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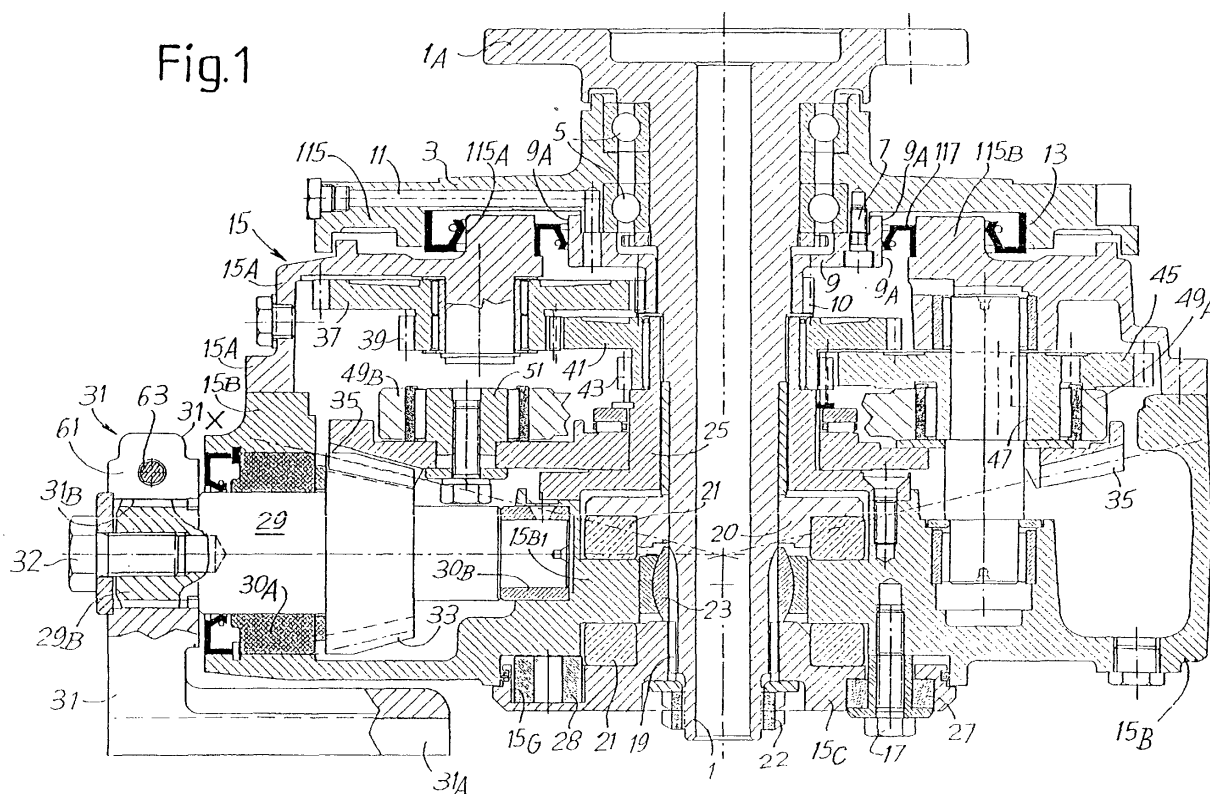
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(54) **Head for smoothing and polishing plates or slabs of stone or other material, with elastic vibration-damping elements**

(57) The gearcase (15) is constrained to the drive shaft (1) by means of a ball-and-socket joint (23), as well

as by means of two elastic damping rings (21) which are coaxial to the drive shaft (1) and further damping elements (27 and 28) which are fastened by bolts (17).



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Description

[0001] In the manufacture of heads for smoothing and polishing plates or slabs of marbles and other stones, it is of fundamental importance to reduce as much as possible the transmission of vibrations from the moving mechanical members to the gearcase by which the shoe-holders for the abrasive blocks are carried and from which they develop.

