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Hand-held rotary bushhammering apparatus.

A rotary bushhammering apparatus comprises a head (26, 119) having a hub (15, 115) connected for rotation to a rotary shaft (16, 112). The head (26, 119) in turn comprises a plurality of freely rotating rollers (12, 117) the axis of which is disposed radially to the rotation axis of the head, each roller having radially projecting points (14, 118) on its peripheral surface, so that on rotation of the head (26, 119), it is driven to roll on a surface to be worked, the points thus scratching said surface to be worked. A mass (20, 121) weighing on the rollers (12, 117) is supported between the rotary shaft (16, 112) and head (26, 119) so that said rollers (12, 117) can exert pressure against the surface to be worked, the mass (20, 121) being prevented from rotating with the head (26, 119). Advantageously, the head (26) can be connected to the rotary shaft (16) by interposition of an articulated joint (25) enabling the free inclination of the head (26) rotation plane with respect to the rotation axis of the shaft (16). In this way, the working of the curved surfaces is permitted.

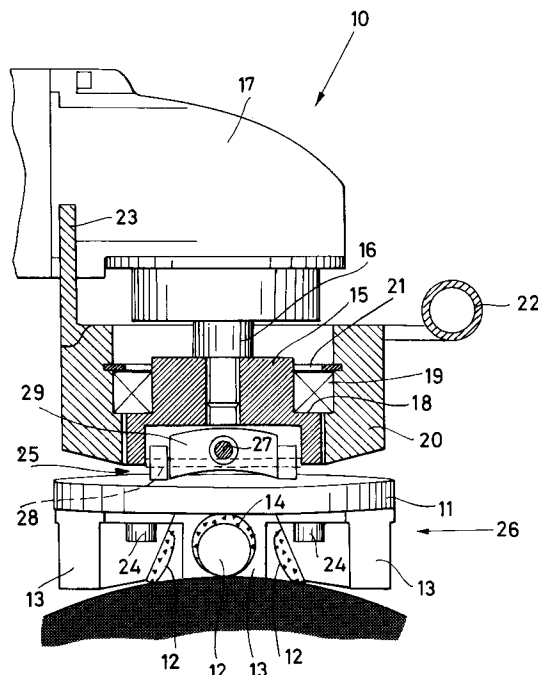


Fig.1

Machines carrying out a particular working known as bushhammering on surfaces made of stone, marble, granite, conglomerate, etc. are known.

These machines comprise a rotary head or disc supporting freely rotating rollers at the lower part thereof, the axis of said rollers being disposed parallel and radial to the head plate and the rollers having radially projecting points on their surfaces.

As the plate rotates, the rollers roll on the surface to be worked and the points produce a plurality of scratches typical of bushhammering.

It is obvious that an important parameter for uniformity and quality in working is the pressure adapted in pushing the rollers against the surface to be worked.

Rotary bushhammering machines, operating as above specified, may be of the stationary type in which the tool formed with the plate and rollers is fixed on a framework and the surfaces to be worked consisting of plates are fed to the tool along a working plan located under the tool itself. Under this situation, the roller thrust is given by actuator means and linkages urging the tool towards the working plan. There are also other models designed to carry out workings on already laid floorings. They consist of big machines such as planing-polishing machines to the lower part of which the bushhammering tool is fitted.

Generally these rotary bushhammering machines are therefore big-sized machines the weight of which is sufficient to give the rollers the required pressure.

For this reason, at the present state of the art bushhammering apparatus are only used for bushhammering individual flat plates or floorings.

The general object of the present invention is to provide a rotary bushhammering apparatus to be used as a small hand-held electrical device for the easy accomplishment or finish of a bushhammering operation on the most different surfaces which may not necessarily be wide floorings or single plates not yet laid.

A further object of the present invention is to provide an hand-held tool for carrying out a bushhammering operation on curved surfaces as well.

In view of the above object, in accordance with the invention a rotary bushhammering apparatus has been devised which comprises a head having a hub connected for rotation to a rotary shaft, the head being provided with a plurality of freely rotating rollers the axis of which is disposed substantially radial to the rotation axis of the head, each roller having radially projecting points on its surface so that on rotation of the head, it is caused to roll on a surface to be worked, the points thus scratching said surface to be worked, characterized in that a mass is supported between the rotary shaft and

the head and it weighs on the rollers to make them exert pressure against the surface to be worked, said mass being prevented from rotating with the head.

