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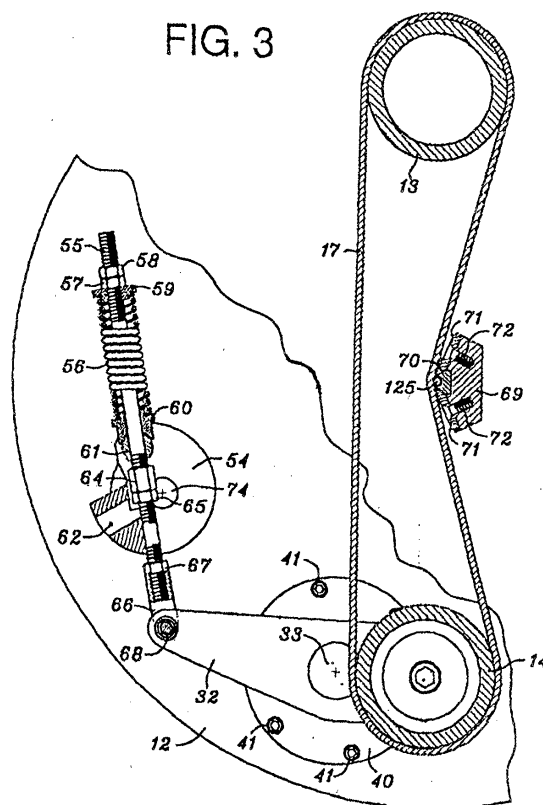
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(54) **An apparatus for abrasively cleaning and descaling the surface of elongated objects**

(57) An apparatus (10) for cleaning and descaling an elongate member (125), comprising an orbital drive housing (12), a drive roller (13) and an adjustable roller (14) both mounted apart from one another in parallel on said orbital drive housing (12), a support member (29) for supporting said elongate member passing through it, an abrasive belt (17) mounted on said rollers (13,14) and in contact with said elongate member (125). A motor (18) rotates said orbital drive housing (12), and a drive rotates said drive roller (13) as the orbital drive housing (12) is rotated about said elongate member (125). The apparatus comprises a belt release system and a tensioning assembly associated with said adjustable roller (14) to provide the pre-tension of the belt. The adjustable roller (14) is mounted free to move outward from the centre of rotation of the orbital drive housing (12) beyond the pre-tension setting.

FIG. 3



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Description

[0001] The present invention relates to an apparatus for abrasively cleaning and descaling the surface of elongated objects such as metallic rod, pipe and especially continuous strands of wire.

[0002] US-A-5,613,900 discloses such an apparatus for cleaning the outer surface of an elongate member which includes an abrasive sanding belt rotated about two rollers, and orbited about the elongate member.

[0003] Said two rollers are secured for rotation to a rotatable drive casing mounted in a stationary housing.

[0004] One of the rollers is a drive roller, the other one is an idler roller rotationally supported by an eccentric rod.

[0005] Said eccentric rod includes both a roller portion and a mounting portion which are axially offset from each other.

[0006] The mounting portion of the eccentric rod is held for rotation within the drive casing by a pair of spherical bearings held in bearing mounts.

[0007] The apparatus includes a sanding belt engagement and disengagement mechanism and a belt tensioning mechanism.

[0008] The belt engagement and disengagement mechanism comprises a linkage mechanism, connected to the mounting portion of the eccentric rod, and a handle affixed to the drive casing.

[0009] Movement of the handle by an operator allows rotation of the mounting portion in two directions. Rotation in one direction moves the roller portion toward the drive roller to a belt release position and rotation in the opposite direction moves the idler roller to a belt engagement position. In the first position the belt may be removed or replaced and in the second position the idler roller applies the necessary tension to the belt.

[0010] A spring is connected between the end of the mounting portion of the eccentric rod to retain the linkage assembly and therefore the idler roller in one of the two positions.

[0011] The belt tensioning mechanism is connected by a second handle to said bearing mount of the eccentric rod to provide a fine adjustment to the tension of the belt.

[0012] Such a bearing mount includes an eccentric mount and is mounted for rotation within said drive casing.

[0013] Rotation of the bearing mount by way of said second handle will move eccentric rod slightly upward or downward depending on the direction of rotation such that the tension applied to the belt will be slightly increased or decreased by the relative upward or downward movement of the idler roller with respect to the drive roller.

[0014] The known apparatus provides a clamping assembly to secure the second handle and, therefore, the bearing mount of the eccentric rod in desired position so that the desired tension of the abrasive belt is main-

tained.

[0015] Therefore, according to the state of art, the tension in the abrasive belt is fixed, and is generated by the rotation of the bearing mount of the eccentric rod, and to a lesser degree by the spring in the belt engagement and disengagement mechanism.

[0016] Whether the apparatus is operating or not, the abrasive belt tension will remain constant.

[0017] In other words, there is the drawback that any variation in abrasive belt length during rotation of the orbital casing is not compensated by a corresponding adjustment of the tension of the abrasive belt.

[0018] It also means that if the abrasive belts are of slightly varying length, the eccentric rod must be adjusted every time the abrasive belt is changed in order to maintain consistent tension.

[0019] An object of the present invention is to provide an apparatus capable of applying to the abrasive belt a correct pre-tension as well as of adjusting continuously the tension during the operation of the apparatus, thus improving the belt tensioning and releasing mechanism.

[0020] Said object is achieved by an apparatus for cleaning and descaling an elongate member comprising an orbital drive housing, a drive roller and an adjusting roller both mounted apart from one another and in parallel on said orbital drive housing, a support for said elongate member passing through it, an abrasive belt mounted on said two rollers and in contact with said elongate member, a motor rotating said orbital drive housing, a drive rotating said drive roller as the orbital drive housing is rotated about said elongate member, a belt release system and a belt tensioning assembly associated with said adjustable roller to provide setting of the belt pre-tension, characterized in that said adjustable roller is mounted free to move outward from the centre of rotation of the orbital drive housing beyond the pre-tension setting due to the centrifugal forces generated by the rotation of said orbital drive housing, whereby the tension of the belt increases as the rotational speed of the orbital drive housing increases.

[0021] Advantageously said adjustable roller tensioning assembly and said belt release system are one and the same mechanism.

[0022] Preferentially, the apparatus comprises an off-set plate having a pivoting shaft and a first and a second end, said pivoting shaft being mounted on a bearing of said orbital drive housing, said adjustable roller being mounted free to rotate around a support shaft at said first end of said off-set plate and said second end being associated to said tensioning assembly.

[0023] Conveniently the apparatus is characterized in that said tensioning assembly comprises a tensioning eccentric rotating about a centre, a threaded rod connected to said off-set plate and to said tensioning eccentric and a compression spring mounted around said threaded rod.

[0024] Preferably, said tensioning eccentric rotates around said centre and is mounted on a tensioning pivot

shaft mounted in bushings in the orbital drive housing.

[0025] Advantageously, said threaded rod has a line of action beyond said centre of said tensioning eccentric.

[0026] Preferably, said compression spring is positioned around the said extended threaded rod between a lower spring washer and an upper spring washer, said compression spring and said spring washers being held in place by an adjusting nut and a locking nut.

[0027] Advantageously, the apparatus comprises means for regulating the pre-tension level of the abrasive belt by regulating the pre-tension level of the compression spring by rotating said adjusting nut about the said threaded rod.

