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## (54) Tension/release mechanism for belt sander

(57) A belt sander (10) includes a mechanism (18,100) to apply and release tension to the roll of sandpaper used in the sander. A release arm (20,120) is rigidly connected to a rotational member (30,132) that is engageable with a support member (50,170) that is operatively connected to the front roller (60) of the sander. The rotational member is designed such that the rotation of the tension release arm creates longitudinal motion of the front roller to apply and remove tension from the endless roll of sandpaper to allow the user to selectively replace the roll of sandpaper.

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## Description

BACKGROUND

**[0001]** This invention relates to a hand-held belt sanding device having a mechanism for applying and releasing the tension of a sandpaper belt to allow easy replacement of the belt.

**[0002]** Hand-held belt sanders are commonly used in wood working activities such as sanding rough boards, chamfering, etc. In addition to wood working, belt sanders are useful when working with plastics and metals and are especially helpful to aid in the removal of rust, paint, or stains.

**[0003]** Many current hand-held belt sanders contain two drums or rollers, one of which is driven by a motor provided in the sanding tool. A sandpaper belt is utilized as the sanding surface and is housed in the belt sander around the outside circumference of the two rollers. A mechanism is used to hold the roller not connected to the belt sander's motor forward or toward the front of the tool to apply tension in the sanding belt. The tension placed on the sanding belt will maintain stability in the belt when it begins to move at a high rate of speed when driven by the motor through the rotation of the rear roller.

**[0004]** It is desirable to provide a belt sander with an improved mechanism to apply and remove sanding belt tension.

BRIEF SUMMARY

**[0005]** An aspect of the present invention provides a belt sander with a tensionireiease mechanism, or iaich, to set and release the sanding belt tension. In general, the belt sander contains the elements of a conventional belt sanding apparatus, including a housing that forms the majority of the exterior surface of the sander, an internal motor driven by a power source, a set of roller wheels with one in the forward portion and the second located near the rear portion. The rear roller wheel is driven by the motor. The forward roller wheel is connected to the sander with the use of the tension/release mechanism according to the present invention.

**[0006]** The present invention includes a release arm coupled to a rotational member. The rotational member engages a portion of a support member such that when the release arm is rotated by the user, the rotational member rotates to cause linear motion of the support member toward the rear of the sander. The forward end of the support member is connected to the front roller, such that the front roller simultaneously moves toward the rear of the sander. This movement removes tension from a roll of sand paper, which is placed around the front and rear rollers so that user can replace the sand paper roll. After the user has changed the sandpaper roll, the user allows the release arm to rotate to the normal, or tension position, aided by the force of an internal biasing spring. The rotation of the release arm causes similar, but opposite, rotation of the rotational member and forward motion of the support member, which places tension on the sandpaper roll to allow for operation of the sander.

**[0007]** In a first aspect the invention provides a latch for a belt sander having a pair of rollers that define a plane of travel for sandpaper comprising (a) an arm rotatable about an axis orthogonal to the sandpaper plane of travel, (b) a rotational member operatively engaged with an end of the arm, (c) a support member having a first end engaged with the rotational member and a second end connected to a first roller such that rotation of the arm changes a distance between the first roller and a second roller.

**[0008]** The arm preferably has a first end and a second end, the first end being engaged with the rotational member, and the second end oriented such that an axis through the length of the second end is generally perpendicular to an axis oriented through the length of the first end. The support member may be biased toward the front roller by a spring. Retaining means may be provided to retain the first roller in a position to allow the sandpaper roll to be removed from the sander against the force of the spring.

**[0009]** The arm and the rotational member may be operatively engaged with a pin. The rotational member may be a pinion gear, with the support member including a plurality of teeth that correspond to a plurality of teeth on the pinion gear.

**[0010]** Alternatively, the rotational member may be a cam plate, with the support member including a recessed portion with a side wall that can be engaged by the cam plate.

**[0011]** In one embodiment the arm and rotation member may be formed as a single member.

**[0012]** In a further aspect the invention provides a belt sander with a mechanism to allow removal and replacement of a roll of sandpaper comprising a support member having a first end and a second end where the first end has grooves that cooperate with teeth formed on a pinion gear and where the second end is operatively connected to a first roller, and an arm that is rotatable about a first axis generally perpendicular to a second axis about which the first roller rotates and that is fixed to the pinion gear to selectively rotate the pinion gear.