For better explaining the innovatory principles of the present invention and the advantages it offers as compared to the known art, possible embodiments of the invention putting said principles into practice will be given hereinafter by way of non-limiting examples, with reference to the accompanying drawings, in which:

- Fig. 1 is a part sectional side view of a tool of the invention, the rollers being disposed according to a first configuration;
- Fig. 2 is a plan view seen from the roller side of the tool shown in Fig. 1, the rollers being however disposed in a second configuration;
- Fig. 3 is a diagrammatic view of the rollers according to the configuration shown in Fig. 2, while concave surfaces are being worked;
- Fig. 4 is a part sectional side view of a second embodiment of a tool according to the invention.

With reference to the drawings, Figure 4 is a diagrammatic side view, partly in section, of a manual hand-held apparatus in accordance with the invention. This apparatus, generally identified by 110, comprises a tool unit 114 in which a rotary working head 119 carries a plurality of freely rotating rollers 117 at the lower part thereof, the axis of said rollers being disposed substantially radial to the rotation axis of the head 119 and the rollers having radially projecting points 118 on their surfaces. The head 119 is comprised at the upper part thereof, of a central hub 115 axially connected (by screw thread engagement, for example) to a drive shaft 112 of a driving device 111 made in the form of a power driven handle, for example a manual power driven device (already known and therefore only partly shown) such as an angular sand papering machine or the like having the innovatory bushhammering tool unit 114 instead of the usual tools.

A mass 121 which is prevented from rotating with the head 126 is supported between the head 119 and drive shaft 112.

The mass 121 may be made for example in the form of a thick axially-hollow metal disc designed to rotatably receive the hub 115.

Advantageously, for supporting said mass the hub 115 comprises a radial abutment 128 on which the mass rests in an axial direction to the shaft, a rolling bearing 120 held in place by a circlip 122 being interposed.

Still advantageously, a handgrip 123 is connected to the mass and it projects from the opposite side with respect to the extension of the power driven handle 111. Also projecting from the mass are tailpieces 126 coming in contact with the

body of the hand-held device 111 in order to prevent free rotation of the mass 121 relative thereto.

The handgrip 123 may be for example fastened to the upper part of the mass 121 by means of two parallel arms 124, 125 the ends of which, opposite the handgrip 123, terminate each with a cranked piece so as to form the interlocking tail-pieces 126.

In use it is sufficient to hold the power driven handle 111 in one hand and the handgrip 123 in the other, start the tool and make it slide keeping the rollers 117 in contact with the surface to be worked.

The mass 121 supplies the rollers 117 with the necessary pressure to be exerted on the surface to be worked without the operator getting tired. The particular arrangement of the mass enables a mass of relatively high weight to be used without encountering undesirable effects. In fact, being the mass supported by the hub 115, its weight is directly discharged onto the rollers 117 and does not weigh on the power driven handle 111, which would stress the mechanics thereof too greatly and above all the rolling bearings of the drive shaft 112. In addition, although the mass 121 is supported by the hub 115, it does not rotate with said hub and therefore a gyroscopic effect that would prevent a comfortable orientation of the tool in work is avoided.

With reference to the Figures 1-3, a different embodiment according to the invention is shown. Shown in Fig. 1 is a hand-held tool embodied in accordance with the invention and generally identified by reference numeral 10. This tool comprises a working head 26 in turn comprising a disc-shaped plate 11 on the lower face of which there is a plurality of freely rotating rollers 12 supported by means of supports 13 and the axes of which are disposed substantially radial to the plate 11. Each roller has radially projecting points or teeth 14 on its side surface and the head 11 is connected for rotation to a rotary shaft or hub 15 so that the rollers are driven in rotation when they rest on the surface to be worked, the teeth scratching said surface in the typical manner of bushhammering. For example, the shaft 15 may be powered by screw connection to a drive shaft 16 of an electric driving device 17. The hub 15 comprises a radial projection forming an abutment 18 for supporting a mass 20 in an axial direction with respect to the shaft (by interposition of a rolling bearing 19 held in place by a circlip 21). A handgrip 22 projects advantageously from the mass 20 on the side opposite the extension of the device 17, which is for example embodied by a power driven handle such as the one used in angular belt-sanding machines or the like.