[0002] One type of smoothing and polishing head comprises a drive shaft, a fixed top flange, and a gearcase which is driven in rotation by the drive shaft and about the latter, and on which there are mounted shafts with oscillating shoe-holders for the abrasive blocks, the said shafts being driven by a transmission gearing for imposing a reciprocating angular motion on said shoe-holders.

[0003] In order to overcome the drawbacks referred to above, in the aforesaid heads and in similar heads, the present invention envisages the following in combination:

- the gearcase is constrained to the drive shaft by means of a ball-and-socket joint, as well as by means of two elastic damping rings which are coaxial to the drive shaft and which skirt a central end edge of the gearcase and are fastened axially between a discoid fixed on the shaft and a third component angularly engaged to the drive shaft and connected with bolts to a bottom component of the gearcase;
- between said bolts and said third component there are provided damping rings fastened by said bolts; and
- between said third component and said bottom component of said gearcase there are set further elastic damping elements fastened by said bolts.

[0004] With the above arrangement, an effective damping of vibrations from the mechanical members to the shoe-holders is achieved.

[0005] The drawings illustrate a head for smoothing and polishing stones, such as marbles, granites and the like, which, as a whole, is very similar to commercially available heads that are notoriously widely used in the technological sector in question, but which presents the characteristics specified in the attached claims.

[0006] The drawing illustrates a head for smoothing and polishing stones, such as marbles, granites and the like, which, as a whole, is very similar to commercially available heads that are notoriously widely used in the technological sector in question, but which presents the characteristics specified in the attached claims.

[0007] In the drawings:

Fig. 1 shows a section of the head according to axial half-planes appropriately chosen to illustrate sufficiently well the basic components;

Figs. 2 and 3 show in isolation a shoe-holder for abrasive blocks in two orthogonal and partial views; and

Figs. 4 and 5 show enlarged details of Fig. 1.

[0008] As illustrated in the annexed drawings, the reference number 1 designates the main drive shaft with a flange 1A for coupling with a motor drive. The reference number 3 designates a fixed top flange designed for being applied to the structure of the machine that is to control the head or a plurality of heads for treatment of a material having even a relatively very large surface. Said fixed flange 3 carries bearings 5 which are used for mounting the shaft 1. Applied by means of screws 7 to said flange 3, in the position corresponding to the bottom bearing 5, is an annular element 9 which forms a fixed gear 10 and further forms a wall 9A that has a cylindrical surface which is also fixed. In the fixed flange 3 and in the annular element 9 a passage 11 is made for lubrication of the inside of the head. The fixed flange 3 may have an annular seat for an O-ring 13 of very large diameter. Normally, the O-ring 13 is provided in heads of this type as the only seal element and presents the problem of fast deterioration due to the very high sliding speed of the rotary head at the surface with which said O-ring must co-operate. The consequence of this is a frequent and fast heating of the seal element 13, which means that it wears out, or else the problem arises of a dispersion of lubricant which, in addition to representing a cost, also and above all represents a risk of damage to the material that is being smoothed, on account of the oil that may drop onto the plate or slab and stain it.

[0009] The smoothing head comprises a gearcase 15 which is substantially made up of two components, a top one 15A and a bottom one 15B, which are joined together for evident requirements of production. Also forming part of the gearcase 15 is a third component 15C which constitutes a drive flange and which is connected with bolts 17 to the component 15B and with grooved profiles 19 to the shaft 1. The reference number 20 designates a discoid fitted on the shaft 1. The reference number 21 designates elastic damping rings set around the shaft 1, one of said rings being set between the discoid 20 and a central end edge 15B1 of the component 15B, and the other of said rings being set between said central end edge 15B1 and the third component 15C. A nut (with a lock nut) 22 fastens the two damping rings 21. The reference number 23 designates a ball-and-socket joint which operates between said central end edge 15B1 and the shaft 1. All the aforesaid members are provided for connection between the shaft 1 and the rotary gearcase 15 (15A, 15B, 15C). The reference number 25 designates an element forming a central flange designed for positioning of the internal mechanism of the head. In addition to the damping rings 21, a further damping ring 27 is provided between the third component 15C of the gearcase 15 and each of the bolts 17 which fasten it, thus preventing direct metal contact be-

tween the components 15B and 15C. Yet further annular elastic damping means 28 are received in seats 15G of the third component 15C and are fastened, by means of the bolts 17, between the two components 15B and 15C. These auxiliary damping means 27 and 28, in combination with the damping rings 21, make it possible to achieve effective damping of the vibrations between the shaft 1 (and corresponding motor) and the rotary gearcase 15 to which the abrasive blocks that operate on the stone are associated.