[0028] Preferably, the apparatus comprises a belt tracking mechanism.

[0029] Conveniently, said tracking mechanism modifies the angular relationship of the adjustable roller with respect the drive roller.

[0030] The present invention will be better understood by means of the following description and of the enclosed figures made by way of non limiting example with reference to the attached sheets of drawings in which:

Fig. 1 is a plan view of the apparatus for cleaning and descaling according to the invention;

Fig. 2 is a view of the belt tensioning mechanism along the plane indicated by 2-2 in Fig. 1;

Fig. 3 is a sectional view of the belt tensioning mechanism along the plane indicated by 3-3 in Fig. 2;

Fig. 3A is a view similar to Fig. 3 but showing the abrasive belt and rollers in the disengaged position;

Fig. 4 is a view of the belt tracking mechanism along the plane indicated by 4-4 in Fig. 1;

Fig. 5 is a cross sectional view of the belt tracking mechanism along the plane indicated by 5-5 in Fig. 4;

Fig. 6 is a view of the elongate member support bearing mechanism along the plane indicated by 6-6 in Fig. 1;

Fig. 7 is a cross sectional view of the elongate member support bearing mechanism along the plane indicated by 7-7 in Fig. 6.

[0031] Referring to Fig. 1, a cleaning and descaling apparatus 10 is shown and generally includes a machine housing 11, containing an orbital drive housing 12 and its constituent components. The orbital drive housing 12 has mounted onto it an adjustable roller tensioning assembly 15, an adjustable roller tracking assembly 16, a drive roller assembly 31, and an elongate support member assembly 29, all of them comprising the main features of the preferred embodiment of the invention, and which will be further described in detail below. The orbital drive housing 12 and the drive roller assembly 31 and their constituent components are not described being already known.

[0032] For example as described in US-A-5,613,900 such an apparatus contains an internal orbital drive system, comprising a center stationary gear and a planetary gear, said planetary gear being mechanically affixed to the drive roller. An external drive rotates the orbital drive housing 12 to which two rollers 13, 14 are mounted.

[0033] In practice, the center stationary gear and the planetary drive gear are operatively connected. The said internal gear drive rotates one of the rollers when the orbital drive housing is rotated.

[0034] Turning back to Fig. 1, the mentioned external drive comprises a motor 18 provided for operating various components within the machine housing 11. Motor 18 is operatively connected to the orbital drive housing 12 by means of a drive belt 25. Motor 18 is mounted on an adjustable motor base 19, which is fastened to a horizontal surface 21 which comprises an integral part of the machine housing 11. The adjustable motor base 19 is attached to the housing surface 21 by means of fasteners 20. The adjustable motor base 19 has adjusting screws 22 and locking nuts 23 by which means the location of motor 18 is adjusted, thereby adjusting the tension in the drive belt 25. Motor 18 has mounted upon it a drive pulley 24, and a brake disk 26 is attached to the drive pulley by fasteners 27. A brake caliper 28 acts upon the brake disk 26 to brake the motor 18 and the orbital drive housing 12 and its constituent components during operation, and to prevent rotation during maintenance of the apparatus 10. The drive belt 25 is generally of the toothed type, and the motor drive pulley 24 and the outer circumference of the orbital drive housing 12 are formed to match the tooth profile of the drive belt 25.

[0035] As also shown in Fig. 1 the orbital drive housing 12 is rigidly attached to the machine housing 11. During the wire sanding and descaling process a wire or other elongate member 125 passes through the machine housing 11 and the orbital drive housing 12 and along the elongate support member 29. The elongate support member assembly 29 is supported at its extended end by an elongate support member bearing assembly 30, which is rigidly attached to the machine housing 11.

[0036] The adjustable roller tensioning assembly 15 has an adjustable roller 14 associated to it, and the drive roller assembly 31 has a drive roller 13 attached to it.

[0037] The drive roller assembly 13 is connected to an internal drive mechanism not shown in the drawings.

[0038] An endless abrasive belt 17 is mounted between the belt rollers 13 and 14 and is tensioned by means of the adjustable roller tensioning assembly 15. The abrasive belt 17 passes over the wire or elongate member 125 which is supported by the elongate support member 29, and during operation abrades the surface of said wire or elongate member 125.

[0039] Referring now to Fig. 2, the adjustable roller tensioning assembly 15 is shown in cross-section. The adjustable roller 14 is mounted onto, and free to rotate about, a support shaft 34 by means of bearings 35 and

36. The outermost bearing 36 is fastened to the support shaft 34 by means of a cylindrical washer 38 and a fastener 39. The innermost bearing 35 is retained inside the adjustable roller 14 by means of a retaining ring 37. The adjustable roller 14 is held captive between the bearings 35 and 36 by internal shoulders to prevent lateral movement. The support shaft 34 is rigidly attached to a first end of an offset plate 32, to which the pivoting shaft 33 is also rigidly attached, forming an assembly in which the respective shafts have differing but parallel centerline axes.

[0040] Referring briefly to Fig. 3, it can be seen that when the pivoting shaft 33 rotates, the adjustable roller 14 will rotate about the centre of the pivoting shaft 33.

[0041] Turning back to Fig. 2, the pivoting shaft 33 is mounted in a spherical bearing 42. The spherical bearing 42 is mounted in a front mounting plate 40, which is attached to the orbital drive housing 12 by means of fasteners 41. The spherical bearing 42 is retained in the front mounting plate 40 by means of a retaining ring 43. The pivoting shaft 33 is attached to the spherical bearing 42 by means of a nut 46, which is held in place by a locking washer 45. A cylindrical washer 44 acts as a spacer between the locking washer 45 and nut 46, and the spherical bearing 42. The other end of the pivoting shaft 33 is held within a hollow sleeve shaft 47, which is further described below.

[0042] The adjustable roller tensioning assembly 15 includes an eccentric assembly 49, a threaded rod 55 and a compression spring 56 as explained herebelow.

[0043] The second extended end of the offset plate 32 is attached to the tensioning eccentric assembly 49, which is mounted on a tensioning pivot shaft 50 by means of fasteners 53. The tensioning pivot shaft 50 is mounted in a pair of bronze bushings 51, which are mounted in the orbital drive housing 12. A locking collar 48 and locking screw 52 attach the locking collar 48 to the tensioning pivot shaft 50 to retain it to the orbital drive housing 12.

[0044] Referring to Fig. 3, the adjustable roller tensioning mechanism 15 is shown in a partial sectional end view. The belt rollers 13 and 14 are shown, with the abrasive belt 17 stretched between them. The wire or other elongate member 125 is shown supported by the elongate member support bar 69. A multiple of carbide slider plates 70, of which only one is shown, are clamped to the elongate member support bar 69 by means of multiple slider retaining plates 71 which are attached to the elongate member support bar by fasteners 72. The slider retaining plates 71 are heat-treated to prevent premature wear by exposure to the abrasive particles from the abrasive belt 17.

[0045] The front mounting plate 40 is mounted to the orbital drive housing 12 by means of fasteners 41. As previously described, the adjustable roller 14 is mounted in such a way that, when viewed from the end of the adjustable roller 14, the centre of the adjustable roller 14 is off-centre with respect to the centre of the pivoting

shaft 33. The offset plate 32 which forms part of the pivoting shaft 33 and support shaft 34 is attached at its outermost second end to the tensioning eccentric 54 which is part of the tensioning assembly 49.

