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Remarks:
Claims 19 to 76 are deemed to be abandoned due to non-payment of the claims fees (Rule 31 (2) EPC).

(54) Apparatus for sharpening objects

(57) An apparatus for sharpening objects (2) comprises abrading means (6) arranged for abrading an end portion of said objects (2) and for creating tip means (2a) in said objects (2) and support means (7) connected to rotation driving means (8) and arranged for supporting said abrading means (6), said abrading means (6) being fixed to said support means (7) by magnetic coupling means (15); the projection of the longitudinal axis of each object (2) on a plane containing an active surface (10) is tangent to a circumference the center of which lies on a rotation axis (X) of said abrading means (6); moving means (33) for moving said objects (2) are provided, the moving means (33) being arranged for driving said objects (2) to interact with regions of said active surface (10); in addition, transfer means (5) rotates each object (2) around the longitudinal axis thereof and moves each object (2) along said longitudinal axis towards said abrading means (6).

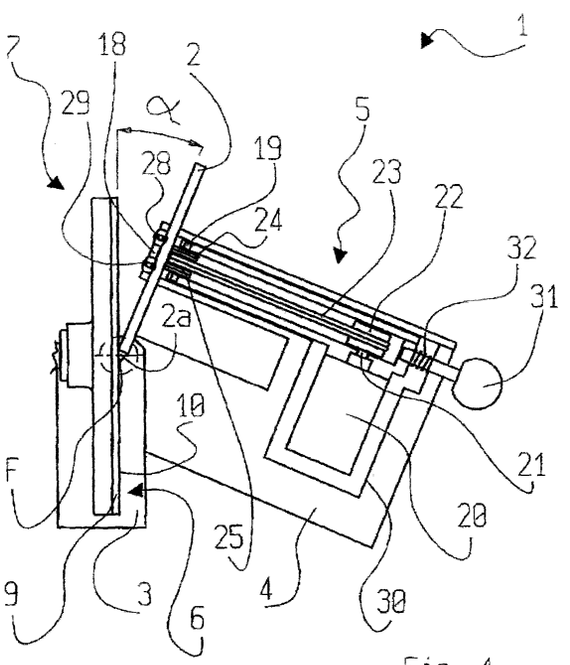

Fig. 1

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Description

[0001] This invention concerns an apparatus for sharpening objects, in particular elongated bodies such as welding electrodes.

[0002] Apparatuses are known for sharpening electrodes, especially for sharpening tungsten electrodes, said apparatuses comprising an abrasive grinder provided with an area coated by electrically deposited synthetic diamond particles. The grinder is fixed by a grubscrew to a shaft actuated by an electric motor, which shaft rotates said grinder.

[0003] The above mentioned apparatuses are also provided with adjusting devices for adjusting the tilt of the electrode in relation to the grinder surface, said devices enabling a preset sharpening angle to be obtained at the tip of the electrode.

[0004] Said devices also comprise a bored sliding bar, provided with a double series of holes of decreasing diameter inside which the electrodes that require sharpening can be positioned, and a roller which is rotated by a second electric motor and which is connected to the latter by an O-ring which also performs the function of rotating the electrode after it has been manually pressed against the roller.

[0005] In order to conduct sharpening operations, an operator first determines the diameter of the electrode on the first series of holes in the sliding bar and then tilts the electrode-holding device to achieve the required sharpening angle, starts up the grinder, and "weighs down" the electrode by means of a metal cylinder. In other words, the operator causes the cylinder to act on the end of the electrode that is further from the grinder so as to push said electrode up against the abrasive grinder, and the operator then inserts the electrode into the second series of holes that are located on the diamond-coated strip, and uses a knob connected to a threaded nut to push the roller against the latter to make it rotate.

[0006] The electrode then makes contact with the grinder and starts sharpening.

[0007] One drawback of prior-art sharpening apparatuses consists in that the diamond-coated grinder always abrades the electrode in the same position, which causes uneven and extremely severe wear to the diamond-coated zone although the width of said diamond-coated zone is significantly greater than the section that becomes progressively worn.

[0008] Another drawback of the prior-art sharpening apparatuses consists in that the tilting device that enables the sharpening angle to be adjusted causes the electrodes, in which a tip must be made having a sharpening angle that is very acute, or otherwise, a very open sharpening angle, to be significantly abraded under or over the grinder's halfway axis; the diamond-coated particles thus come into contact obliquely with the electrode in relation to the projection of the axis of the electrode on the grinder surface, thus leaving unsatisfactory roughness on the surface of the sharpened taper.

[0009] A further drawback of the prior-art sharpening apparatuses is that the O-ring which rotates the electrode wears down very quickly, as it must be pressed with sufficient force to overcome the friction which is generated between the electrode and the holes arranged on the sliding bar, in addition, the efficacy of this system depends on the operator's skill in identifying the optimal pressure with which the O-ring must be pressed against the electrode: too light pressure will not enable the electrode to rotate, too great pressure will have the opposite effect of prematurely wearing out the O-ring.

[0010] Moreover, if the metal cylinder used to "weigh down" the electrode has not been carefully chosen, and in particular if it is very heavy, it may make the grinder interact with the electrode too violently and thus cause very high consumption of abrasive material. On the other hand, if the cylinder is too light, sharpening time will be very long because the electrode will not be pressed against the grinder with sufficient force.

[0011] A further drawback of the prior-art sharpening apparatuses is that replacing the grinder is rather complicated, mainly because correct axial positioning of the grinder depends on the operator's skill.

[0012] An object of this invention is to improve the known apparatuses for sharpening objects, especially for sharpening welding electrodes.

[0013] Another object of this invention is to obtain a sharpening apparatus provided with an abrasive grinder that can be easily and rapidly assembled and disassembled.

[0014] A further object of this invention is to obtain a sharpening apparatus comprising an abrasive portion that does not have regions that are specially subject to wear, but which is subject to uniform wear.

[0015] A further object of this invention is to provide a sharpening apparatus that, at the end of sharpening operations, enables electrodes to be obtained the tips of which have extremely low surface roughness.

[0016] Another further object of this invention is to obtain a sharpening apparatus provided with transfer means which is suitable for automatically rotating the electrodes around the respective longitudinal axis and for axially moving said electrodes in such a manner as to drive them to interact with the abrasive grinder.

[0017] In a first aspect of the invention, an apparatus for sharpening objects is provided, said apparatus comprising abrading means arranged for abrading an end portion of said objects and for creating tip means in said objects, and support means connected to rotation driving means and arranged for supporting said abrading means, characterised in that said abrading means is fixed to said support means by magnetic coupling means.

