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(54) **Pneumatic machine with grip with inflatable cap**

(57) A machine (1) for machining surfaces is disclosed, comprising a pneumatic motor (3) on which there is provided a grip (10) encompassing the upper part of a frame (2) supporting and bounding the motor compartment (44) of said pneumatic motor (3). Said machine (1) has an inflatable cap (12, 12'') housed in an internal cavity (13) of a deformable grip (10) that is suitable for changing the convexity (11) of the grip (10), and comprising a

central inlet port (14) fixed to the top of the underlying frame (2) bounding the motor compartment (44) and suitable for conveying to said cap (12, 12'') the leaked air (50) of the motor compartment (44), the convexity (11) of the grip (10) being variable in function of the inflation of the cap (12, 12'') which is in turn variable in function of the quantity of air (50) leaked from the motor compartment below (44) (Fig.1).

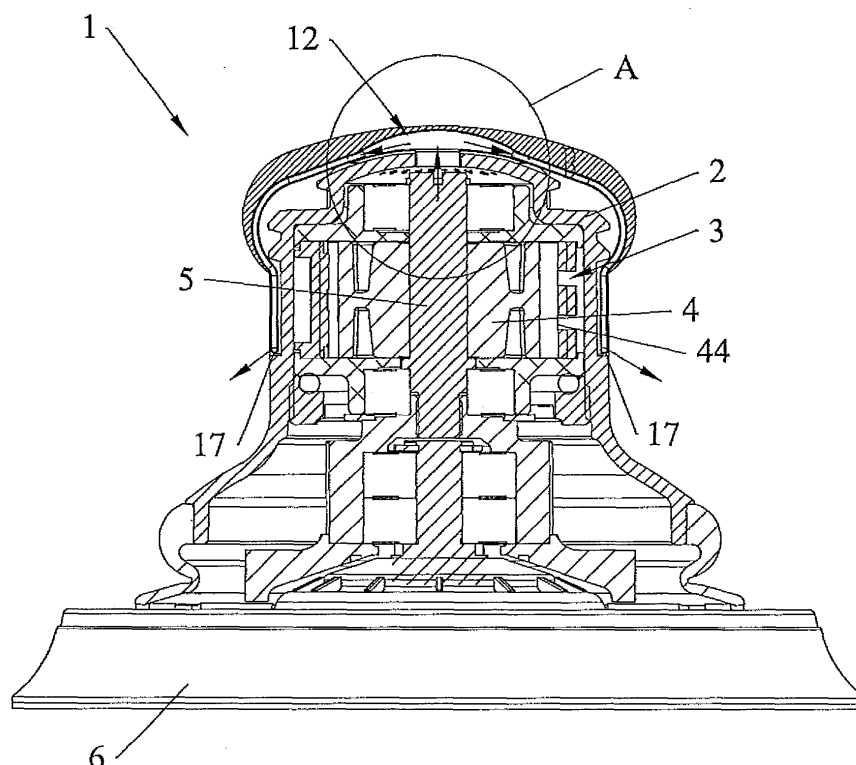


FIG.1

Description

[0001] The present invention relates to a pneumatic machine with grip with inflatable cap.

[0002] Pneumatic machines for machining surfaces have a pneumatic motor with a bladed rotor splined on the shaft driven by pressurised air entering the machine via an inlet (delivery) port and discharged via an outlet (discharge)port.

[0003] One example of a pneumatic motor is disclosed in patent application MI2009A000988 of this applicant.

[0004] Said known machines have a shaped grip for facilitating grasp and manoeuvrability.

[0005] The motor shaft moves suitable surface-machining means for lapping and similar tasks.

[0006] During the work step said machines are subject to vibrations that make the grip of the operator tiring and precarious, jeopardising the quality of the machining.

[0007] DE-1628003, DE-3007127, WO-02/38341 disclose grips for tools with chambers that are inflatable with external means through an external valve. US-3379278 shows discharge channels for the used air coming from a motor compartment. EP-0691181 shows a polishing machine with pneumatic motor supplied by a main channel and a secondary channel that conveys the supply air from below a stiff grip to the motor compartment underneath.

[0008] The object of the present invention is to make a pneumatic machine that has means for damping vibrations and facilitating the grasp of the grip.