[0046] The tensioning eccentric 54 rotates about the centre 74 of the tensioning pivot shaft 50.

[0047] A freely rotating stub shaft 61 is mounted into the tensioning eccentric 54, and a threaded rod 55 extends through a hole in the stub shaft 61. At the lower end of the threaded rod 55 a clevis 66 is attached and held in place by means of a locking nut 67. Between the stub shaft 61 and the clevis 66 there is an adjusting nut 64 and a locking nut 65. Rotation of this adjusting nut 64, thereby moving it upwardly or downwardly along the threaded rod 55, will change the limit of motion of the adjustable roller. The adjusting nut 64 will also act as a stop against the compression spring 56 when the tensioning eccentric 54 is rotated for belt dis-engagement, as described further below.

[0048] Referring briefly to Fig. 5, the second extended end of the offset plate 32 has a spherical bearing 76 mounted in it and held in place by means of a retaining ring 77. A pin 68 passes through the clevis 66 and spherical bearing 76, and is held captive by means of retaining rings 75 on both ends.

[0049] Returning to Fig. 3, the extended end of the threaded rod 55 has mounted on it a lower spring washer 60, the compression spring 56, and an upper spring washer 59.

[0050] The tension eccentric 54 comprises a first flat portion and a second curvilinear portion for supporting the lower spring washer 60 in the two configurations shown according to Fig. 3 A and Fig. 3 and determined by the rotation of the tension eccentric 54 about the centre 74.

[0051] When the tension eccentric 54 is rotated into the abrasive belt release position as shown in Fig. 3A, the lower spring washer 60 is located on the flat portion of the tension eccentric 54, causing the said eccentric to be held in said position by the force of the compression spring 56.

[0052] The compression spring 56 and washers 59 and 60 are held in place by means of an adjusting nut 57 and a locking nut 58. Since the line of action of the threaded rod 55 is beyond the centre 74 of the pivoting shaft 50, the compression spring 56 acts to apply tension to the abrasive belt 17 when in the engaged position as shown in Fig. 3. The tensioning eccentric 54 is restrained from further rotation once the threaded rod 55 is in contact with a shoulder within the tensioning eccentric 54. Rotation of the adjusting nut 57, moving it upwardly or downwardly along the threaded rod 55, will respectively decrease or increase the amount of pre-tension in the compression spring 56, and therefore the amount of pre-tension imparted into the abrasive belt 17.

[0053] The tensioning eccentric 54 has a hole 62 drilled in it, to receive a handle 63. Although the abrasive

belt 17 has a pre-tension generated in it by the compression spring 56, the belt tension will be higher at operational speeds. During operation of the apparatus 10, the orbital drive housing 12 and its constituent components rotate at speed, generating centrifugal forces in the orbital drive housing 12 and all of its components. The adjustable roller 14 is free to move outward from the rotational centre of the orbital drive housing 12, limited in travel only by the adjusting nut 64. The adjusting nut 64 is adjusted in such a way that during normal operation of the apparatus 10 the nut does not contact the stub shaft 61, thereby restricting acceptable outward movement of the adjustable roller 14. As the rotational speed increases, the centrifugal force increases proportionately, and the adjusting roller 14 will therefore impart an increased force against the abrasive belt 17 as it tries to move outward from the rotational centre. This increased tension is counter-balanced by the opposing centrifugal force acting upon the drive roller 13, and the increased forces result in a higher tension in the abrasive belt 17. The wire or elongate member 125 travelling through the apparatus 10 will increase in linear speed proportionate to the rotational speed of the orbital drive housing 12, and this will consequently increase the lateral frictional force imparted into the abrasive belt 17. By increasing the tension in the abrasive belt 17 by the means described above, the abrasive belt 17 will consistently track on the rollers 13 and 14, and will be restricted in said tendency to move laterally along the rollers 13 and 14 at high operational speeds.

[0054] Referring to Fig. 3A, when the handle 63 is inserted into the hole 62, and the tensioning eccentric 54 is rotated clockwise (as shown), the tension in the abrasive belt 17 is released and a slack 73 is created in the abrasive belt 17. This allows the abrasive belt 17 to be easily removed or replaced.

[0055] In said disengaged position the adjusting nut 64 will act to prevent the compression spring 56 from complete extending, and thereby reducing the amount of slack 73.

[0056] Counter-clockwise rotation (as shown) of the handle will restore the pre-set tension in the abrasive belt 17, as the compression spring 56 is compressed and locked into operating position as shown in Fig. 3.

[0057] Referring now to Fig. 4, the belt tracking mechanism 16 is shown from the rear of the orbital drive housing 12 in a partial section view. The adjustable roller 14, the drive roller 13, and the abrasive belt 17 are also depicted from the rear of the orbital drive housing 12. A rear mounting plate 78 is attached to the orbital drive housing 12 by means of fasteners 79. A cover plate 80 is attached to the rear mounting plate 78 by means of fasteners 81. A threaded adjusting screw 83 is located in a stepped hole through the rear mounting plate 78. The threaded adjusting screw 83 has an integral rectangular head 84 to permit adjustment by means of a wrench, and a bronze washer 85 is installed between the rectangular head 84 and the rear mounting plate 78.

On the lower end of the adjusting screw 83 a bronze washer 89 and a locking nut 88 are placed. At the extended end of the threaded adjusting screw 83 is a rectangular-head nut 86, held captive on the threaded adjusting screw by means of a locking nut 87. The threaded adjusting screw 83 is threaded through a freely rotating pivot pin 82. The pivot pin 82 is inserted into a hole in the sleeve shaft 47. The hole 91 in the sleeve shaft 47 for the threaded adjusting screw 83 is oversized, as further described below.

[0058] Turning to Fig. 5, the belt tracking mechanism 16 is shown in cross-sectional view. The sleeve shaft 47 has a flat surface 90 machined on either side to fit the rectangular slot 92 machined into the rear mounting plate 78. The oversize hole 91 in the end of the sleeve shaft 47 allows for a small amount of angular movement of the threaded adjusting screw 83. The pivoting shaft 33 is inserted into a hole in the end of the sleeve shaft 47. Clearance is provided by the rectangular slot 92 in the rear mounting plate 78 for angular adjustment of the sleeve shaft 47 and pivoting shaft 33. Rotation of the threaded adjusting screw 83 will move the pivot pin 82 upwardly or downwardly along the threaded adjusting screw, thereby changing the angle of the sleeve shaft 47, the pivoting shaft 33, and by extension the angle of the adjustable roller 14.

[0059] Referring back briefly to Fig. 4, it is apparent that the alignment of the rectangular slot 92 in the rear mounting plate 78 is in alignment with a line drawn through the centres of the adjustable roller 14 and the drive roller 13. Adjustment of the threaded adjusting screw 83 will alter the angular relationship of the adjustable roller 14 with respect to the drive roller 13 in one plane only, making the extended ends of the rollers 13 and 14 either more convergent or divergent.

[0060] Turning back to Fig. 5, once the threaded adjusting screw 83 is set to the required position by rotating either the rectangular head 84 or the rectangular nut 86, the position is made captive by locking the lock nut 88. The pivoting shaft 33 is free to rotate within the sleeve shaft 47 regardless of the angular position set by the threaded adjusting screw 83. The spherical bearing 42 will permit both angular motion and rotational movement of the roller shaft 33 during both tracking and tensioning adjustment and operation. The spherical bearing 76 in the offset plate 32 will accommodate angular disparity between the offset plate 32 and the clevis 66.