[0018] In a preferred version, the magnetic coupling means comprises magnetic pads housed in suitable seats arranged in the support means.

[0019] In another preferred version, the abrading

means comprises a crown of ferromagnetic material on which a layer of abrasive material such as diamond particles is deposited; the magnetic pads are thereby able to interact with the abrading means, keeping said abrading means fixed to the support means during operation of the apparatus.

[0020] Owing to this aspect of the invention, an apparatus for sharpening objects can be obtained, in which assembly and/or replacement of the abrading means is extremely easy and economical.

[0021] In a second aspect of the invention, an apparatus for sharpening objects is provided, said apparatus comprising abrading means having an active surface arranged for abrading an end portion of said objects and for creating tip means in said objects, characterised in that it further comprises moving means for moving said objects, said moving means being arranged for driving said objects to interact with regions of said active surface.

[0022] In one advantageous version, the abrading means comprises an active surface shaped as a circular crown having a width, in a radial direction, which is significantly greater than the end of each object requiring abrasion.

[0023] The moving means comprises trolley means on which the object to be sharpened is fixed and further comprises an eccentric device arranged for actuating said trolley means with a straight reciprocating movement, so as to bring the end of the object into contact with said active surface at all points.

[0024] This is possible, in particular, because the moving means causes each object to oscillate in a direction which is perpendicular to the grinder axis and with an oscillation width which is as great as the width of the grinder's active surface.

[0025] Owing to this aspect of the invention, an apparatus for sharpening objects can be obtained, in which the abrading means is subject to uniform and extremely limited wear.

[0026] In a third aspect of the invention, an apparatus is provided for sharpening objects, said apparatus comprising abrading means driven into rotation around a respective rotation axis and arranged for abrading an end portion of said objects to create tip means in said objects, characterised in that, during said sharpening, said objects interact with said abrading means so that a projection of the longitudinal axis of each object on a plane containing said active surface is tangent to a circumference the center of which lies on said rotation axis.

[0027] Owing to this aspect of the invention, an apparatus can be obtained for sharpening objects, wherein the abrading means creates, at one end of each of the objects, a having an external surface provided with a plurality of microgrooves arranged at right angles to the axis of the object, thereby creating excellent surface roughness.

[0028] In a fourth aspect of the invention, an apparatus for sharpening objects is provided, said apparatus comprising abrading means arranged for abrading an end portion of said object to create tip means on said objects, characterised in that it further comprises transfer means arranged for rotating each of said objects around a respective longitudinal axis and for simultaneously moving each of said objects along said longitudinal axis, to drive each of said objects to interact with said abrading means.

[0029] In a preferred version, the transfer means comprises first idle roller means, second idle roller means and driving roller means, which are arranged for gripping the objects to be sharpened and rotating them and moving them axially as described above, the driving roller means being tilted by a given angle in relation to the first idle roller means and to the second idle roller means, the axes of which are mutually parallel.

[0030] In another preferred version, the driving roller means is fitted to slide means and can therefore be moved close to or far from the first idle roller means and the second idle roller means and are thus suitable for machining objects of any dimensions after they have been pressed up against said objects.

[0031] Owing to this aspect of the invention, an apparatus for sharpening objects can be obtained, by means of which apparatus objects of any dimensions can be machined simply and effectively. Such machining is completely automatic, the operator having to intervene only to position the objects on the apparatus and take them from the apparatus at the end of the machining cycle.

[0032] In order that the invention may be clearly and completely disclosed, by way of examples that do not limit the scope of the invention, reference will now be made to the accompanying drawings, wherein:

Figure 1 is a partially sectioned side view of the apparatus according to the invention, showing an electrode to be sharpened which is tilted in relation to the abrading means by a preset angle;

Figure 2 is a view like that in Figure 1 showing an electrode tilted in relation to the abrading means in such a way as to form a different angle from the one shown in Figure 1;

Figure 3 is a side view, partially sectioned, of the abrading means of the apparatus according to the invention, of the relative support means and of the rotation driving means;

Figure 4 is a front view of the support means of Figure 3;

Figure 5 is a plan view of the transfer means of the apparatus of Figure 1;

Figure 6 is a front view of the apparatus of Figure 1;

Figure 7 is a front diagrammatical view of an apparatus according to the invention showing an electrode to be sharpened lying on a plane that passes through the rotation axis of the abrading means.

[0033] Figures 1 to 5 show an apparatus 1 for sharp-

ening electrodes 2, comprising a body 3 to which a frame 4 is fixed, the frame 4 holding transfer means 5 arranged for moving the electrodes 2 according to a helicoidal motion. Said helicoidal motion has a rotation component with respect to a longitudinal axis of said electrodes and a translation component in the direction of said axis.

[0034] The apparatus 1 further comprises abrading means 6 which is fixed to respective support means 7 and which is suitable for abrading an end portion of the electrodes to create on each of said electrodes a sharpened tip 2a.

[0035] The abrading means 6 comprises a crown 9 made of ferromagnetic material, on which an active surface 10 can be identified, said active surface 10 being created by depositing a layer of abrasive material, such as diamond powder.

[0036] The support means 7 is rotated around a respective axis X by actuating means 8, comprising an electric motor 11.

[0037] The support means 7 comprises a flange 12 fitted to the shaft 13 of the electric motor 11. In said flange 12, several chambers 14 are housed, each one of which can accommodate a magnetic element 15 arranged for interacting with the crown 9 to fix it to the flange 12. To replace the abrading means 6, once said abrading means 6 has become worn, it is sufficient to remove the worn crown 9 and replace it with a new crown 9 that has a layer of abrasive material in pristine condition.

[0038] This operation is extremely simple, particularly because the crown 9 is fixed to the flange 14, which has an assembly reference on shaft 13, thereby enabling complicated axial operations to position the crown and the flange to be eliminated.

[0039] The electrodes 2 can be tilted in relation to the working plane of the abrading means 6 by rotating the frame 4 around a fulcrum F and subsequently locking said frame 4 in the required position by manually acting on the clamp blocking means 16 of a known type. Thus, the angle formed by the electrodes 2 with respect to said working plane can be varied, going for example from an angle α, shown in Figure 1, to an angle β, shown in Figure 2; thus, it is possible to obtain electrodes 2 of which the tips 2a are basically shaped as cones with angles at the tops of a set degree.

