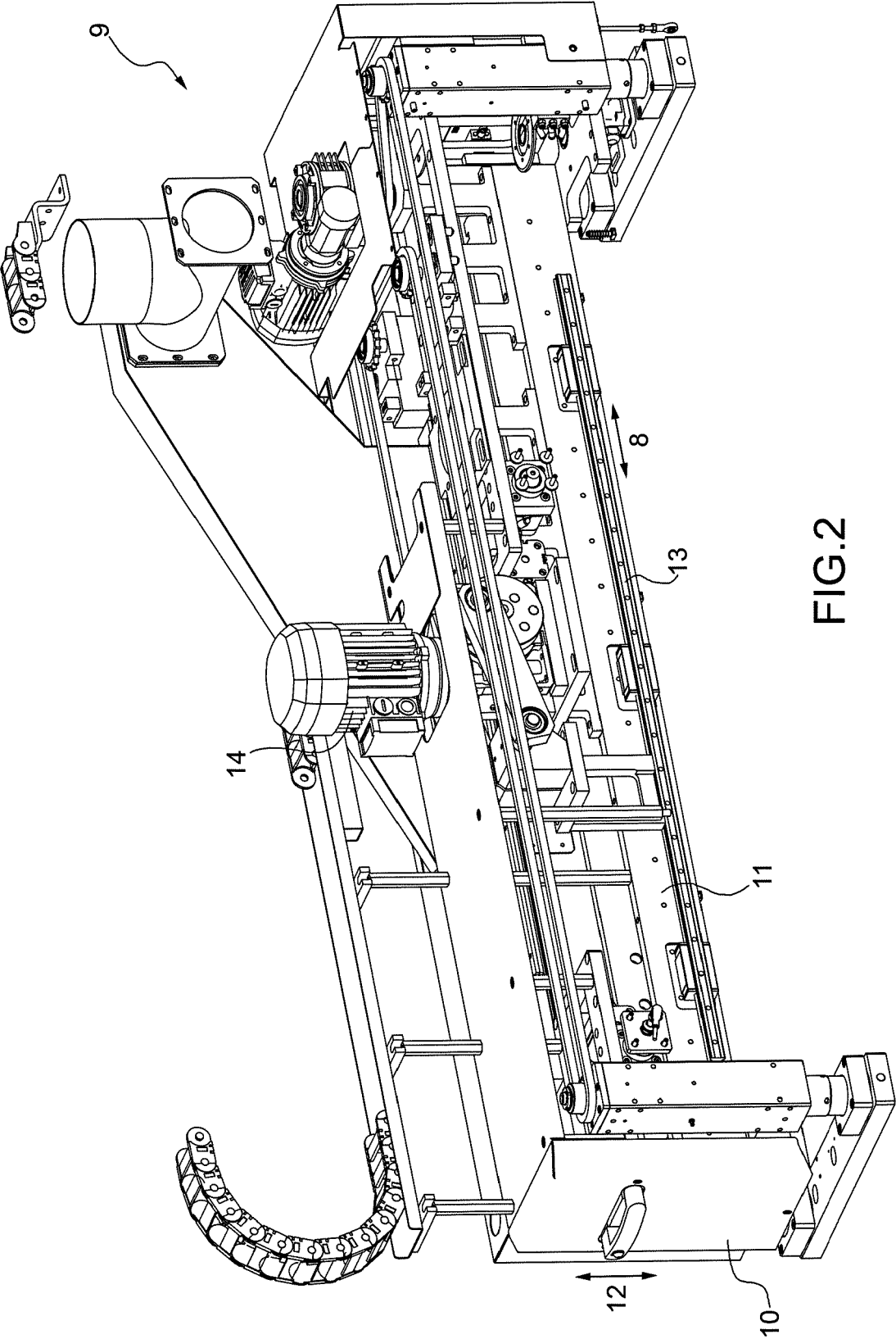


FIG.2

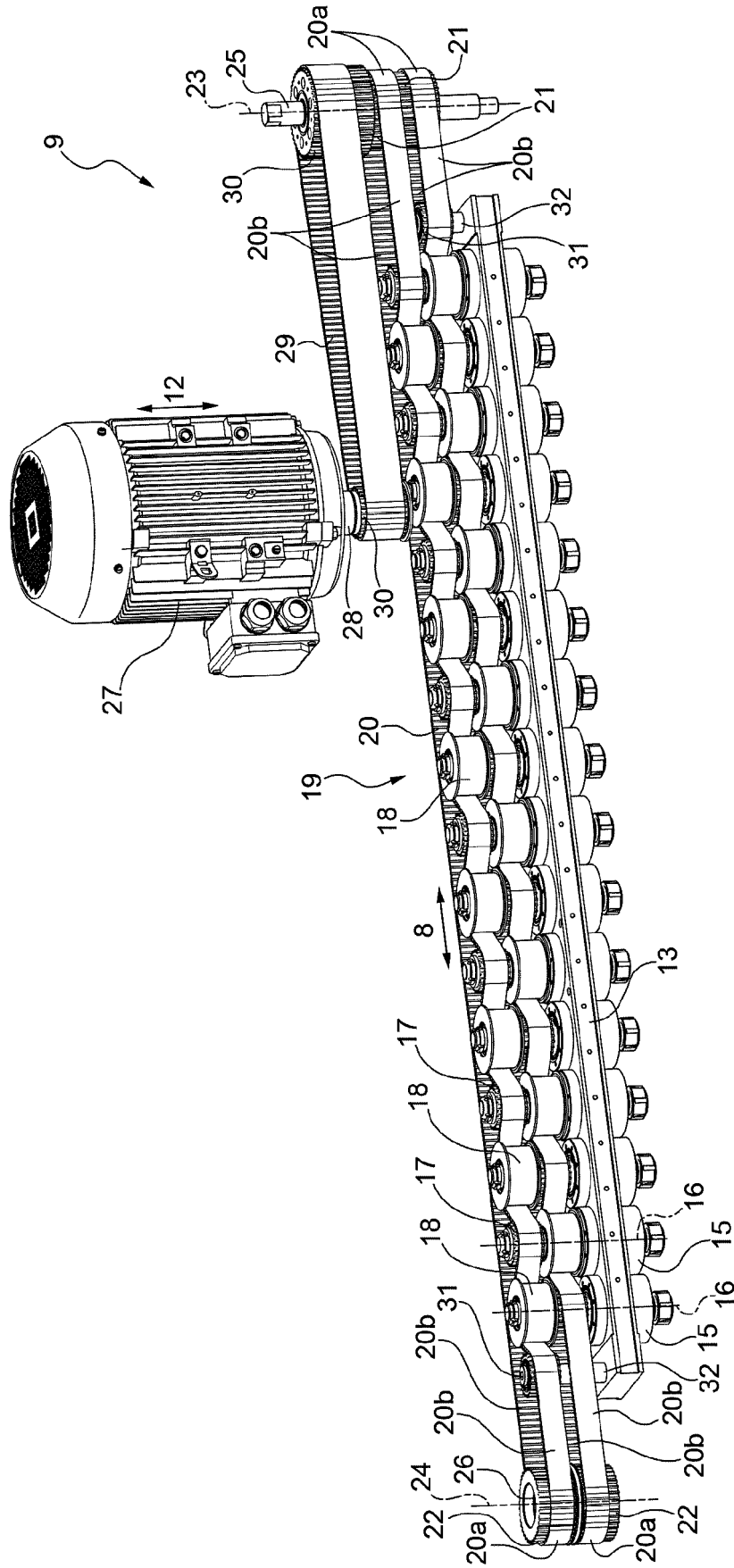


FIG.3

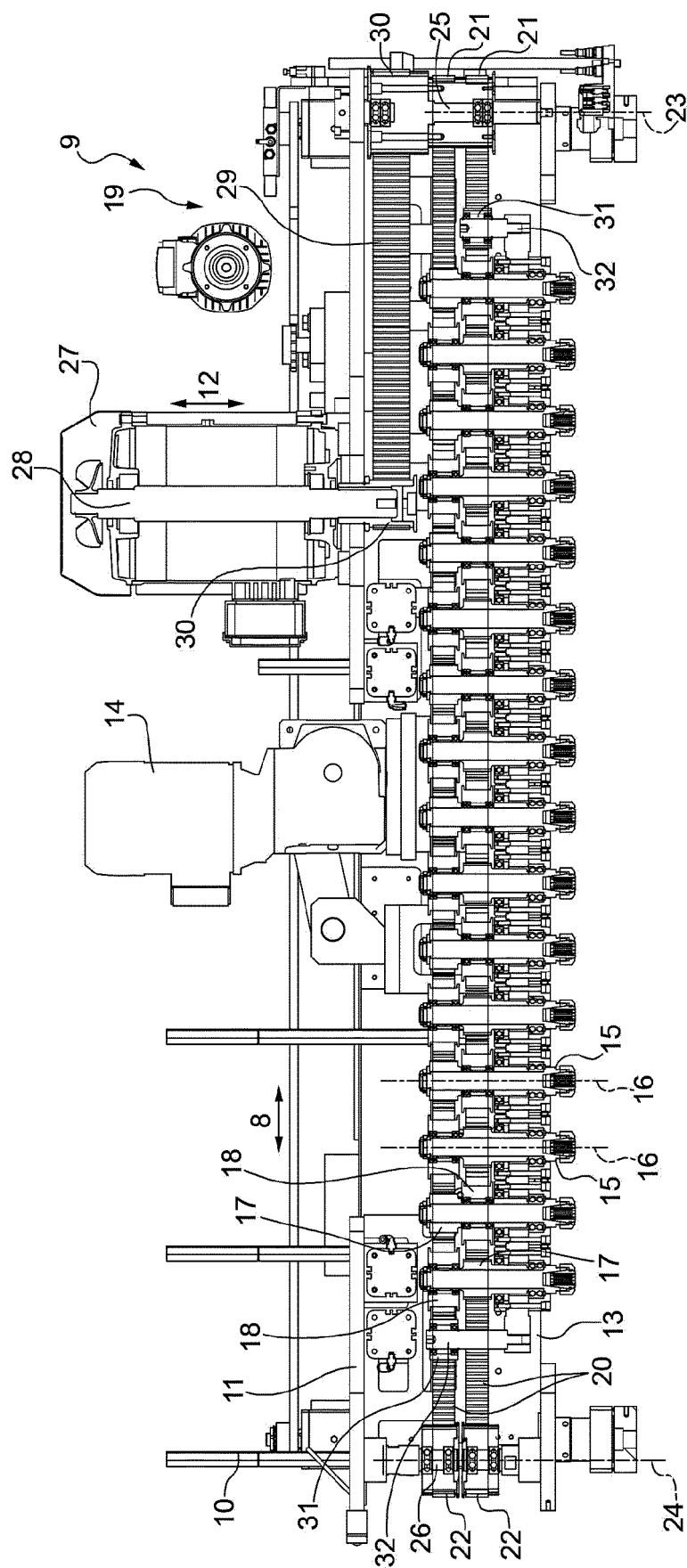


FIG.4



## EUROPEAN SEARCH REPORT

Application Number  
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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                         |                                                   |                                            |
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| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                         |                                                   |                                            |
| Place of search<br>Munich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                         | Date of completion of the search<br>19 April 2021 | Examiner<br>Kornmeier, Martin              |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                                                         |                                                   |                                            |

EPO FORM 1503 03.82 (P04C01)

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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