[0061] Referring now to Fig. 6, the elongate support member bearing assembly 30 is shown in a partial sectional view. Adjustment of the support bearing housing 98 is permitted in two planes. The support bearing housing is mounted onto a lower adjustable plate 104 by means of fasteners 100 and washers 101. The support bearing housing has slotted holes 99 to permit side to side adjustment. Two adjuster plates 108 are mounted on either side of the lower adjustable plate 104 by means of fasteners 109. Adjusting screws 110 are threaded into the adjuster plates 108 and locked in place

by lock nuts 111. The lower adjusting plate 104 is mounted to a lower support block 114 by means of fasteners 106 and washers 107, passing through slotted holes 105 to permit vertical adjustment. Adjusting screws 116 are threaded into the bottom of the lower support block and locked in place by locking nuts 117.

[0062] Referring to Fig. 7, a section through the elongate support member bearing assembly 30 is shown. The lower support block 114 is rigidly attached to the machine housing 11 by means of fasteners 115. The support bearing housing 98 is guided by a slot formed by the lower adjustable plate 104 and a retainer plate 112, mounted to the lower adjustable plate 104 by means of fasteners 113. Prior to operation of the apparatus 10, the centre of the support bearing housing 98 and bearing 121 is aligned with the centre of the orbital drive housing 12 by means of the adjustments as described above.

[0063] The elongate member support bar 69 is attached to an adapter plate 93 by means of fasteners 94. The adapter plate 93 is heat treated to prevent undue wear from rubbing by the abrasive belt 17. A carbide slider plate 70 is clamped to the elongate member support bar 69 by means of slider retaining plates 71 which are attached to the elongate member support bar by fasteners 72. The wire or elongate member 125 is supported by the carbide slider plate 70, and passes through a cylindrical carbide bushing 118 which further guides the wire 125 as it passes through the centre hole 97 in the support shaft 96. The adapter plate 93 is attached to a support shaft 96 by means of fasteners 95. The support shaft is mounted in the support bearing housing 98 by means of a bearing 121. A hardened spacer ring 102 is installed on the inboard side of the bearing 121, and a hardened spacer ring 103 is installed on the outboard side. The spacer rings 102 and 103, and the bearing 121 are retained on the support shaft 96 by means of a nut 123 and locking washer 122. Two cylindrical grease seals 119 and 120 are installed in the support bearing housing 98, and re-lubrication is provided by means of the grease nipple 124.

[0064] The operation of the apparatus 10 is now briefly described.

[0065] Prior to the operation of the apparatus 10, the abrasive sanding belt 17 may be mounted onto the rollers 13 and 14 by inserting the handle 63 into the adjustable roller tensioning mechanism 15 and rotating the eccentric housing 54 into the disengaged position as shown in Fig. 3A. When the abrasive belt 17 has been positioned on the rollers 13 and 14, the eccentric housing 54 may be rotated back into the operating position as shown in Fig. 3 in order to induce pre-tension in the abrasive belt 17. Adjustment of the pre-tension in the abrasive belt 17 may be made by adjusting the tensioning nut 57, and locking said nut 57 by means of the lock nut 58 when the desired tension has been reached. The handle 63 is removed from the apparatus 10 for the duration of the sanding and descaling operation. The sand-

ing and descaling operation of the apparatus 10 is similar to those previously described in earlier patents for such apparatuses. As already explained during rotation of the orbital drive housing 12 and all attached components, the tension in the abrasive belt 17 increases in proportion to the rotational speed of the orbital housing. The increase in abrasive belt tension will compensate for the increased drag created by the wire or other elongate member 125 being abraded by the abrasive belt 17. If during the sanding and descaling operation it is found that the abrasive belt 17 is shifting along the axes of the rollers 13 and 14, and is not staying in location due to the frictional pull of the wire 125 against the abrasive belt 17, adjustment may be made to the roller tracking mechanism 16 to correct this action. Adjustment of the threaded adjusting screw 83 will alter the angular relationship of the rollers 13 and 14, and cause the abrasive belt to shift laterally along the axes of the rollers 13 and 14. When the desired setting has been reached the threaded adjusting screw 83 may be locked into position by means of the locking nut 88.

[0066] Many advantages result from the apparatus according to the invention.

[0067] The new apparatus uses a roller 14 mounted on a shaft having an eccentric pivot 33, with an over-centre linkage 54 used to apply a pre-tension to the abrasive belt, and which also allows the roller 14 to freely move outward beyond the pre-tension setting. The belt pre-tension is adjustable by means of a nut 57 and screw 55, with a lock nut 58 used to retain the setting. A handle 63 is inserted into the over-centre linkage 54 to apply or release the belt pre-tension, and this handle is removed during machine operation. When the orbital housing 12 begins rotating, the centrifugal force from the tensioning roller is used to increase the abrasive belt tension. This allows higher belt tensioning than can be applied by a simple linkage mechanism and the elimination of a fixed handle as part of the linkage reduces rotational mass, permitting easy machine balancing and allowing higher rotational speeds. The centrifugal force acting on the eccentrically mounted adjustable roller 14 also balances the centrifugal force acting on the drive roller 13, equalizing the forces and allowing higher rotational speeds avoiding that the centrifugal forces exert dangerous bending moments on the rollers and roller shafts. The abrasive belt effectively becomes a tension member, transferring forces between the two rollers. This also increases the belt force imparted onto the wire during operation, resulting in better abrading at high speed. Since the abrasive belt has a very low degree of elasticity, the actual movement of the freely-moving adjustable roller is very small. Any variation in abrasive belt length will be automatically compensated for during rotation by the freedom of movement given to the tensioning roller. Moreover even though the wire travels at a higher lateral speed at higher sander rotational speeds, the increase of this "drag", which tries to move the abrasive belt laterally, is compensated by the features of the

invention. In fact, the tracking mechanism is used to further compensate for this lateral force, by adjusting the divergence of the roller ends, and making them more or less out-of-parallel to help overcome any remaining tendency of the belt to move laterally.

[0068] The elongate support bearing assembly further assists in compensating for the tendency of the abrasive belt to move laterally. During rotation of the orbital housing the elongate support, being eccentric to the center of rotation of the orbital housing, and being subject to the tension forces in the abrasive belt and imparted into the wire or elongate member, will want to deflect when said orbital housing is in rotation. This deflection is prevented by the addition of the elongate support member bearing assembly, which will negate the bending forces as described above. This elongate support bearing assembly contributes to the ability of the apparatus to operate at higher rotational speeds, and therefore permits the wire or elongate member to pass through the apparatus at higher lateral speeds.