In addition, the mass 20 has an end extension 23 interlocking with the device 17 so as to prevent the mass 21 from rotating therewith.

The head 26 is connected to the shaft 15 by interposition of an articulated joint 25 for enabling the free inclination of the head plane with respect to the rotation axis. For example, the joint 25 may be made in the form of a known universal joint consisting of a first pivoting element 27 normal to the rotation axis of the shaft 16 or integral therewith, and a second pivoting element 28 (normal to the first element and the rotation axis of the shaft) integral with the head. The first and second pivoting elements are interconnected with each other by an element or body 29.

Advantageously, the body 29 can be made of an appropriate resilient material so that the joint also performs the function of an absorber means for absorbing vibrations produced during the use of the tool.

As clearly shown in Fig. 2, the rollers are three in number and are distributed along the perimeter of the plate 11 equidistantly from each other.

Advantageously, each roller 12 is of truncated conical form and has its major base close to the respective support 13. It is provided with free axial rotation and its axis moves away from the plate plane as it approaches the minor base. The supports 13 are screwed to the plate 11 by means of screws 24 in a manner enabling them to be reversed; in other words, they can be fastened in such a manner that the rollers are faced towards each other, as shown in Fig. 1, or that the rollers are faced away from each other, as shown in Figs. 2 and 3. As respectively shown in Figs. 1 and 3, in the first position they can be put in contact with convex surfaces whereas in the second position they can be put in contact with concave surfaces without the supports interlocking with said surfaces even in the case of large bending radii.

In use it is sufficient to lay the rolls on the surface to be worked and start rotation of the tool. By virtue of the arrangement of the rollers according to the vertices of an equilateral triangle and the presence of the articulated joint, the working head can move on the curved surfaces freely assuming sloping positions (as diagrammatically shown in dotted line in Fig. 3), so that the rollers constantly lay on the surface being worked. This is made possible by the fact that the distance between the joint fulcrum and the curvilinear surface to be worked remains substantially unchanged as far as the tool rotates. It is therefore apparent that spherical, cylindrical or even more complicated curved surfaces can be easily followed.

At this point it is clear that the intended purposes are attained, as a bushhammering tool is provided which can be used manually in an easy

manner while at the same time ensuring the same qualitative results as the bench machines or bulky machines for floorings.

Obviously, the above description of embodiments applying the innovatory principles of the invention is given for purposes of illustration only and is not to be interpreted as a limitation of the inventive scope as herein claimed.

For example, the head plate supporting the rollers may be made detachable from the hub, so as to enable the roller set to be quickly replaced by another set having a different toothing for example, in order to adapt the apparatus to the required working degree or the particular material forming the surface to be worked.

In addition, the arrangement of the bearing and the conformation of the hub may be different from those shown, as may be easily conceived by a person skilled in the art. For example, the abutment can be eliminated and the mass may rest on another portion of the head, provided that the free rotation of the head with respect to the mass is ensured.

Moreover, a casing may be provided around the rotating parts for protecting the operator.

As may be easily understood by a person skilled in the art, the fastening system of the rollers to the working head may be different from the one shown. For example, the rollers may have a tipping axis for better suiting the sloping of the surface to be worked.

Claims

1. A rotary bushhammering apparatus comprising a head (26,119) having a hub (15, 115) connected for rotation to a rotary shaft (16, 112), the head (26, 119) being provided with a plurality of freely rotating rollers (12, 117) the axis of which is disposed radially to the rotation axis of the head, each roller having radially projecting points (14, 118) on its surface so that, on rotation of the head (26, 119), it is caused to roll on a surface to be worked, the points thus scratching said surface to be worked, characterized in that a mass (20, 121) is supported between the rotary shaft (16, 112) and the head (26, 119) and it weighs on the rollers (12, 117) to make them exert pressure on the surface to be worked, said mass (20, 121) being prevented from rotating with the head (26, 119).
2. A rotary bushhammering apparatus according to claim 1, characterized in that the interposition of rolling bearings (19, 120) is provided for supporting the mass (20, 121).