[0040] The transfer means 5 comprises driving roller means 19 arranged for interacting with the electrodes 2 and for pressing them against first driven roller means 17 and second driven roller means 18. The driving roller means 19 is actuated by a belt 23 stretched between said driving roller means 19 and a pulley 22 that is fixed to a shaft 21 of a further electric motor 20. A first pair of O-rings 24 and a second pair of O-rings 26 are associated with the driving roller means 19, at axially consecutive sections, said O-rings rotating the electrodes 2 by friction.

[0041] At axially consecutive sections, a first bearing 26 and a second bearing 27, and a third bearing 28 and a fourth bearing 29 are associated respectively with the first driven roller means 17 and to the second driven roller means 18, the external races of said bearings acting as abutting elements for the electrodes 2 pressed on them by the driving roller means 19.

[0042] As shown in Figure 6, the driving roller means 19 has a longitudinal axis tilted by an angle γ in relation to the axes of the first driven roller means 17 and of the second driven roller means 18, which are basically mutually parallel.

[0043] When the driving roller means 19 is actuated by the further electric motor 20, the two pairs of O-rings 24 and 25, which are fixed to the driving roller means 19, transmit a rotary movement to the electrodes 2 around a longitudinal axis thereof. In addition, owing to the presence of slight misalignment between the axes of the driving roller means 19 and the axes of the first driven roller means 17 and the second driven roller means 18, the electrodes 2 are shifted sideways along said longitudinal axis, which drives the electrodes 2 to interact with the abrading means 6.

[0044] The driving roller means 19 and the actuating devices thereof, namely the further motor 20, the pulley 22 and the belt 23, are fitted to a slide 30, which is slidably coupled with the frame 4 and movable far from and close to the first driven roller means 17 and the second driven roller means 18: this makes the apparatus 1 suitable for machining electrodes 2 of any dimensions. In fact, by adjusting the knob 31 and overcoming the resistance of the spring 32 it is possible to bring into contact with the bearings 26, 27, 28, 29, an electrode with a wide range of diameters and subsequently, after releasing said knob 31, it is possible to keep the electrode in position under the thrust of the two pairs of O-rings 24, 25.

[0045] The driving roller means 19 with the relative actuating devices, and the first driven roller means 17 and the second driven roller means 18 are fitted on trolley means 33. The trolley means 33 is actuated with a reciprocating straight movement by means of an eccentric 34 rotating around a respective axis G: thus, the tip 2a of each of the electrodes 2 is driven to interact with the entire active surface 10 of the abrading means 6 and wear said abrading means 6 down in a uniform manner and to a limited extent.

[0046] In fact, the trolley means 33, pressed by the eccentric 34 and recalled by a further spring 35, oscillates with an oscillation amplitude which is substantially equal to the width of crown 9. As Figure 7 shows, the transfer means 5 and the trolley means 33 described above are so arranged that the electrodes 2, during sharpening, interact with the abrading means 6, the electrodes 2 lying on a plane that passes through the rotation axis of the abrading means 6: thus the abrading means 6 achieve excellent abrading of the electrodes and give them tips 2a with extremely limited surface roughness.

Claims

1. Apparatus for sharpening objects (2), comprising abrading means (6) arranged for abrading an end portion of said objects (2) and for creating tip means (2a) in said objects (2), and support means (7) connected to rotation driving means (8) and arranged for supporting said abrading means (6), **characterised in that** said abrading means (6) is fixed to said support means (8) by magnetic coupling means (15).

2. Apparatus according to claim 1, wherein said abrading means (6) comprises tool means (9) made of ferromagnetic material and provided with an active surface (10) comprising abrasive material.

3. Apparatus according to claim 2, wherein said magnetic coupling means comprises magnetic elements (15) arranged for interacting with said tool means (9).

4. Apparatus according to claim 3, wherein said support means (7) comprises flange means (12) wherein chamber means (14). is created, said chamber means (14) being arranged for accommodating said magnetic elements (15).

5. Apparatus according to claim 4, and further comprising moving means (33) for moving said objects (2), said moving means (33) being arranged for driving said objects (2) to interact with active surface regions (10) of said abrading means (6).

6. Apparatus according to claim 5, wherein said moving means comprises trolley means (33) actuated with a straight reciprocating movement by eccentric means (34) cooperating with restoring spring means (35).

7. Apparatus according to claim 6, wherein said trolley means (33) oscillates with an oscillation amplitude that is basically as great as the width of said active surface (10).

8. Apparatus according to one of the preceding claims, wherein said abrading means (6) is rotated around a longitudinal axis thereof (X) by actuating means (11).

9. Apparatus according to one of the preceding claims, wherein, during said sharpening, said objects (2) interact with said abrading means (6) so that a projection of the longitudinal axis of each object (2) on a plane containing said active surface (10) is tangent to a circumference the center of which lies on said rotation axis (X).

10. Apparatus according to one of the preceding claims, and further comprising transfer means (5) arranged for rotating each of said objects (2) around a respective longitudinal axis and for simultaneously moving each of said objects (2) along said longitudinal axis to drive each of said objects (2) to interact with said abrading means (6).

11. Apparatus according to claim 10, wherein said transfer means (5) comprises driving roller means (19) arranged for interacting with said objects (2) to block them against stop means (17, 18).

12. Apparatus according to claim 11, wherein, at axially consecutive sections, respectively first contact means (24) and second contact means (25) are associated with said driving roller means (19), said first contact means (24) and said second contact means (25) being arranged for rotating said objects (2) around respective longitudinal axes.

13. Apparatus according to claim 12, wherein said first contact means comprises a first pair of O-rings (24).

14. Apparatus according to claim 12, or 13, wherein said second contact means comprises a second pair of O-rings (25).

15. Apparatus according to any one of claims 11 to 14, wherein said stop means comprises first driven roller means (17) and second driven roller means (18) having longitudinal axes which are substantially mutually parallel.

16. Apparatus according to claim 15, wherein, at axially consecutive sections, respectively first and second bearing means (26, 27) and/or third and fourth bearing means (28, 29) are associated with said first driven roller means (17) and/or with said second driven roller means (18), the external races of said first and second bearing means (26, 27) and/or of said third and fourth bearing means (28, 29) acting as stop elements for said objects (2).

17. Apparatus according to one of claims 11 to 16, wherein said driving roller means (19) has a longitudinal axis tilted by a preset angle (γ) in relation to the axes of said stop means (17, 18).

18. Apparatus according to one of claims 11 to 17, wherein said driving roller means (19) is fixed to slide means (30) which is movable towards and away from said stop means (17, 18).

19. Apparatus for sharpening objects (2), comprising abrading means (6) having an active surface (10) arranged for abrading an end portion of said objects (2) and for creating tip means (2a) in said objects,

characterised in that it further comprises moving means (33) for moving said objects (2), said moving means (33) being arranged for driving said objects (2) to interact with regions of said active surface (10).