Claims

1. An apparatus (10) for cleaning and descaling an elongate member (125), said apparatus comprising an orbital drive housing (12), a drive roller (13) and an adjustable roller (14) both mounted apart from one another and in parallel on said orbital drive housing (12), a support member (29) for supporting said elongate member (125) passing through it, an abrasive belt (17) mounted on said two rollers (13,14) and in contact with said elongate member (125), a motor (18) rotating said orbital drive housing (12), a drive rotating said drive roller (13) as the orbital drive housing (12) rotates about said elongate member (125), a belt release system and a tensioning assembly (15) associated with said adjustable roller to provide setting of the belt pre-tension, **characterized in that** said adjustable roller (14) is mounted free to move outward from the centre of rotation of the orbital drive housing (12) beyond the pre-tension setting due to the centrifugal forces generated by the rotation of the orbital drive housing (12) whereby the tension of the belt (17) increases as the rotational speed of the orbital drive housing (12) increases.
2. An apparatus (10) for cleaning and descaling according to claim 1, **characterized in that** said tensioning assembly (15) and said belt release system are one and the same mechanism.
3. An apparatus (10) for cleaning and descaling according to claim 1 or 2, **characterized in that** it comprises an offset plate (32) having a pivoting shaft (33) and a first and a second end, said pivoting shaft (33) being mounted on a bearing (42) of said orbital drive housing (12), said second adjustable roller (14) being mounted free to rotate around a support shaft (34) at the first end of said offset plate (32) and said second end of said off-set plate (32) being associated to said tensioning assembly (15).
4. An apparatus (10) for cleaning and descaling according to claim 3, **characterized in that** said tensioning assembly (15) comprises a tensioning eccentric (54) rotating about a centre (74), a threaded rod (55) connected to said offset plate (32) and to said tensioning eccentric (54), a compression spring (56) mounted around said threaded rod (55).
5. An apparatus (10) for cleaning and descaling according to claim 4, **characterized in that** said tensioning eccentric (54) rotates around a centre (74) of a tensioning pivot shaft (50) and is mounted in bushings (52) of the orbital drive housing (12).
6. An apparatus (10) for cleaning and descaling according to claim 4 or 5, **characterized in that** said threaded rod (55) has a line of action beyond said centre (74) of the tensioning eccentric (54).
7. An apparatus (10) for cleaning and descaling according to any of the claims from 4 to 6, **characterized in that** said tensioning eccentric (54) is provided with a freely rotating shaft (61) and said threaded rod (55) extends through a hole in said stub shaft (61).
8. An apparatus (10) for cleaning and descaling according to any of claims from 4 to 7, **characterized in that** the lower end of said threaded rod (55) is connected to a clevis (66) and the second end of said offset plate (32) has a bearing (76), a pin (68) passing through said clevis (66) and said bearing (76).
9. An apparatus (10) for cleaning and descaling according to any of claims from 5 to 8, **characterized in that** said compression spring (56) is positioned around the said extended threaded rod (55) between a lower spring washer (60) and an upper spring washer (59), said compression spring (56) and said spring washers (59, 60) being held in place by an adjusting nut (57) and a locking nut (58).
10. An apparatus (10) for cleaning and descaling according to claim 9, **characterized by** the fact of comprising means for regulating the pre-tension level of the abrasive belt (17) by regulating the pre-tension level of the compression spring (56) by rotating said adjusting nut (57) about the said threaded rod (55).
11. An apparatus (10) for cleaning and descaling ac-

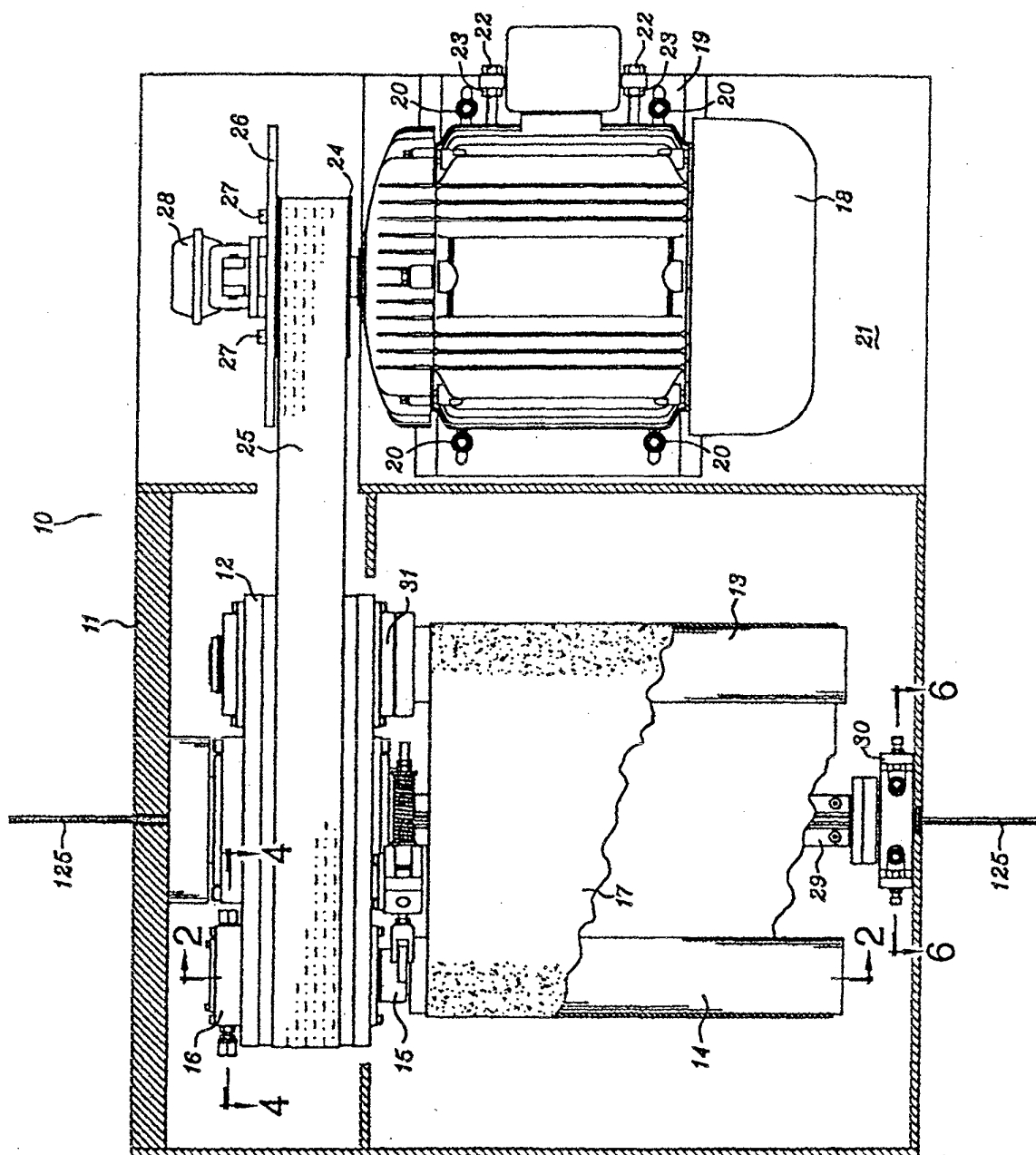
cording to claim 8, **characterized by** the fact of comprising means to regulate the limit of motion of the adjustable roller (14), said means comprising an adjusting nut (64) and a locking nut (65) between the said stub shaft (61) and the said clevis (66), whereby said limit is regulated by rotating said nut (64) around said threaded rod (55).