3. A rotary bushhammering apparatus according to claim 1, characterized in that the mass (20, 121) is supported on an abutment projecting radially from the hub (15, 115) so as to constitute a mass (20, 121) support in the axial direction of the hub.
4. A rotary bushhammering apparatus according to claim 1, characterized in that a handgrip (22, 123) is connected to the mass (20, 121).
5. A rotary bushhammering apparatus according to claim 1, characterized in that the drive shaft (16, 112) projects from the body of a manual hand-held power driven device (17, 111).
6. A rotary bushhammering apparatus according to claim 5, characterized in that tailpieces (23, 126) interferring with the body of the hand-held device (17, 111) project from the mass (20, 121) so as to prevent rotation of the mass (20, 121) relative to said device.
7. A rotary bushhammering apparatus according to claim 1, characterized in that the mass (20, 121) is axially hollow for receiving the head (26, 119) hub (15, 115).
8. A rotary bushhammering apparatus according to claim 1, characterized in that the head (26, 119) is connected to the rotary shaft (16, 112) by interposition of an articulated joint (25) enabling the free inclination of the head (26, 119) rotation plane with respect to the rotation axis of the shaft.
9. A rotary bushhammering apparatus according to claim 1, characterized in that the rollers (12, 117) are three in number and are disposed around the rotation axis of the head being equidistant from each other.
10. A rotary bushhammering apparatus according to claim 8, characterized in that the articulated joint (25) is a universal joint.
11. A rotary bushhammering apparatus according to claim 8, characterized in that the articulated joint (25) has a body (29) made of resilient material for absorbing the vibrations produced by rotation of the head (26).
12. A rotary bushhammering apparatus according to claim 8, characterized in that the rollers (12) are of truncated conical form and are supported by adjustable support means (13) for alternatively orienting the rollers (12) with their major base facing the centre or the periphery

of the head (26).

- 13.** A rotary bushhammering apparatus according to claim 12, characterized in that the rollers (12) are hung to the support means by their major base. 5
- 14.** A rotary bushhammering apparatus according to claim 12, characterized in that for orientation of the rollers, the support means is fastened to the head by screws, in a reversible manner. 10
- 15.** A rotary bushhammering apparatus according to claim 8, characterized in that the articulated joint (25) is disposed between the hub (15) and the rollers supporting plate (11). 15