**[0013]** A catch may be provided to maintain the belt sander of any one of claims 11 to 13 further comprising a catch to maintain the first roller in a position to allow the sandpaper roll to be removed from the sander against the force of the spring.

**[0014]** In a still further aspect the invention resides in a mechanism to provide and release tension for a sandpaper roll of a belt sander, comprising (a) a first roller and a second roller, (b) an arm rotatable from a tension position to a release position, (c) a cam plate operatively connected to the arm, having a flat surface and at least one curved surface with an end tangential to an end of the flat surface, and (d) a support member formed with at least one flat wall that engages the flat wall of the cam

plate when the handle is in the tension position, and that makes rolling contact with the curved surface of the cam plate when the handle is rotated toward the release position, wherein rotation of the arm causes linear motion of the support member along a longitudinal axis of the support member.

**[0015]** The cam plate may further comprise a second flat surface with an end tangential to a second end of the curved surface, wherein the second flat surface is parallel with and contacts the flat wall of the support member when the arm is in the release position.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0016]** FIG. 1 is a perspective view of a belt sander showing a tension/release mechanism in the tension position.

**[0017]** FIG. 2 is the belt sander of FIG. 1 with a first embodiment of the tension/release mechanism shown in an exploded view.

**[0018]** FIG. 3 is the perspective view of FIG. 1 showing the tension/release mechanism in the release position.

**[0019]** FIG. 4 is a perspective view of a catch for the belt sander.

**[0020]** FIG. 5 is an exploded view of another embodiment of a tension/release mechanism.

**[0021]** FIG.6 is a perspective view of a support member.

**[0022]** FIG. 7 is a top view of the cam plate and the idle arm in the tension position.

**[0023]** FIG. 8 is a top view of the cam plate and the idle arm in the release position.

**[0024]** FIG. 9 is an exploded view of another embodiment of a tension/release mechanism.

## DETAILED DESCRIPTION OF THE DRAWINGS AND THE PREFERRED EMBODIMENTS

**[0025]** Turning now to FIGS. 1-4, a belt sander 10 is provided with a tension/release mechanism 18 to set and release sanding belt tension. The belt sander 10 generally contains the elements of a conventional belt sanding apparatus. Thus, the belt sander 10 includes a shell 12 that is typically of two pieces and that forms the majority of the exterior surface of the sander 10, an internal motor (not shown) driven by a power source (not shown). As is known in the art, the power to operate the belt sander 10 may be supplied from an AC source or a DC source, such as rechargeable batteries. The belt sander 10 includes a forward roller wheel 60 and a rear roller wheel 14. The rear roller wheel 14 is normally driven by the motor. The forward roller wheel 60 is connected to the belt sander 10 with the use of a tension/release mechanism 18. The forward roller 60 rotates about an axis 60a and the rear roller rotates about an axis 14a.

**[0026]** The tension/release mechanism 18 includes a release arm 20 that is rotatably connected to the belt sander 10 and may be rotated by the user to selectively apply and remove the tension in the endless belt of sandpaper. The belt release arm is operatively engaged with a pinion gear 30 through a non-circular pin 28. The pinion gear 30 engages corresponding rack gear teeth 51 on a projection 52 from a support member that is ultimately rotatably connected with the forward roller wheel 60.

**[0027]** The release arm 20 can be rotated about an axis 20a from a tension position (shown in FIG. 1) where the arm is substantially parallel to the side surfaces of the belt sander, to a release position (shown in FIG. 3) where the arm is substantially perpendicular to the side surfaces of the belt sander 10. The release arm 20 contains three portions, a first portion 23 that is connected to the other elements of the tension/release mechanism 18, a central portion 22, and a second portion 21 that forms the handle for the user to operate the mechanism 18. The release arm 20 can be rotated by the user to rotate a rotational member, such as a pinion gear 30.