[0010] The main component 15B of the gearcase 15 forms seats for radial shafts 29 distributed circumferentially. Each of said shafts 29 is mounted on bearings 30A and 30B and is designed to support externally a shoe-holder 31, to which there may be applied, with the aid of a shaped portion 31A, an abrasive block. The abrasive blocks with the corresponding shoe-holders 31 must oscillate about the axes of the respective shafts 29 so as to obtain an effect of gradual displacement of the active surfaces of the abrasive blocks in such a way as to enable regular stone-working on the surface of the material that is to undergo treatment.

[0011] The fit between each shaft 29 and the respective shoe-holder 31 is obtained by means of a grooved end 29B of the shaft 29 and a grooved seat 31 B of the shoe-holder 31. To obtain oscillatory actuation, each of the shafts 29 has a bevel gear 33. All the various bevel gears 33 mesh simultaneously with the toothing of a ring bevel gear 35, which is coaxial to the shaft 1 and which must be moved with a reciprocating angular motion precisely to obtain simultaneous reciprocating angular movements of the various radial shafts 29. In order to obtain said reciprocating movement, in the gearcase 15 a gearing is provided which, starting from the fixed gear 10, comprises a series of gears 37, 39; 41, 43; 45, the gears 37, 39 being fixed to one another, and the gears 41, 43 also being fixed to one another. The gearing 37 to 45 has the function of bringing about, with the rotation of the head 15, the rotation of a cam 47 which is fixed to the end gear 45 of said gearing. Mounted on the cam 47 is a connection rod 49A, 49B, of which there may be seen the two seats for the bearings of the connecting-rod big end 49A and small end 49B. The connecting-rod big end 49A is mounted on the cam 47, whilst the small end 49B is mounted on a pin 51 which is carried by the ring gear 35. With the above arrangement, angular reciprocating movement of the ring gear 35 that drives the radial shafts 29 is obtained by means of the gearing 10, 37 to 45 and the crank mechanism 47, 49, 51.

[0012] Connection, by means of the grooved shaped portions 29B and 31B, between the outer end of each of the shafts 29 and the respective shoe-holder 31 for the abrasive block must transmit the oscillations to the shoe-holder 31, preventing the onset, over time, of play between the shaft and the shoe-holder. Mere connection between the grooved surfaces of the end 29B of the shaft 29 and the surfaces of the seat 31B, also by means of axial forcing exerted during assembly (even using a

hammer) and stabilized by a bolt 32 screwed axially in the shaft 29, has not proved sufficient, over time, to maintain proper fit and prevent onset of play.

[0013] In order to overcome the aforesaid drawback, each shoe-holder 31 has a slot 61 which, from outside, reaches radially the seat 31 B in such a way as to create two branches 31X in the shoe-holder 31 which are largely symmetrical and between which there is the seat 31B, which is thus slotted. The two branches 31X can be brought up to one another by means of a bolt 63 which traverses the branches 31X and the slot 61, so as to secure the end 29B of the shaft 29. In this way, any onset of play between the shafts 29 and the shoe-holders 31 is prevented; on the other hand, it is always possible to adjust the bolts 63 to increase or restore tightening.

[0014] The grooved profiles of the shafts 29 and of the seat 31 B may have the shape of a gear toothing.

[0015] The top component 15A of the gearcase 15 forms the side wall, i.e., external wall, 15F of the gearcase 15. From said wall 15F there develops a top wall 115, which is set beneath the fixed flange 3 and forms a surface 115A, with which the O-ring 13 co-operates.