20. Apparatus according to claim 19, wherein said moving means comprises trolley means (33) actuated by straight reciprocating movement means (34, 35).

21. Apparatus according to claim 20, wherein said trolley means (33) travels strokes the amplitude of which is substantially equal to the width of said active surface (10).

22. Apparatus according to one of claims 19 to 21, and further comprising support means (7) connected to rotation driving means (8) and arranged for supporting said abrading means (6).

23. Apparatus according to claim 22, wherein said abrading means (6) is fixed to said support means (8) through magnetic coupling means (15).

24. Apparatus according to one of claims 19 to 23, wherein said abrading means (6) comprises tool means (9) made of ferromagnetic material, on which a layer of abrasive material is located, said layer of abrasive material identifying said active surface (10).

25. Apparatus according to claim 24, wherein said magnetic coupling means comprises magnetic elements (15) arranged for interacting with said tool means (9).

26. Apparatus according to claim 25, when claim 24 is appended to claim 22, or to claim 23, wherein said support means (8) comprises flange means (12) in which chamber means (14) is created, said chamber means (14) being arranged for accommodating said magnetic elements (15).

27. Apparatus according to one of claims 19 to 26, wherein said abrading means (6) is rotated around a longitudinal axis thereof (X) by actuating means (11).

28. Apparatus according to claim 27, in which, during sharpening, said objects (2) interact with said abrading means (6) so that a projection of the longitudinal axis of each object (2) on a plane containing said active surface (10) is tangent to a circumference the center of which lies on said rotation axis (X).

29. Apparatus according to one of claims 19 to 28, and further comprising transfer means (5) arranged for rotating each of said objects (2) around a respective longitudinal axis and for simultaneously moving each of said objects (2) along said longitudinal axis to drive each of said objects (2) to interact with said abrading means (6).

30. Apparatus according to claim 29, wherein said transfer means (5) comprises driving roller means (19) arranged for interacting with said objects (2) to immobilise said objects (2) against stop means (17, 18).

31. Apparatus according to claim 30, wherein, at axially consecutive sections, respectively first contact means (24) and second contact means (25) are associated with said driving roller means (19), said first contact means (24) and said second contact means (25) being arranged for rotating said objects (2) around respective longitudinal axes.

32. Apparatus according to claim 31, wherein said first contact means comprises a first pair of O-rings (24).

33. Apparatus according to claim 31, or 32, wherein said second contact means comprises a second pair of O-rings (25).

34. Apparatus according to one of claims 30 to 33, wherein said stop means comprises first driven roller means (17) and second driven roller means (18).

35. Apparatus according to claim 34, wherein, at axially consecutive sections, respectively first and second bearing means (26, 27) and/or third and fourth bearing means (28,29) are associated with said first stop means (17) and/or with said second stop means (18), the external races of said first and second bearing means (26, 27) and/or of said third and fourth bearing means (28, 29) acting as stop elements for said objects (2).

36. Apparatus according to one of claims 30 to 35, wherein said driving roller means (19) has a longitudinal axis which is tilted by a preset angle (γ) in relation to the axes of said stop means (17, 18).

37. Apparatus according to one of claims 30 to 36, wherein said driving roller means (19) is fixed to slide means (30) which is movable towards and away from said first driven roller means (17) and said second driven roller means (18).

38. Apparatus for sharpening objects, comprising abrading means (6) provided with an active surface (10) and driven into rotation around an axis (X) for abrading an end portion of said objects (2) to create tip means (2a) in said objects (2), **characterised in that**, during said sharpening, said objects (2) inter-

act with said abrading means (6) so that a projection of the longitudinal axis of each object (2) on a plane containing said active surface (10) is tangent to a circumference the center of which lies on said rotation axis (X).

39. Apparatus according to claim 37, and further comprising support means (7) connected to rotation driving means (8) and arranged for supporting said abrading means (6).

40. Apparatus according to claim 39, wherein said abrading means (6) is fixed to said support means (8) through magnetic coupling means (15).

41. Apparatus according to one of claims 38 to 40, wherein said abrading means (6) comprises tool means (9) made of ferromagnetic material and provided with an active surface (10) obtained by depositing a layer of abrasive material.

42. Apparatus according to claim 41, wherein said magnetic coupling means comprises magnetic elements (15) arranged for interacting with said tool means (9).

43. Apparatus according to claim 42, when claim 41 is appended to claim 39, or 40, wherein said support means (8) comprises flange means (12) in which chamber means (14) is created, the chamber means (14) being arranged for accommodating said magnetic elements (15).

44. Apparatus according to claim 43, and further comprising moving means (33) for moving said objects (2), said moving means (33) being are arranged for driving said objects (2) to interact with the entire area of said active surface (10).

45. Apparatus according to claim 44, wherein said moving means comprises trolley means (33) actuated by reciprocating straight movement by eccentric means (34), said eccentric means (34) cooperating with restoring spring means (35).

46. Apparatus according to claim 45, wherein said trolley means (33) travels strokes the amplitude of which is substantially equal to the width of said active surface (10).

47. Apparatus according to one of claims 38 to 46, and further comprising transfer means (5) arranged for rotating each of said objects (2) around a respective longitudinal axis and for simultaneously moving each of said objects (2) along said longitudinal axis, to drive each of said objects (2) to interact with said abrading means (6).

48. Apparatus according to claim 47, wherein said transfer means (5) comprises driving roller means (19) arranged for interacting with said objects (2) to immobilise said objects (2) against stop means (17, 18).

49. Apparatus according to claim 48, wherein, at axially consecutive sections, first contact means (24) and second contact means (25) are respectively associated with said driving roller means (19), said first contact means (24) and said second contact means (25) being arranged for rotating said objects (2) around respective longitudinal axes.

50. Apparatus according to claim 49, wherein said first contact means comprises a first pair of O-rings (24).

51. Apparatus according to claim 49, or 50, wherein said second contact means comprises a second pair of O-rings (25).

52. Apparatus according to one of claims 48 to 51, wherein said stop means comprises first driven roller means (17) and second driven roller means (18).

53. Apparatus according to claim 52, wherein, at axially consecutive sections, respectively first and second bearing means (26, 27) and/or third and fourth bearing means (28, 29) are associated with said first driven roller means (17) and/or with said second driven roller means (18), the external races of said first and second bearing means (26, 27) and/or of said third and fourth bearing means (28, 29) acting as stop elements for said objects 2.