[0009] According to the invention, this object is achieved with a machine as disclosed in claim 1.

[0010] Advantageously, said cap is housed in a space of the grip, is fixed to the frame of the machine by a collar through which the excess inflating air leaked from the motor compartment enters, and has air discharge channels.

[0011] These and other features of the present invention will be made clearer from the following detailed description of a practical embodiment thereof illustrated by way of non-limiting example in the enclosed drawings, in which:

figure 1 shows an axial vertical section view of a pneumatic machine with a cap according to a first embodiment of the invention;

figure 2 shows an enlarged section view of the circle A in figure 1;

figure 3 shows an axial vertical section view of a pneumatic machine with a cap according to a second embodiment of the invention;

figure 4 shows an enlarged section view of the circle B in figure 3;

figure 5 shows an axial vertical section view of a pneumatic machine with a cap according to a third embodiment of the invention;

figure 6 shows an enlarged section view of the circle C in figure 5;

figure 7 shows an axial vertical section view of a pneumatic machine with a cap according to a fourth embodiment of the invention;

figure 8 shows an enlarged section view of the circle D in figure 7.

[0012] A pneumatic machine 1 for machining surfaces, for example a lapping machine, a grinder or a polishing machine, essentially comprises a load-bearing frame 2 containing a pneumatic motor 3 consisting of a bladed rotor 4 housed in a space 44 and splined on a drive shaft 5 of a backing pad 6.

[0013] The rotor 4 is driven by pressurised air that flows between an inlet port 7 and an outlet port 8 (which are not shown).

[0014] The machine 1 further has a deformable rubber grip 10 with convexity 11 determined by an internal rubber cap 12 inserted into a cavity 13 of the grip 10 and supported by the frame 2 by a connecting collar 14 integrated into the cap 12.

[0015] From the side ends 15 of the cap 12 discharge channels 16 extend vertically as far as the discharge ports 17 well under the upper zone of the grip 10, i.e. below the grasping surface of the grip.

[0016] Functionally, the space 44 ensures a pneumatic seal within the limits allowed by constructional tolerances. A flow of leaked air runs from the motor compartment 44 to the summit of the machine substantially along the edge of the shaft 5.

[0017] The leaked air 50, which is pressurised between 2 and 8 bar, thus enters through the collar or inlet port 14 into the cap 12, inflating the cap 12, (see in the figures the arrows that schematise the flow of leaked air 50).

[0018] The discharge channels 16 convey outside the excess air, maintaining the pressure inside the cap 12 constant.

[0019] Advantageously, inflating the rubber cap 12 enables the convexity 11 to be accentuated and above all limits transmission of vibrations from the work zone to the hand of the operator. Convexity 11 thus depends on the air 50 leaked from the motor compartment 44.

[0020] The inflated rubber thus acts as a damping means, both for the rubber material and for the pressurised air in the interior thereof.

[0021] In figures 3-4 there is shown a second embodiment of the invention, which has a pre-inflated cap 12' inserted into the cavity 13 and anchored on the frame 2 via a sealing shim 20 in place of the connecting collar 14 of the preceding embodiment.

[0022] Pre-inflating occurs before assembly using a common inflating means that is suitable for penetrating a thin hole 21 of the thickness 20 that is otherwise sealingly closed.

[0023] This solution does not envisage the exploitation of air leaked from the motor compartment 44 and does not therefore have discharge channels 16; it is certainly simpler although it is not as effective as the previous one although it guarantees advantages in terms of damping

of the vibrations, there being damping pressurised air inside the cap 12'.

[0024] Figures 5-6 show a third embodiment in which the cap to be pre-inflated 12" is one piece with the grip 10; the cap 12" thus coincides with the cavity 13. The advantages are the same as with the second embodiment with the simplification of not having a cap that is separated from the grip and is thus without assembly problems. The grip is thus made of rubber material and thus enables elasticity to be obtained that is sufficient to generate the aforesaid damping effect in addition to accentuating the convexity 11.

[0025] Lastly, figures 7-8 show a fourth embodiment with an inflatable cap 12"" integrated into the grip as in the third embodiment, but not pre-inflated.