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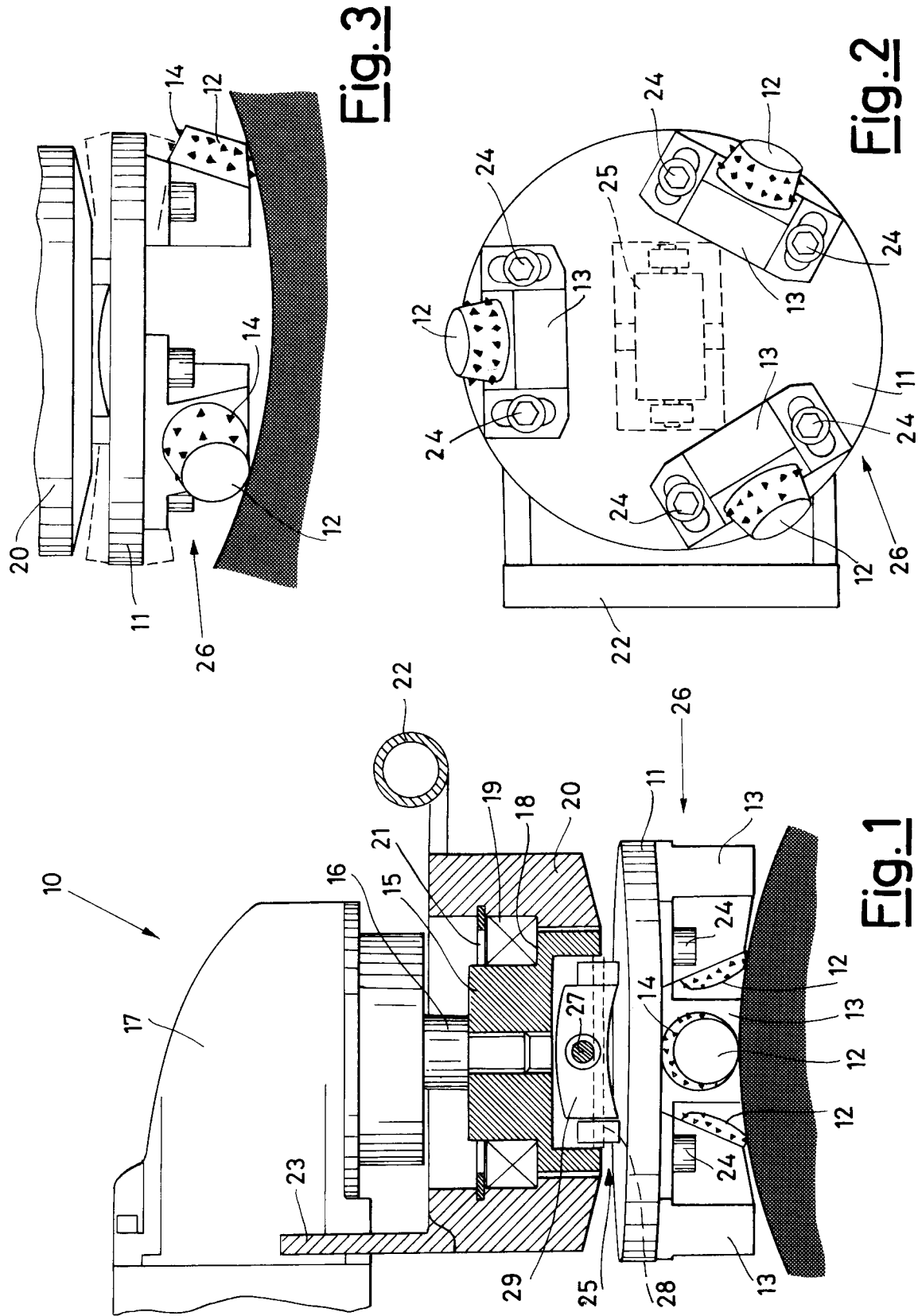
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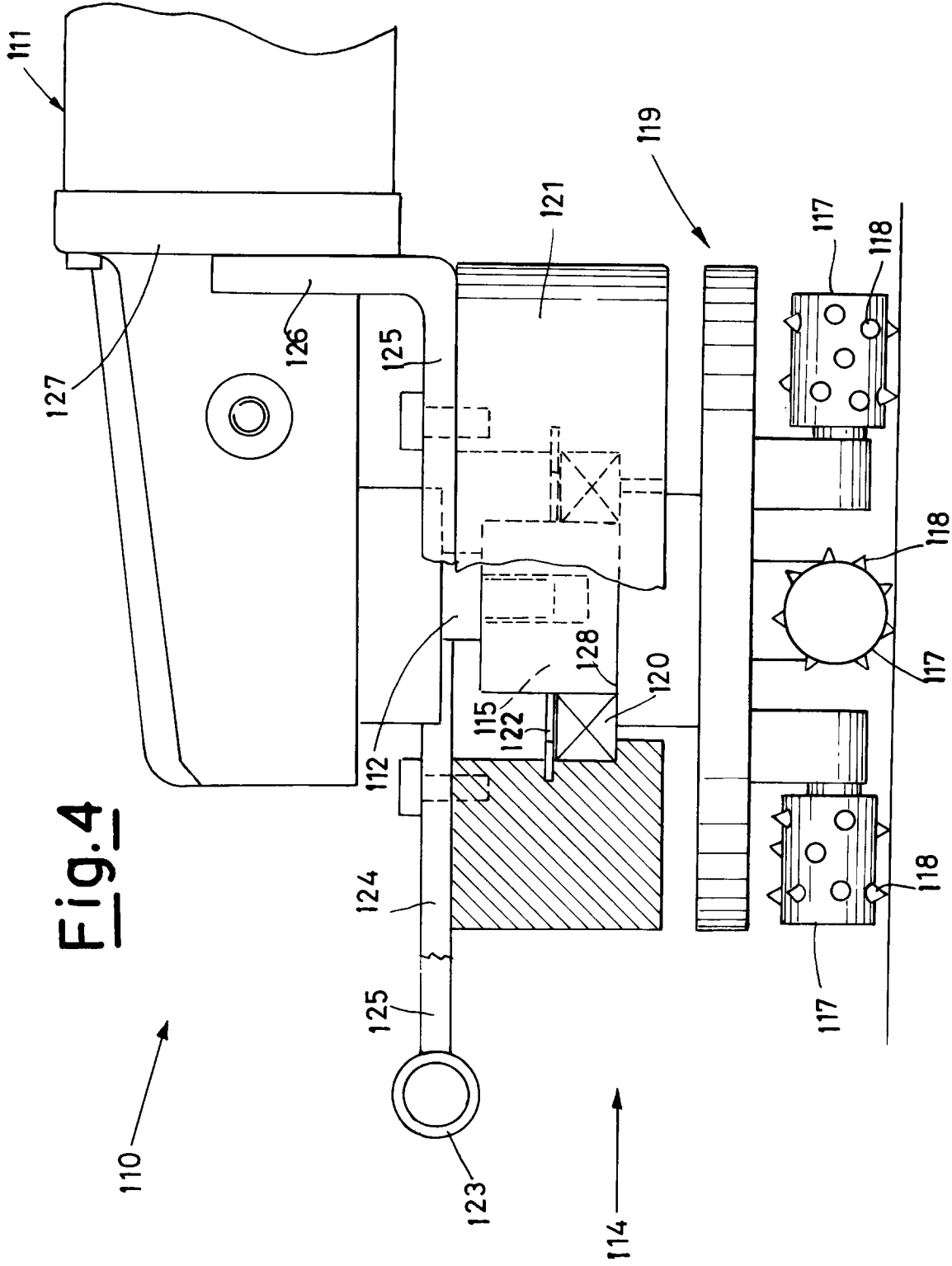
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EUROPEAN SEARCH REPORT