54. Apparatus according to one of claims 48 to 53, wherein said driving roller means (19) has a longitudinal axis which is tilted by a preset angle (γ) in relation to the axes of said stop means (17, 18).

55. Apparatus according to one of the claims from 48 to 54, wherein said driving roller means (19) is fixed to slide means (30) which is movable towards and away from said stop means (17, 18).

56. Apparatus for sharpening objects (2), comprising abrading means (6) arranged for abrading an end portion of said objects (2) to create tip means (2a) in said objects (2), **characterised in that** it further comprises transfer means (5) arranged for rotating each of said objects (2) around a respective longitudinal axis and for simultaneously moving each of said objects (2) along said longitudinal axis to drive each of said objects (2) to interact with said abrading means (6).

57. Apparatus according to claim 56, wherein said transfer means (5) comprises driving roller means

(19) arranged for interacting with said objects (2) to immobilise said objects (2) against stop means (17, 18).

58. Apparatus according to claim 57, wherein, at axially consecutive sections, first contact means (24) and second contact means (25) are respectively associated with said driving roller means (19), said first contact means (24) and said second contact means (25) being arranged for rotating each of said objects (2) around said respective longitudinal axis.

59. Apparatus according to claim 58, wherein said first contact means comprises a first pair of O-rings (24).

60. Apparatus according to claim 58, or 59, wherein said second contact means comprises a second pair of O-rings (25).

61. Apparatus according to one of claims 57 to 60, wherein said stop means comprises first driven roller means (17) and second driven roller means (18) which have axes that are substantially mutually parallel.

62. Apparatus according to claim 61, wherein, at axially consecutive sections, first and second bearing means (26, 27) and/or third and fourth bearing means (28, 29) are respectively associated with said first driven roller means (17) and/or with said second driven roller means (18), the external races of said first and second bearing means (26, 27) and/or of said third and fourth bearing means (28, 29) acting as stop elements for said objects (2).

63. Apparatus according to one of claims 57 to 62, wherein said driving roller means (19) has a longitudinal axis which is tilted by a preset angle (γ) in relation to the axes of said stop means (17, 18).

64. Apparatus according to one of claims 57 to 63, wherein said driving roller means (19) is fixed to slide means (30) which is movable towards and away from said stop means (17, 18).

65. Apparatus according to one of claims 54 to 64, and further comprising support means (7) connected to rotation driving means (8) and arranged for supporting said abrading means (6).

66. Apparatus according to claim 63, wherein said abrading means (6) is fixed to said support means (8) through magnetic coupling means (15).

67. Apparatus according to one of claims 56 to 64, wherein said abrading means (6) comprises tool means (9) made of ferromagnetic material.

68. Apparatus according to claim 67, when claim 66 is appended to claim 64, or 65, wherein said magnetic coupling means comprises magnetic elements (15) arranged for interacting with said tool means (9).

69. Apparatus according to claim 68, wherein said support means (8) comprises flange means (12) in which chamber means (14) are created, the chamber means (14) being arranged for accommodating said magnetic elements (15).

70. Apparatus according to claim 69, and further comprising moving means (33) for moving said objects (2), said moving means (33) being arranged for driving said objects (2) to interact with the entire area of said active surface (10).

71. Apparatus according to claim 70, wherein said moving means comprises trolley means (33) actuated by straight reciprocating movement by eccentric means (34) which cooperates with restoring spring means (35).

72. Apparatus according to claim 71, wherein said trolley means (33) travels strokes the amplitude of which is substantially equal to the width of said active surface (10).

73. Apparatus according to one of claims 56 to 72, wherein said abrading means (6) is rotated around a longitudinal axis thereof (X) by actuating means (11).

74. Apparatus according to claim 73, in which, during said sharpening, said objects (2) interact with said abrading means (6) so that a projection of the longitudinal axis of each object (2) on a plane containing said active surface (10) is tangent to a circumference the center of which lies on said rotation axis (X).

75. Apparatus according to one of the preceding claims, wherein said objects comprise elongated bodies.

76. Apparatus according to one of the preceding claims, wherein said objects comprise welding electrodes.

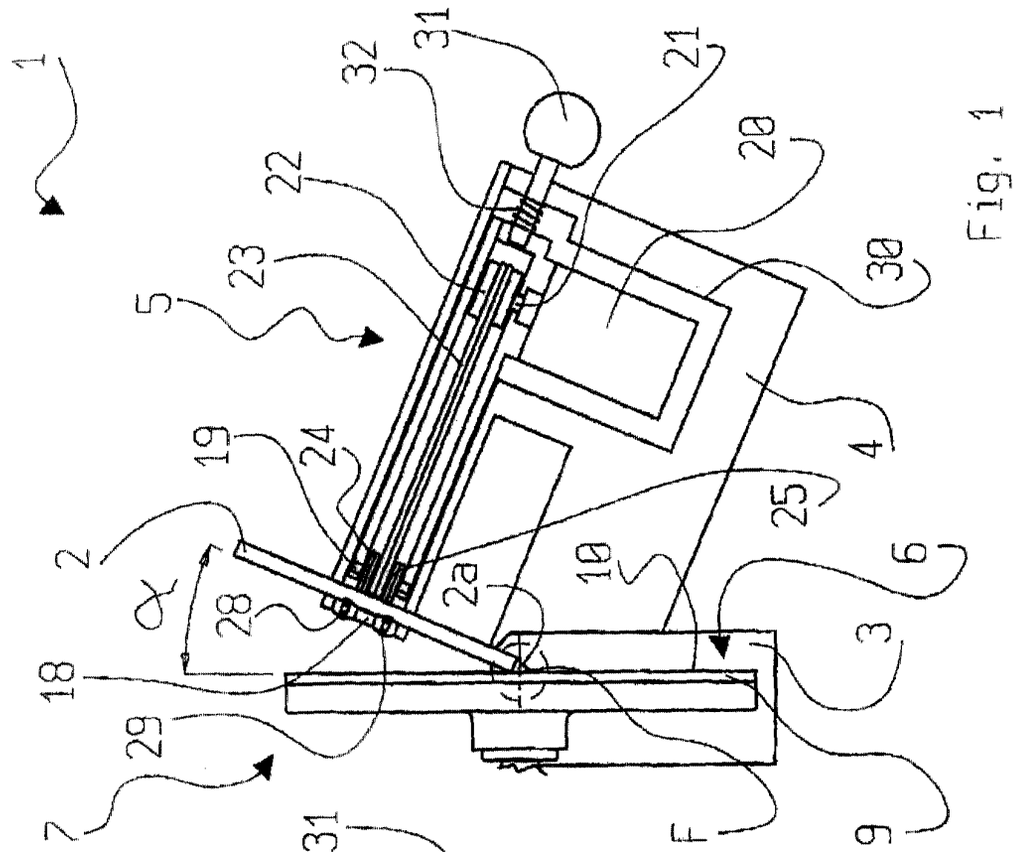
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Fig. 1