[0016] Said top wall 115 is further developed in a centripetal direction beyond the surface 115A (the latter surface being provided and used when also the O-ring 13 is adopted). Said top wall 115 develops as indicated in particular by 115B to form the seat for a main O-ring 117 of a diameter which is much smaller than that of the possible and optional traditional O-ring 13. Said O-ring 117 is designed to co-operate with the surface 9A of the element 9. Given the same speed of rotation of the gearcase 15, the speed of sliding of the O-ring 117 on the fixed surface 9A is much lower than the speed of sliding of a traditional O-ring (such as the O-ring 13), which has a much larger diameter than that of the O-ring 117. It follows from this that the O-ring 117 can operate in conditions that are far more favourable than those of an O-ring having a diameter like the one of the O-ring 13 illustrated, and its efficiency is maintained for a much longer time as compared to the relatively very short duration of an O-ring such as the O-ring 13. The advantage is achieved therefrom of an improved functionality of the entire head on account of the presence of said O-ring 117 and on account of the aforesaid conformation obtained by adopting the O-ring 117. The possible retaining of an O-ring such as the O-ring 13 constitutes an aid to the functioning of the O-ring 117, but is not altogether essential.

Claims

1. A head for smoothing and polishing stones, comprising a drive shaft (1), a fixed top flange (3), and a gearcase (15) which is driven in rotation by the drive shaft (1) and on which there are mounted substantially radial shafts (29) with oscillating shoe-holders (31) for the abrasive blocks, the said shafts

being driven by a transmission gearing for imposing a reciprocating angular motion on said shoe-holders, **characterized by** the following combination:

- the gearcase (15) is constrained to the drive shaft (1) by means of a ball-and-socket joint (23), as well as by means of two elastic damping rings (2) which are coaxial to the drive shaft (1) and which skirt a central end edge (15B1) of the gearcase (15) and are fastened axially between a discoid (20) fixed on the shaft (1) and a third component (15C) angularly engaged to the drive shaft (1) and connected with bolts (17) to a bottom component (15B) of the gearcase; 5 10
 - between said bolts (17) and said third component (15C) there are provided damping rings (27) fastened by said bolts; and 15
 - between said third component (15C) and the component (15B) of said gearcase there are set further elastic damping elements (28) fastened by said bolts (17). 20
2. The smoothing head according to Claim 1, **characterized in that** the said further elastic damping means (28) are partially received in seats (15G) made in one of the two components, between which said damping elements (28) react. 25
3. A head for smoothing plates or slabs of stone or the like, with elastic vibration-damping elements; the foregoing as above described and represented. 30