Application Number
EP 93 20 2670

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A	DE-A-28 44 205 (H. GLAHN) * page 4; figures 1,2 * ---	1	B28D1/18 B28D1/26 B28D1/30
A	US-A-1 385 732 (W. TAYLOR) * page 2, line 58 - line 64 * * page 4, line 10 - line 19 * * figure 1 * ---	1,7	
A	GB-A-0 409 194 (F. HAMBLETON ET AL.) * page 1, line 98 - line 102 * * page 2, line 86 - line 123 * * figures 1,2 * ---	1-7	
A	US-A-3 731 338 (V.T. WALSH ET AL.) * column 2, line 59 - column 3, line 32 * * column 4, line 40 - line 44 * * figures 1,2,4,6 * ---	1-5,7	
A	US-A-3 351 046 (R.C. COLLINS) * column 1, line 68 - column 2, line 17 * * figures 1-3 * ---	8-11,13	TECHNICAL FIELDS SEARCHED (Int.Cl.5)
A	DE-U-89 14 345 (FESTO KG) * page 17, line 6 - line 9 * * page 17, line 24 - line 26 * * figures 1,2 * ---	8-11,13	B28D
A	US-A-2 234 109 (J.L. CULPEPPER) * page 1, left column, line 1 - line 12 * * page 1, right column, line 3 - line 20 * * page 1, right column, line 45 - line 46 * * page 2, left column, line 55 - line 59 * * page 2, right column, line 11 - line 20 * * figures 1-3 * ---	8-11	
A	US-A-4 121 437 (J.L. MICHEL) * abstract * --- -/--	11	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 20 December 1993	Examiner Moet, H
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	



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Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A	FR-A-2 505 235 (G. LEBBO) * page 5, line 9 - line 10; figure 1 * ---	12	
A	EP-A-0 429 893 (LUPATO ANTONIO EREDI SNC DI SCIESSERE MARIA & F) * abstract; figures 1,2 * -----	14	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 20 December 1993	Examiner Moet, H
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			