12. An apparatus (10) for cleaning and descaling according to any of claims from 5 to 11, **characterized by** the fact of comprising means (62, 63) for rotating the tensioning eccentric (54) in a first direction in order to pretension the abrasive belt (17) and in a second direction to disengage the abrasive belt (17).
13. An apparatus (10) for cleaning and descaling according to claim 12, **characterized in that** said means for rotating comprise a hole (62) drilled in said tensioning eccentric (54) and an handle (63) insertable in said hole (62).
14. An apparatus (10) for cleaning and descaling according to any of claims from 1 to 13, **characterized by** the fact of comprising a belt tracking mechanism (16).
15. An apparatus (10) for cleaning and descaling as in claim 14, **characterized in that** said tracking mechanism (16) modifies the angular relationship of the adjustable roller (14) with respect the drive roller (13).
16. An apparatus (10) for cleaning and descaling according to claim 14 or 15, **characterized in that** it further comprises a hollow sleeve shaft (47) into which said pivoting shaft (33) of said plate (32) is inserted, and means (83, 82) to change concurrently the angle of said sleeve shaft (47), of said pivoting shaft (33) and of said adjusting roller (14).
17. An apparatus (10) for cleaning and descaling according to claim 16, **characterized in that** said means further comprise a threaded adjusting screw (83) and a freely rotating pivot pin (82) inserted into a hole (91) of said sleeve shaft (47), whereby the rotation of said threaded adjusting screw (83) moves said pivot pin (82) along the threaded adjusting screw modifying the angle of said adjusting roller (14).
18. Cleaning and descaling apparatus (10) according to claim 17, **characterized in that** said threaded adjusting screw (83) is located in a hole of a mounting plate (78) of the orbital drive housing (12).
19. Cleaning and descaling apparatus (10) according to claim 17 or 18, **characterized in that** it further comprises a locking nut (88) for locking in position

said threaded adjusting screw (83).

20. Cleaning and descaling apparatus (10) according to claim 1 **characterized in that** it further comprises said orbital drive housing (12) attached to a machine housing (11) to which is attached an elongate support member bearing assembly (30) supporting an elongate member support bar (69), said elongate member (125) passing through said machine housing (11) and orbital driving housing (12), and along the said elongate member support bar (69).
21. Cleaning and descaling apparatus (10) according to claim 20 **characterized in that** said elongate support member bearing assembly (30) comprises a support bearing housing (98) mounted on a lower adjusting plate (104) which is mounted on a lower support block (114) associated to said machine housing (11), means (110, 116) being provided to permit a substantially horizontal side by side adjustment of the support bearing housing (98) with respect to the said lower adjusting plate (104) and substantially vertical adjustment of the support bearing housing (98) with respect to the said lower support block (114).
22. Cleaning and descaling apparatus (10) according to claim 20 or 21 **characterized in that** a support shaft (96) is mounted on said support bearing housing (98) by means of a bearing (121) located in said housing (98), said elongate member (125) passing through the center hole (97) in said support shaft (96).
23. Cleaning and descaling apparatus (10) according to claim 20 or 21 or 22 **characterized in that** said support bearing housing (98) comprises a carbide slider plate (70) and a cylindrical carbide bushing (118), said elongate member (125) being supported by said carbide slider plate (70) and passing through said cylindrical carbide bushing (118).