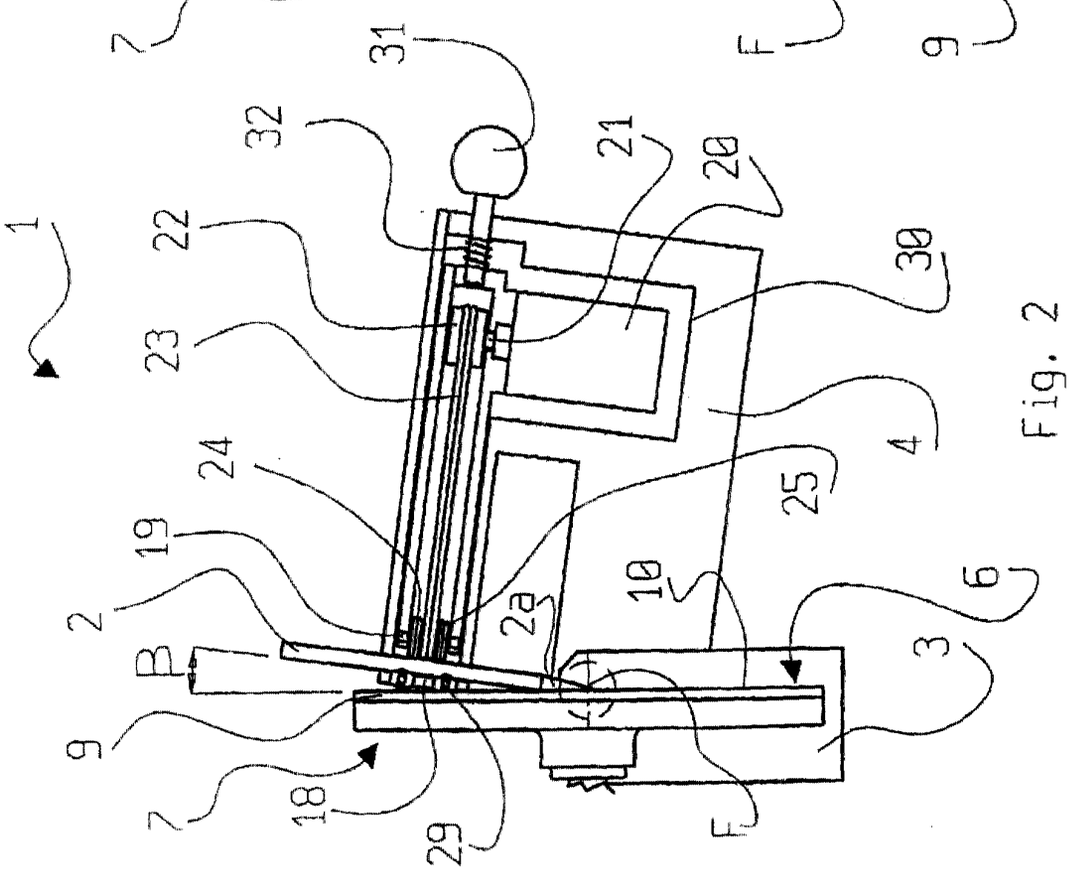
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Fig. 2