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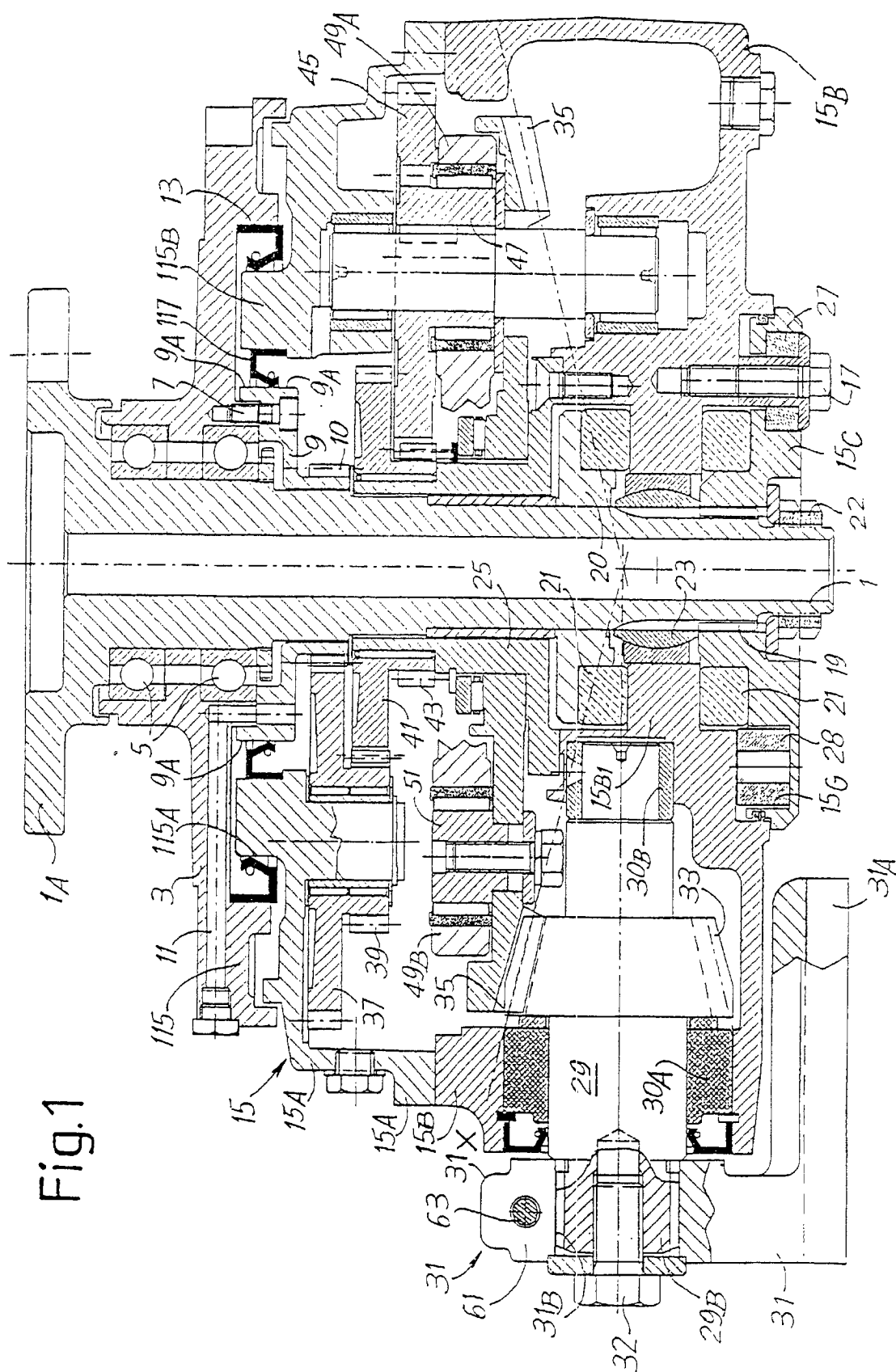


Fig. 1

Fig. 2

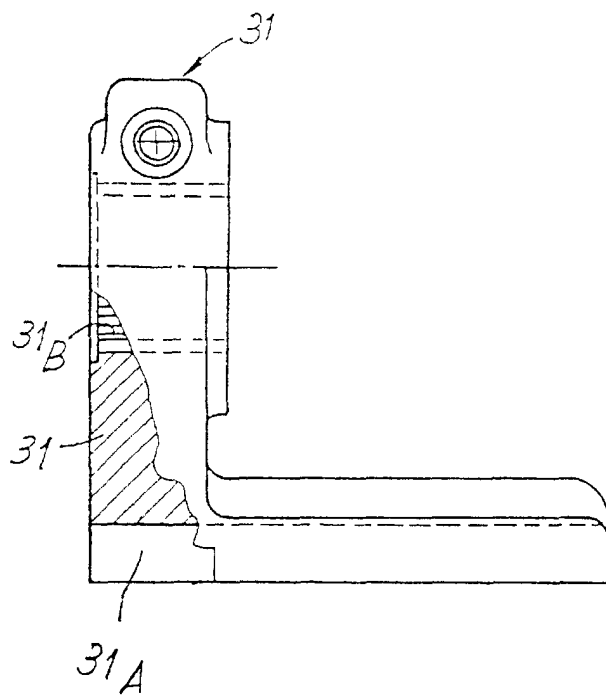


Fig. 3