FIG. 1



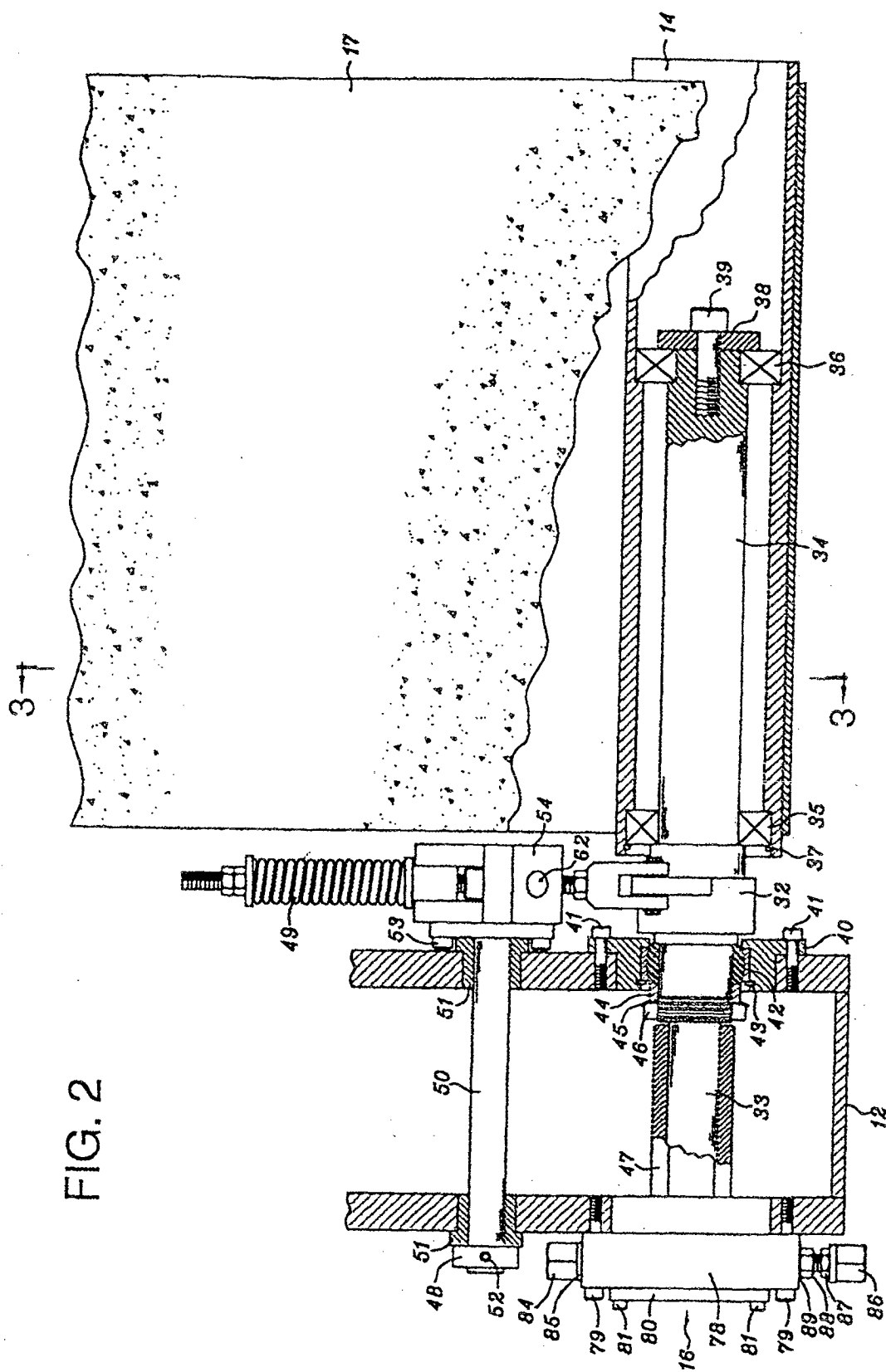
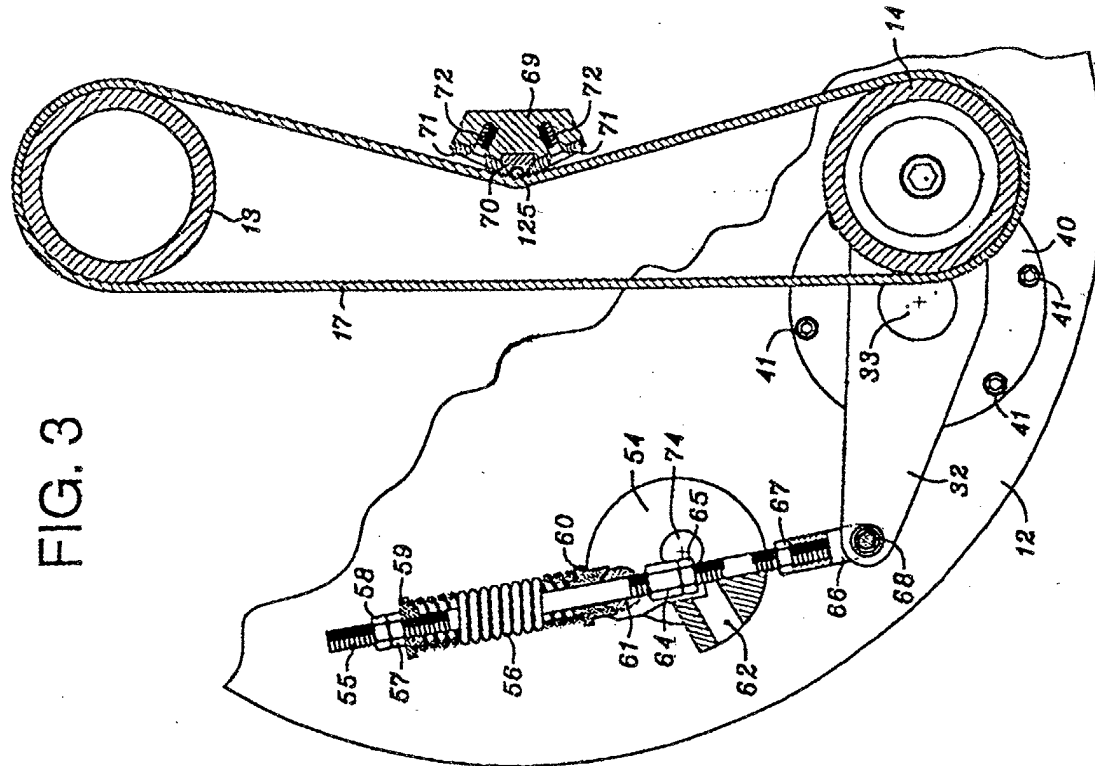
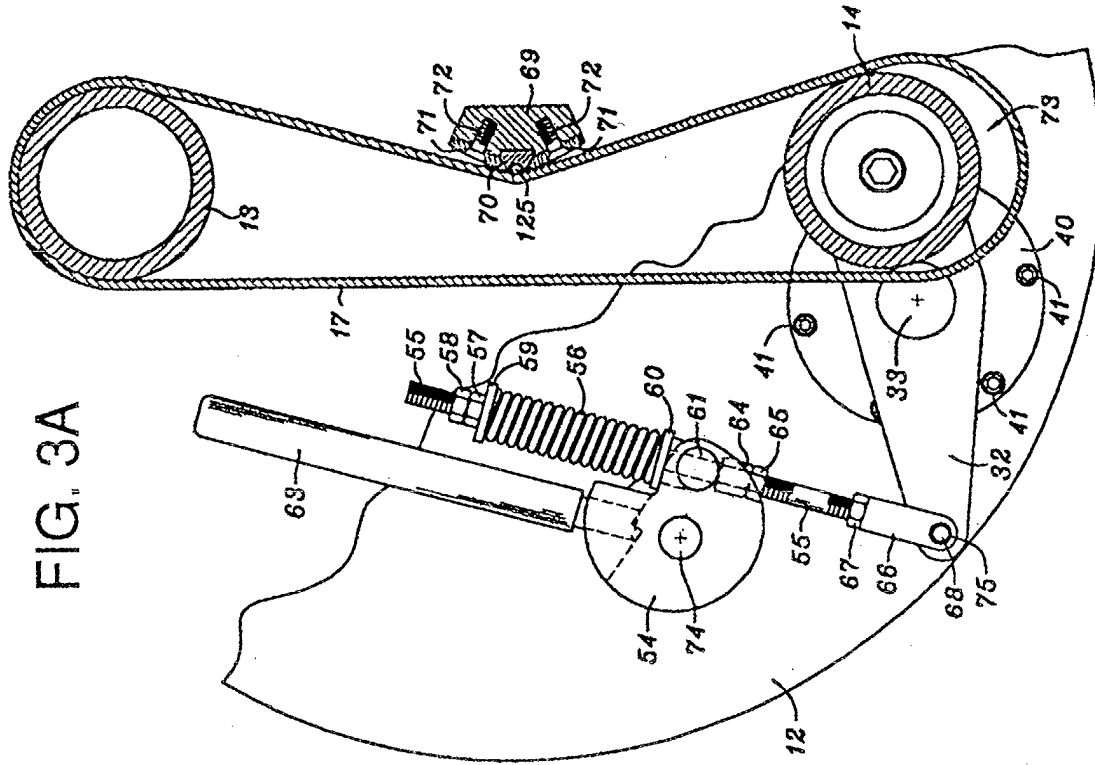
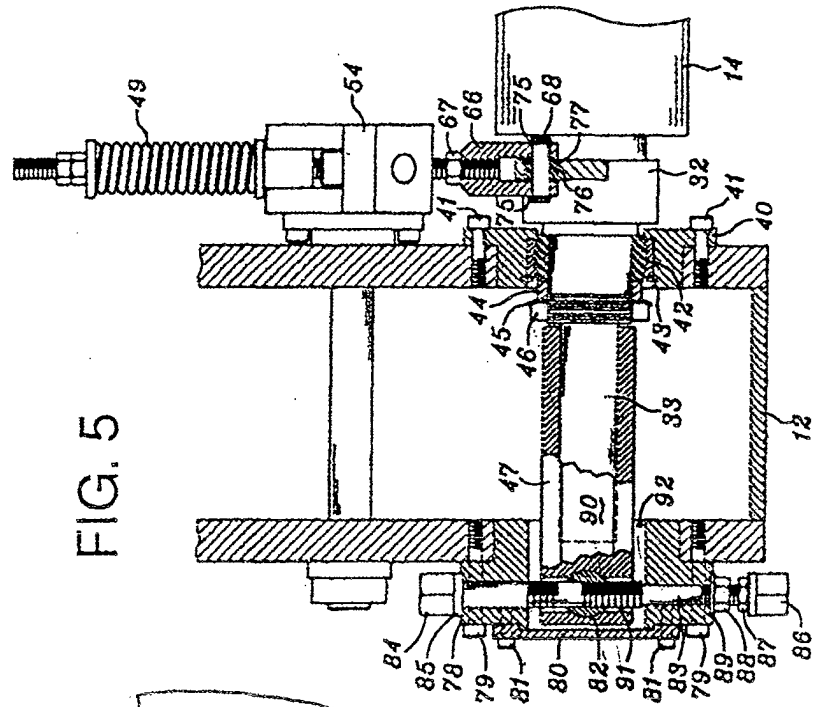
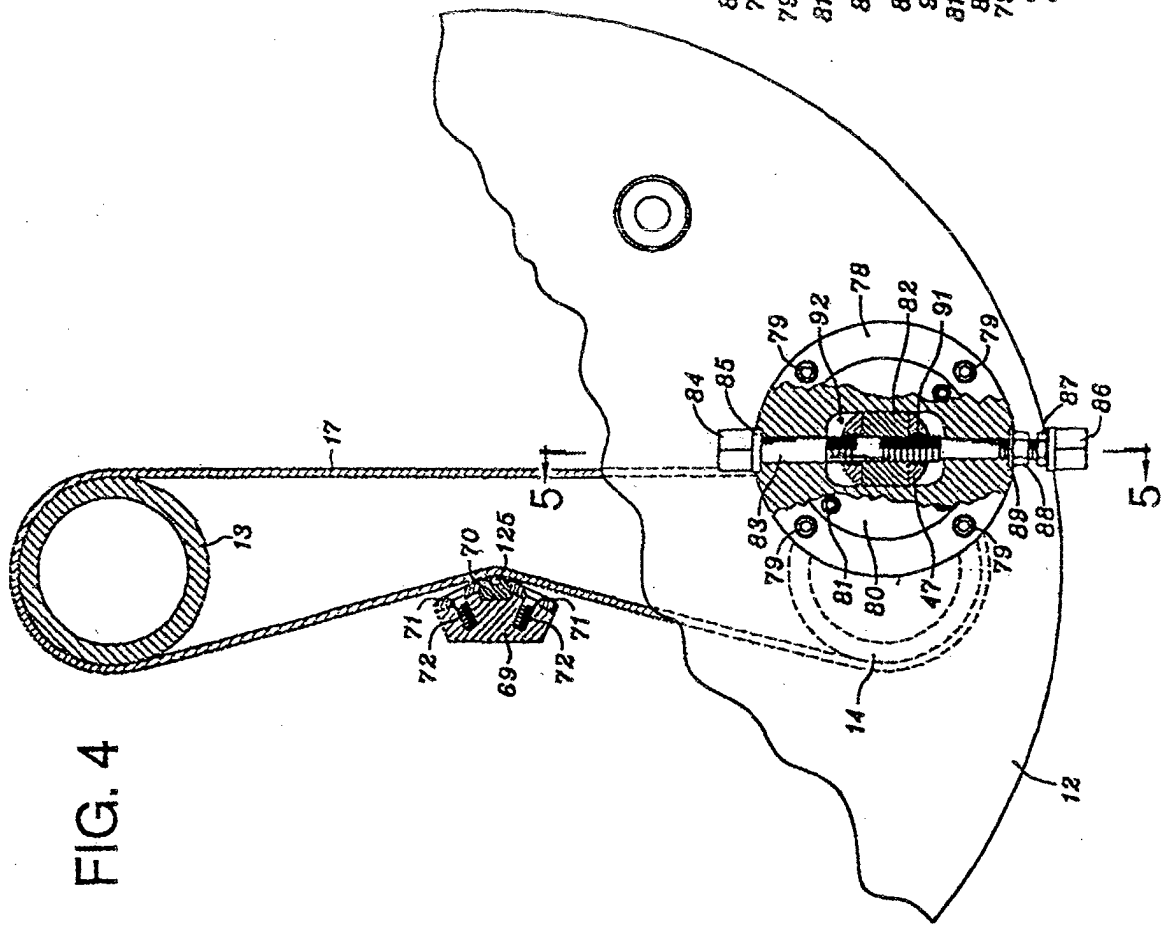
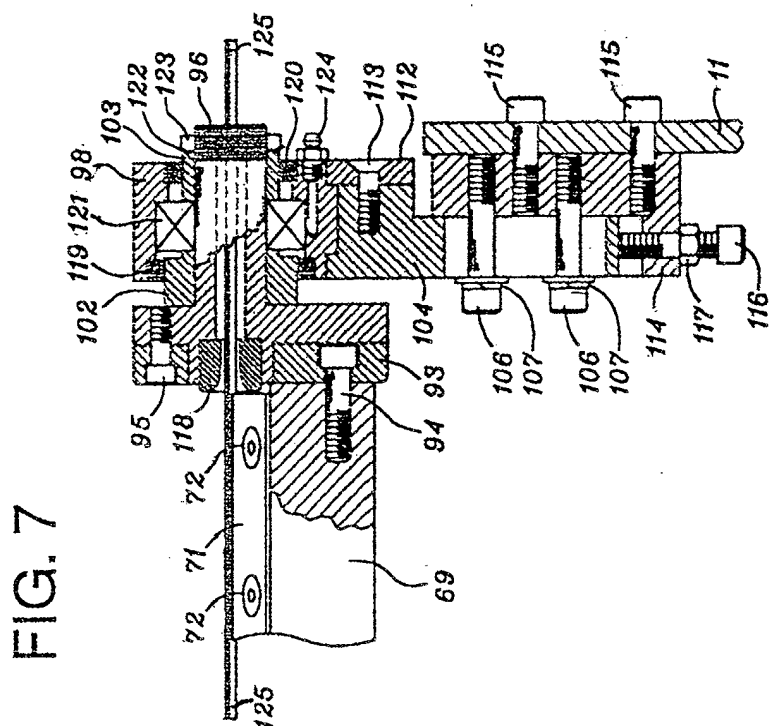