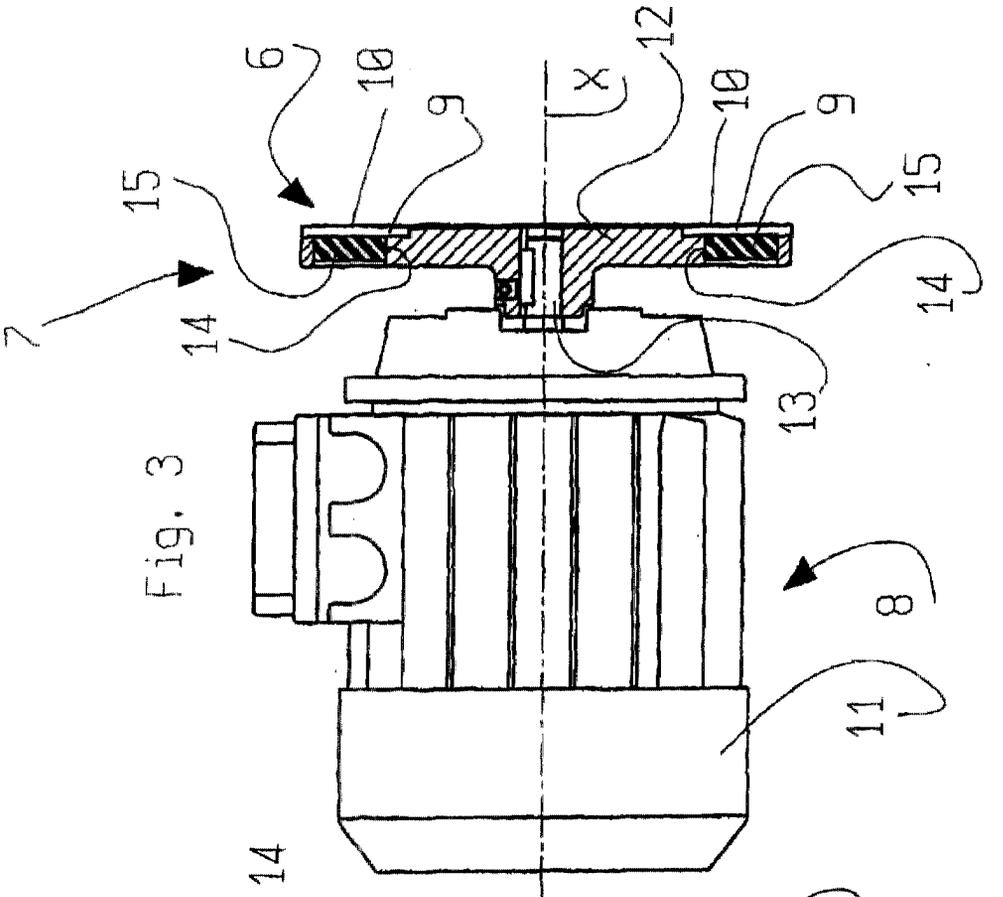

Fig. 3

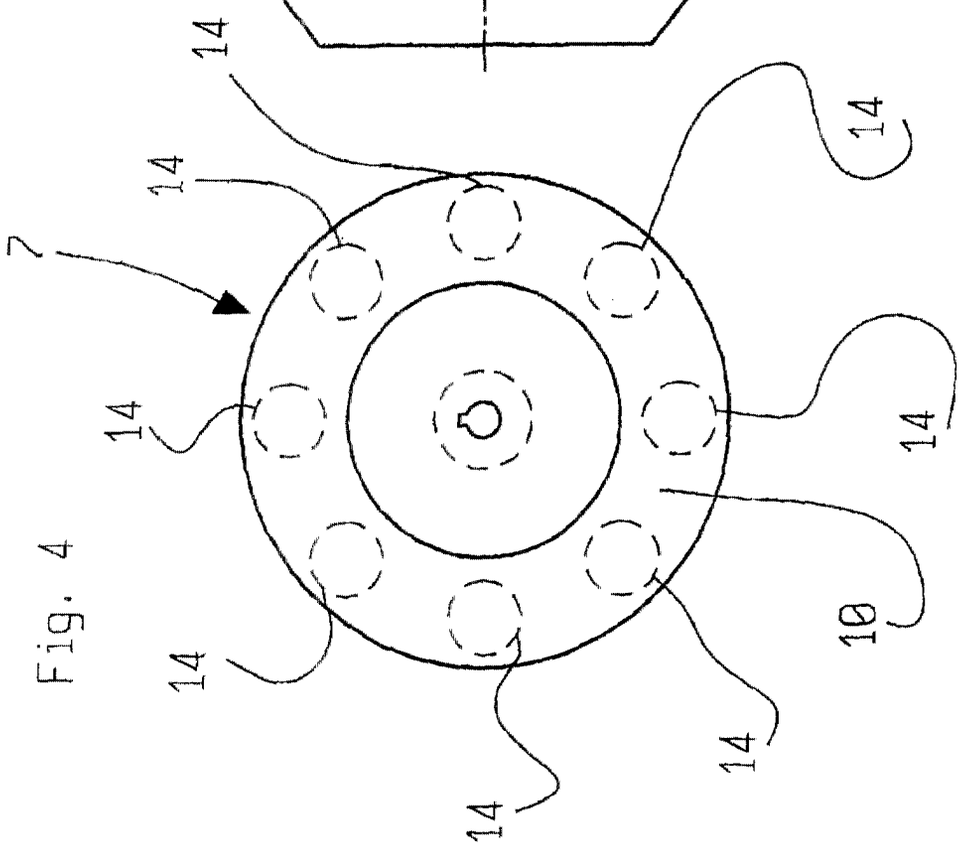

Fig. 4

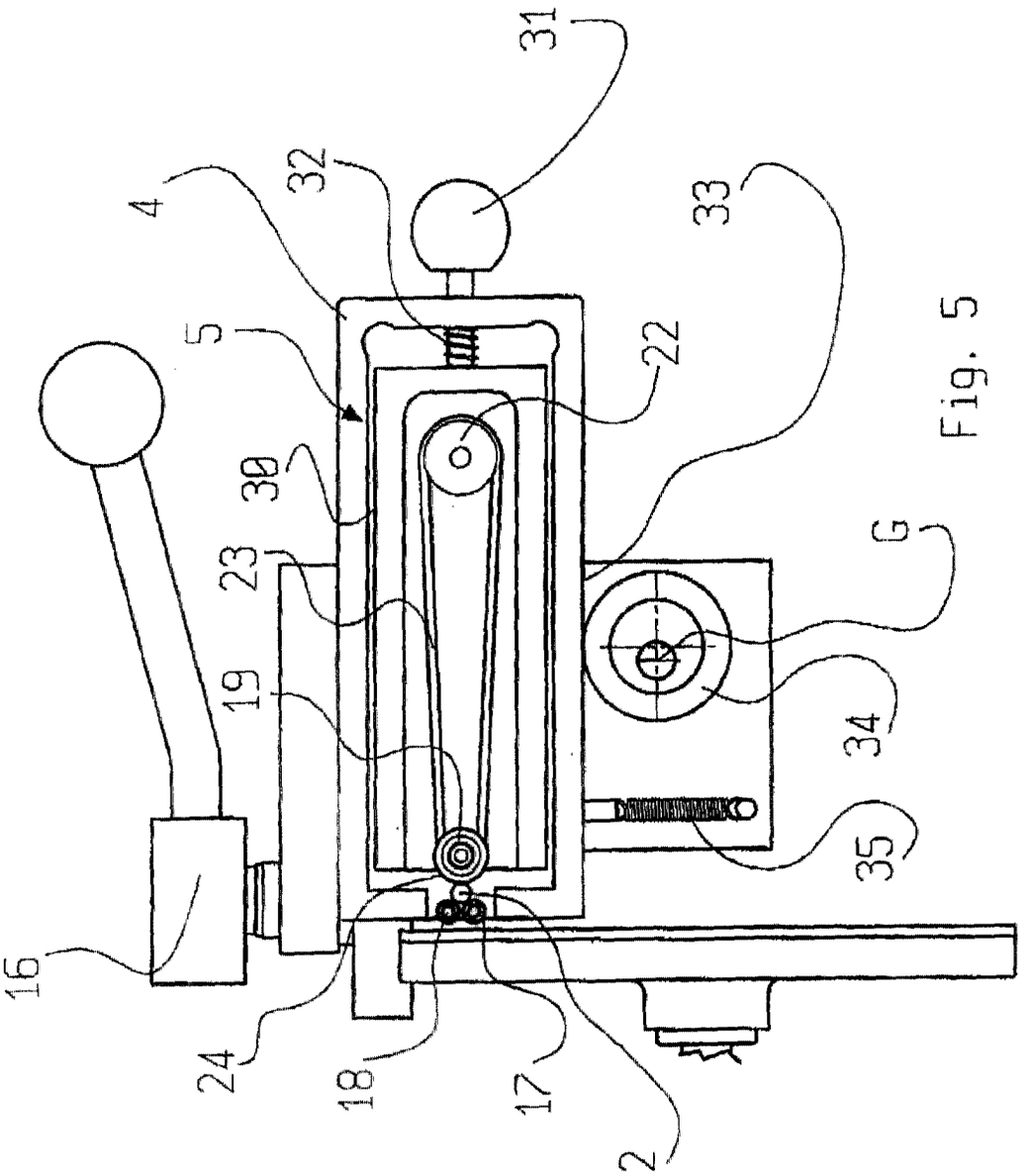