**[0028]** In the embodiment shown in FIGs. 1 and 2, the first portion 23 of the release arm 20 is formed to contain two fingers 29. These fingers 29 extend from the central portion 22 and are shaped such that there is a discrete space between the fingers 29 sufficient for a pinion gear 30, as shown in FIG. 2, a gear housing 40, and a slight amount of relative translational motion between the release arm 20 and the pinion gear 30. The fingers 29 are connected to the pinion gear 30 such that there is no relative rotational movement permitted between them. As shown in FIG. 2, the fingers 29 each feature "D" shaped holes 24 such that each hole 24 shares a centerline, and are formed with the same "D" shape orientation. In another embodiment, the arm 20 and pinion gear 30 may be formed such that they are made from a single member that is manufactured to have a portion with the dimensions and gear teeth 31 of the pinion gear 30, and a portion that serves as the arm 20, including a central portion 22 and a second portion 21 forming a handle.

**[0029]** There are a multitude of possible shapes and sizes for the central 22 and second 21 portions of the release arm 20. Preferably, the central portion 22 is shaped to be substantially thinner than the distance between the two flat exterior surfaces of the first section 23 of the release arm 20 with the bottom surface of the central portion 22 being uniform with the bottom surface of the first section 23. This geometry reduces the material requirements, which reduces the weight of the belt sander 10. More importantly, the design provides room for the user to manipulate the second section 21 of the release arm in order to transfer the mechanism from the tension position to the release position. It is preferred that the second portion 21 be formed so that a line through the length of the second portion 21 is substantially perpendicular to a line through the length of the central portion 22. As shown in FIGs. 1 and 2, the second portion 21 of the arm 20 extends in an upward direction (i.e. toward the top of the sander 10). Of course, the second portion 21 of the arm 20 could be arranged to extend in a down-

ward direction (i.e. toward the sand paper). In other embodiments, the handle 20 could be formed substantially as a "T" with the second portion 21 perpendicularly connected to the central portion 22, with the central portion 22 substantially bisecting the second portion 21.

**[0030]** In the embodiment shown in FIG. 2, the release arm 20 is coupled to the mechanism by the use of a "D" shaped pin 28 extending through "D" shaped holes 24 in the fingers 29 of the first portion 23 of the release arm 20. The "D" shaped pin 28 prevents any freedom of rotational motion between the arm 20 and the pin 28 to transfer the torque in release arm 20 to other objects connected to the pin 28. Of course, one skilled in the art would understand that other configurations of pin 28 (and holes 24 in the release arm 20 and hole 32 in the pinion gear 30) could be used that prevent relative rotational movement between the arm 20 and the pinion gear 30. The pin 28 and the release arm 20 are preferably attached to eliminate any relative translational motion between the two. The embodiment shown in FIG. 2 uses screws 27 to fix the pin 28 relative to the release arm 20, although other methods known in the art can be used as well.

**[0031]** A pinion gear 30 is provided with a "D" shaped hole 32 to receive the pin 28 to transfer the torque within the pin 28 to the pinion 30 to cause it to rotate. The pinion gear 30 includes a plurality of teeth 31 along the circumference of the pinion 30. The teeth 31 of the pinion gear 30 engage with corresponding rack gear teeth 51 on a rearwardly extending leg 52 that is a component of a support member 50.

**[0032]** The pinion gear 30 and the projection 52 are housed in the support housing 48. A spring 41 is positioned within the support housing 48 and biases the support member 50 forward to apply tension to the sanding belt to allow for normal use of the belt sander 10. The support housing 48 is rigidly attached to the housing 12 through the use of screws 11 or other attachment mechanisms known in the art. Alternatively, the support housing 48 may be formed as an integral portion of the housing 12.