[0026] Observing the enlargement in figure 8 it is in fact noted that there is no connecting shim 20 but a through hole 25 in the frame 2 that enables the leaked air 50 (primary leak) to move from the motor compartment 44, as occurs in the first embodiment.

[0027] This latter embodiment is substantially a simplification of what has been shown in figures 1-2; it has no discharge channels 16 but nevertheless ensures inflation of the cap 12"", damping the vibration according to the object of the present invention. The excess leaked air 50 entering the cap will be discharged from further lateral secondary leaks from the cap to the exterior, preferably through the gaps between the grip 10 and the frame 2 without then flowing back to the motor compartment 44.

such that the air exits below the grasping surface of the grip (10).

3. Machine (1) according to claim 1, **characterised in that** the cap (12'') is integrated into the deformable grip (10) coinciding with the space (13).
4. Process for damping the vibrations of a pneumatic machine (1), **characterised in that** it recirculates the leaked air (50) from the motor compartment (44) to an inflatable cap (12, 12'') contained in a deformable grip (10).
5. Process according to claim 4, **characterised in that** the excess inflating air of the cap (12) is discharged through discharge channels (16).
6. Process according to claim 4, **characterised in that** it provides a secondary discharge leak of the excess inflating air of the cap (12'') through gaps in the machine (1).

Claims

1. Machine (1) for machining surfaces comprising a pneumatic motor (3) on which there is provided a grip (10) encompassing the upper part of a frame (2) supporting and bounding the motor compartment (44) of said pneumatic motor (3),
characterised in that there is an inflatable cap (12, 12'') housed in an internal cavity (13) of a deformable grip (10) that is suitable for modifying the convexity (11) of the grip (10), comprising
a central inlet port (14) fixed to the top of the underlying frame (2) bounding the motor compartment (44) and suitable for conveying to said cap (12, 12'') the leaked air (50) of the motor compartment (44), the convexity (11) of the grip (10) being variable in function of the inflation of the cap (12, 12''), which is in turn variable in function of the quantity of air (50) leaked from the motor compartment below (44).
2. Machine (1) according to claim 1, **characterised in that** said cap has lateral outlet ports (15) that are suitable for conveying air from the inside of the cap (12, 12'') to the external environment through the lateral discharge channels (16) below the grip (10)