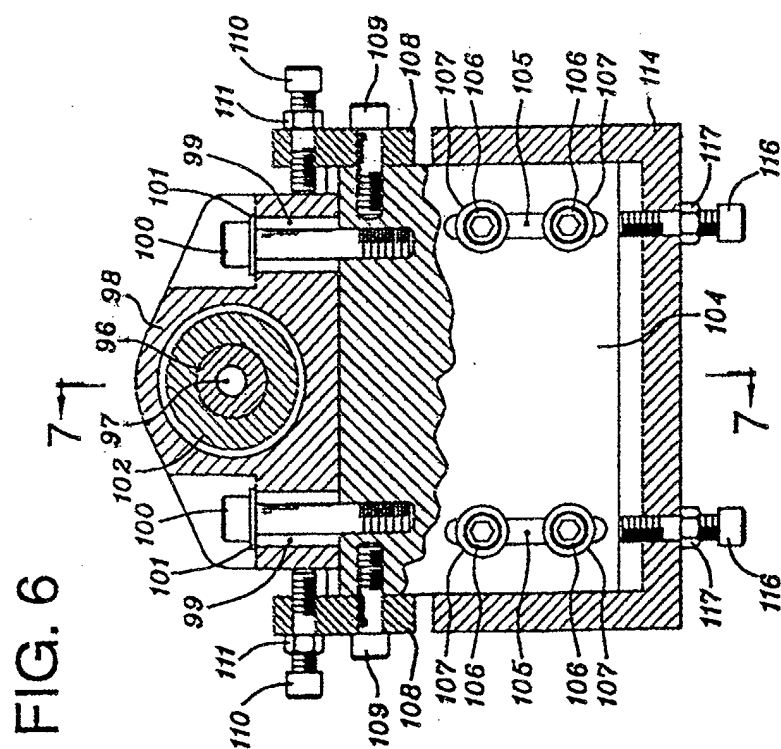
FIG. 2







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EUROPEAN SEARCH REPORT

Application Number
EP 03 42 5023

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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 20 March 2003	Examiner Koller, S
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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