Fig. 5

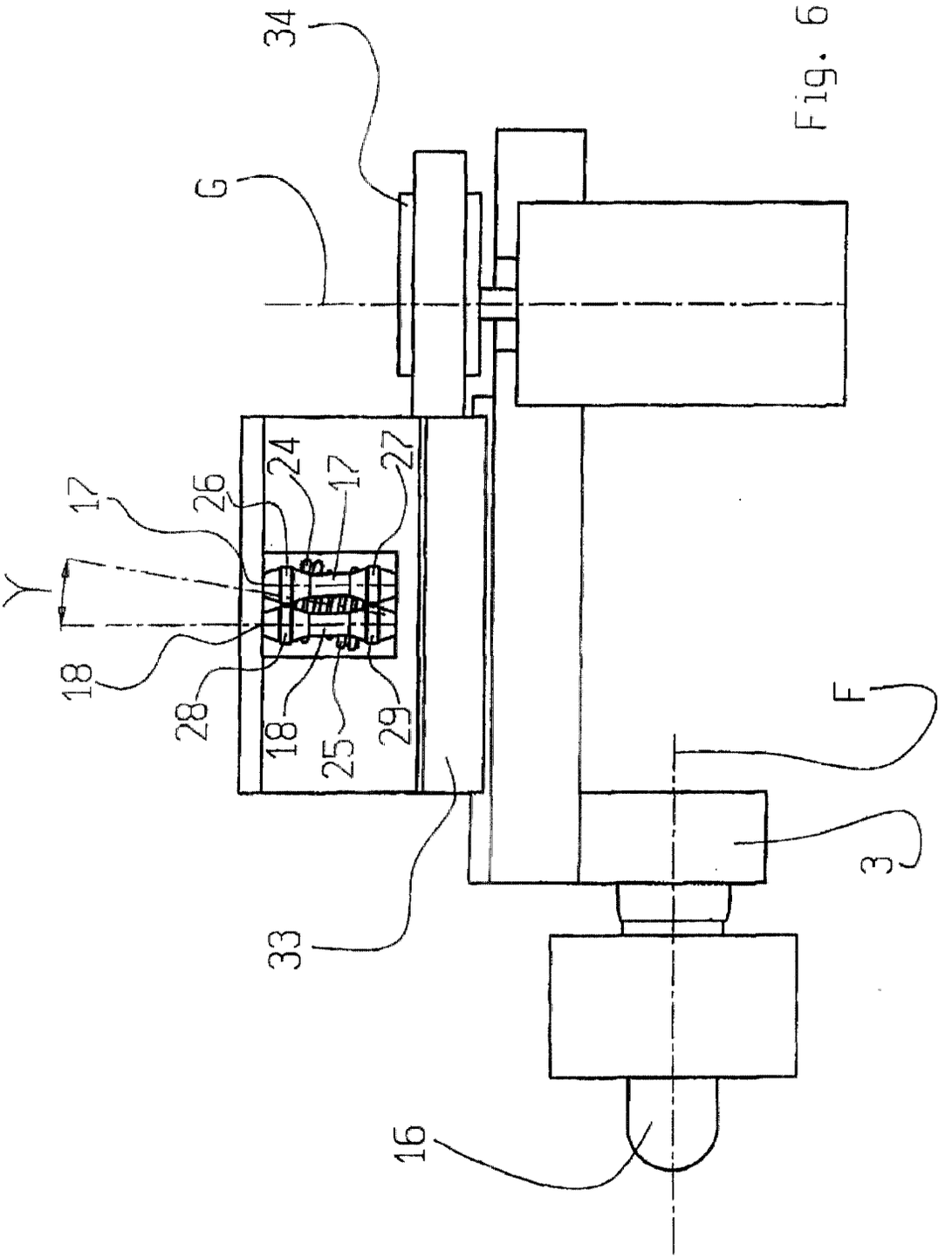

Fig. 6

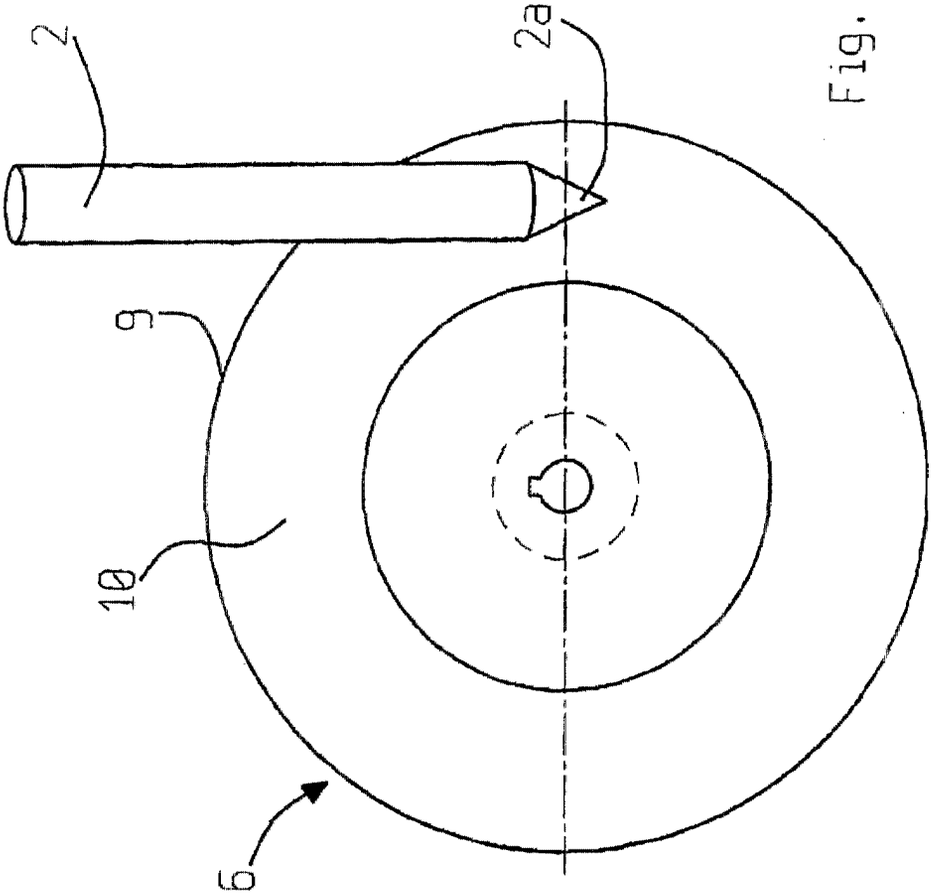

Fig. 7