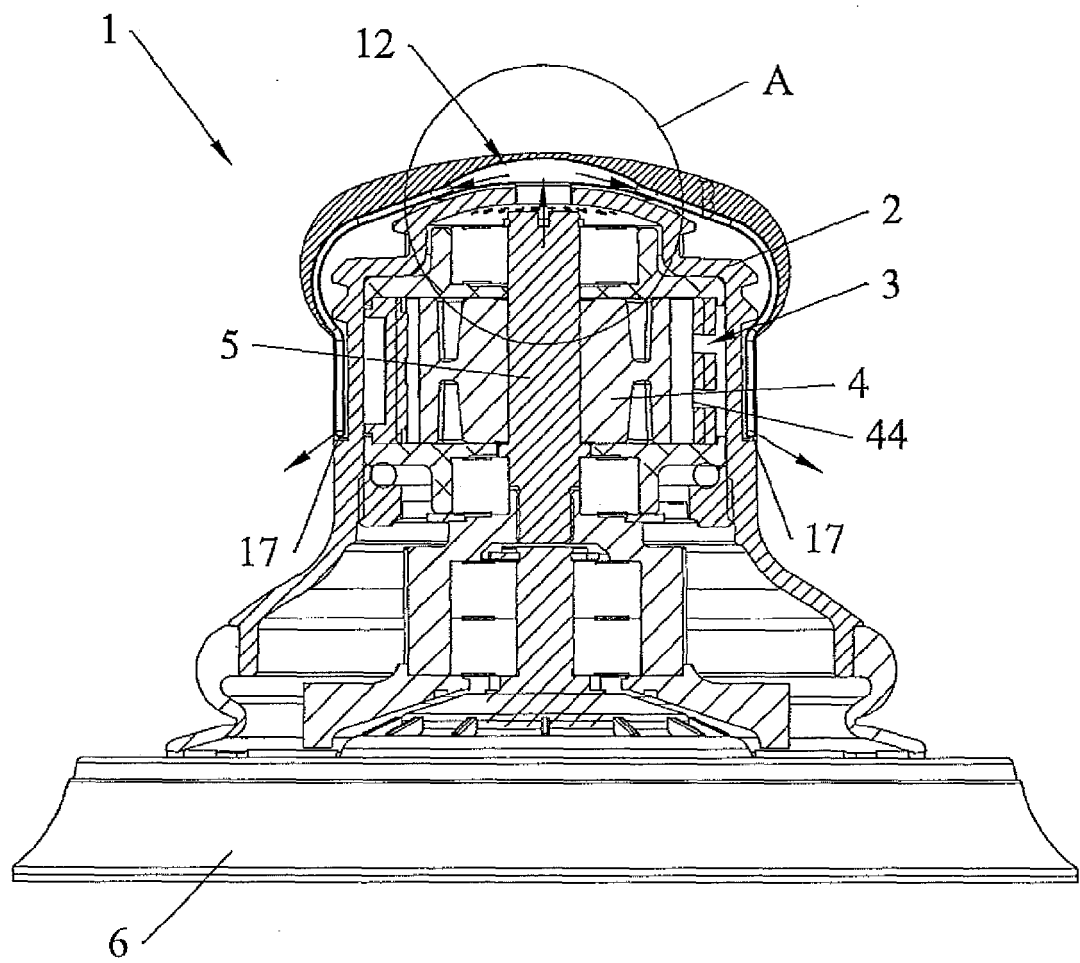


FIG.1

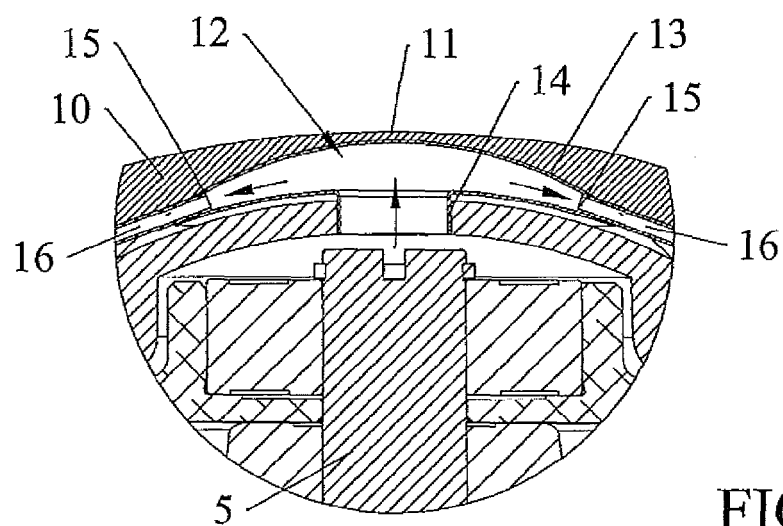


FIG.2

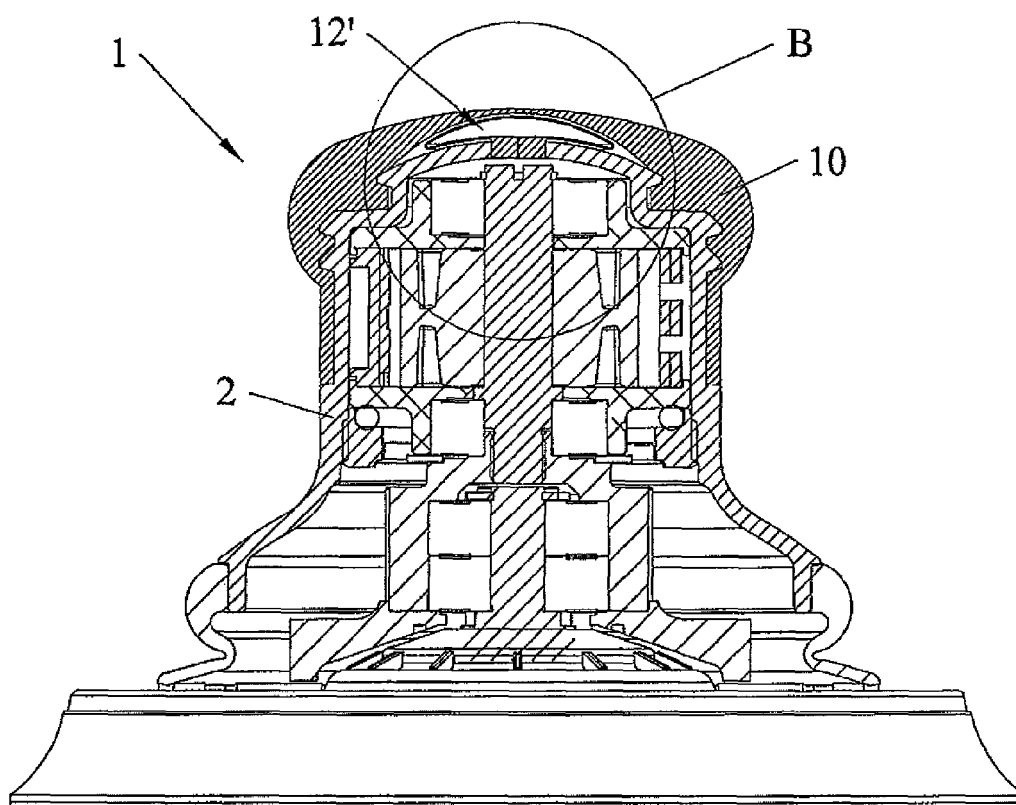


FIG.3

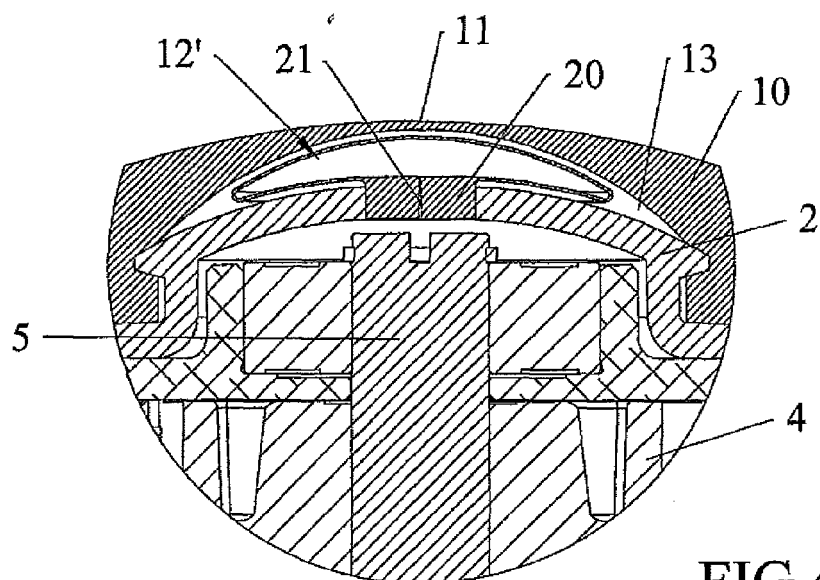


FIG.4

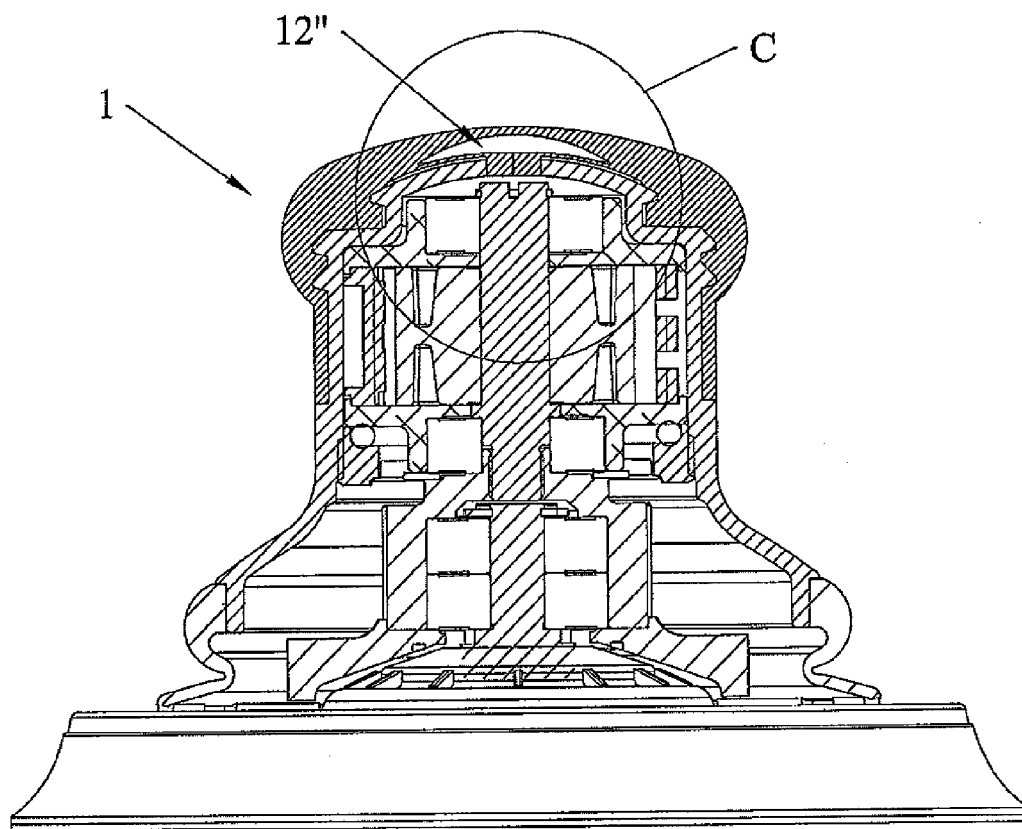


FIG.5

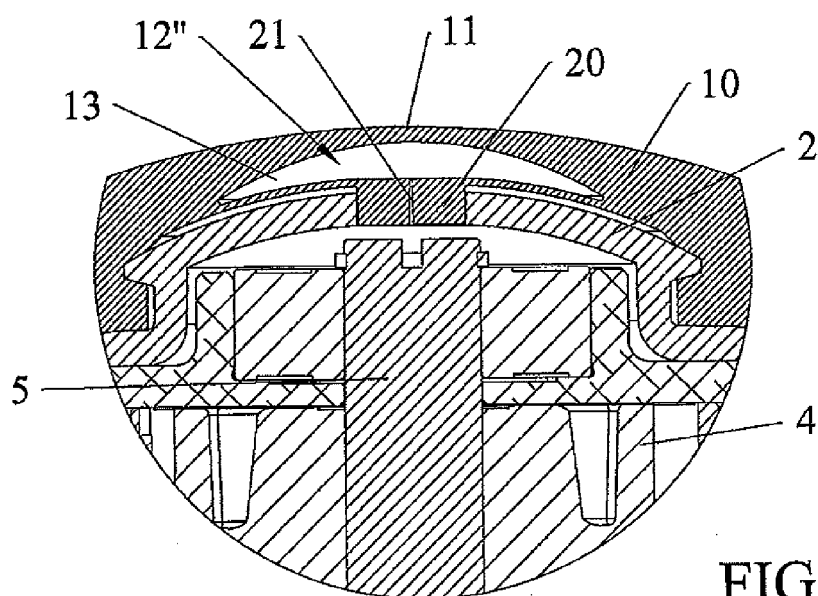


FIG.6

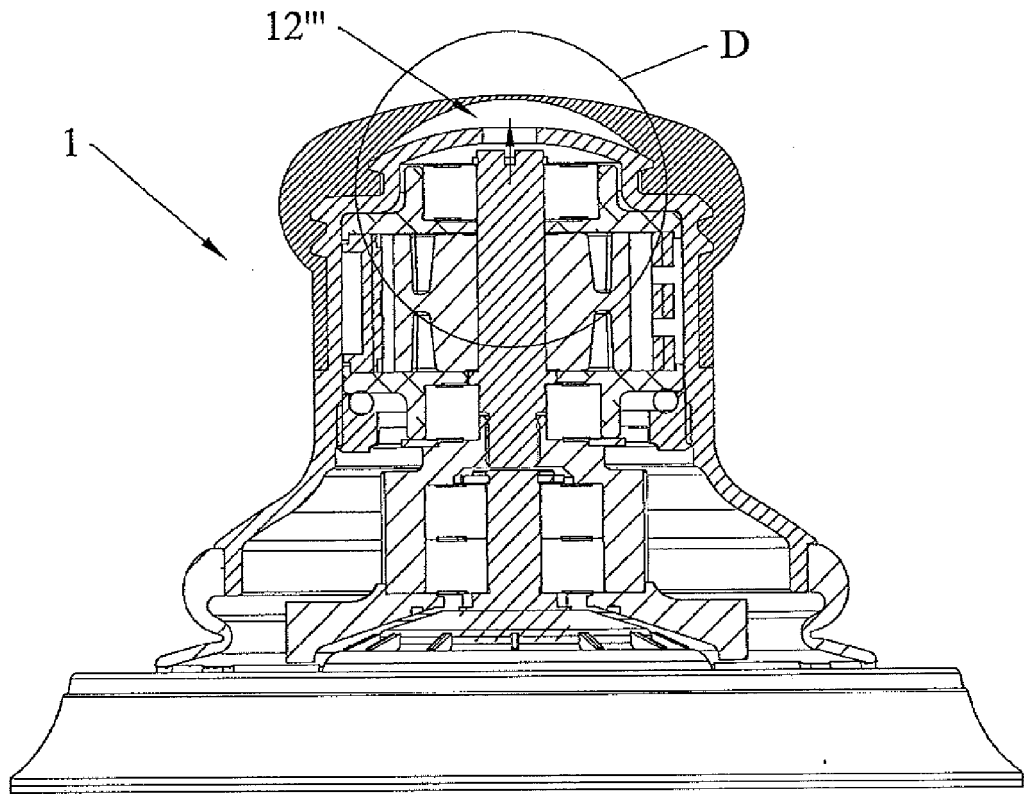


FIG. 7

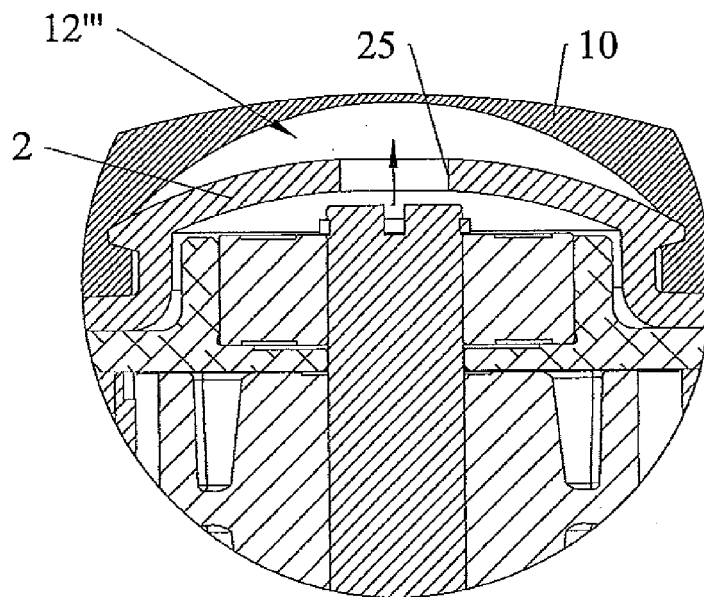


FIG. 8



EUROPEAN SEARCH REPORT

Application Number
EP 10 17 0859

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 0 691 181 A1 (SHINANO SEISAKUSHO KK [JP]) 10 January 1996 (1996-01-10) * column 2, line 19 - line 44; figure 1 * -----	1-3	INV. B24B23/02 B24B41/00 B25F5/00 B25G1/01
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X	US 3 379 278 A (CARL SKOWRON) 23 April 1968 (1968-04-23)	4-6	
A	* column 1, paragraph 54-57; figures 3,4 * * column 2, line 58 - column 3, line 10 * -----	1-3	
			TECHNICAL FIELDS SEARCHED (IPC)
			B24B B25F B25G
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 October 2010	Examiner Gelder, Klaus
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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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 10 17 0859

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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15-10-2010

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