**[0033]** In the embodiment shown in FIG. 2, a gear housing 40 is attached to the support housing 48 to maintain the pinion gear 30 and the gear teeth 51 of the projection 52 in mesh throughout all positions of the release arm 20. Additionally, some of the pinion gear 30 may be formed without teeth 31 around the entirety of the circumference of the gear so that when the mechanism is in the tension position, the projection 52 is not engaged by gear teeth and is free to apply tension to the sanding belt due to the forward biasing force of the spring 41. The gear housing 40 is formed with a semicircular side surface 44 with a radius slightly larger than the radius of the gear teeth 31 of the pinion gear 30. The gear housing 40 is optimally formed with top and bottom surfaces that form an envelope around the top and bottom surfaces of the pinion gear 30. The top surface 71 of the gear housing 40 and bottom surface (not shown) each contain holes that share a centerline with the holes in the pinion gear 30. The holes in the gear housing 40 are larger than the dimensions of the pin 28 to allow freedom of rotation of the arm 20 and pinion gear 30. Additionally, the gear housing 40 contains flanges 42 or similar protuberances that extend from the two ends of the semicircular sides 44 that allow the gear housing 40 to be rigidly attached to the exterior wall of the support housing 48 to maintain all components of the tension/release mechanism 18, in their correct orientation with respect to each other in all positions of the release arm 20. In other potential embodiments of the tension/release mechanism 18, the release arm 20 and the pinion gear 30 are formed from the same member.

**[0034]** The support member 50 contains three portions, a central portion 54, a roller support arm 56, and the projection 52 that extends rearwardly and perpendicularly from an end of the central portion 54. The roller support arm 56 extends perpendicularly from the opposite end of the central portion 54. All three portions of the support arm 50 are oriented along the same horizontal plane. The roller support portion 56 of the support arm 50 includes suitable structure to rotatably support the front roller 60 as understood by those of ordinary skill in the art.

**[0035]** In operation, the user rotates the release arm 20 in the counter-clockwise direction (as viewed from the top of the belt sander 10) from the tension position toward the front of the sander 10 to release the tension in the sand paper belt (not shown) to allow for belt replacement. The rotational axis of the release arm 20 is orthogonal to a plane formed along the bottom surface of the sandpaper roll. The rotation of the release arm 20 causes the pinion gear 30 to rotate. The rotation of the pinion gear 30 causes the support member 50 to move linearly in a direction toward the rear of the sander 10 against the force of the biasing spring 41 due to the meshed connection between the pinion gear teeth 31 and the corresponding rack gear teeth 51 on the projection 52. This lateral movement of the support member 50 causes the front roller 60 to move linearly rearward, releasing the tension on the sanding belt to allow for removal of the sanding belt.

**[0036]** When the arm 20 is sufficiently rotated to remove the tension of the sanding belt, the release arm 20 is sufficiently stabilized in the release position by a catch 70 in the tension/release mechanism 18, as is shown in FIG. 4. The gear housing 40 is formed with a wedge-shaped protuberance 72 projecting from the top surface 71 of the gear housing 40. The wedge 72 is aligned such that when the release arm 20 is manipulated to release the tension on the sanding belt, the release arm 20 travels up the inclined surface 73 of the wedge 72. After the release arm passes over the top edge 74 of the wedge 72, the release arm 20 lowers to its original height. The vertical surface 75 of the wedge 72 prevents the release arm 20 from returning to the tension position. In other embodiments, the catch 70 may be formed by other struc-

tures known to those of ordinary skill in the art including, but not limited to being spring loaded.

**[0037]** After the sanding belt has been replaced, the user may reapply the tension to the belt by releasing the release arm 20 from the wedge 72. In performing this step, the user lifts the release arm 20 upward to allow it to pass over the top edge 74 of the wedge 72 and travel down the inclined surface 73 until reaching its normal height. After the release arm 20 clears the wedge 72, it returns to the tension position with the aid of the biasing spring 41. The rotation of the release arm 20 causes the pinion gear 30 to rotate in a clockwise manner (when the belt sander 10 is viewed from above), which causes the support member 50 and the front roller 60 to move linearly toward the front end of the belt sander 10. This motion of the front roller 60 applies tension to the sanding belt to allow for operation on a workpiece.

**[0038]** An alternate embodiment of the tension/release mechanism 100 is provided and shown in FIGs. 5-9. The tension/release mechanism 100 includes a release lever 120, a rotational member, such as a cam plate 132, that is attached to the release lever 120 through a cam shaft 140, an idle arm 172 with a recessed portion 173 that engages the cam plate 132. The idle arm 172 is attached to a support member 170 that rotatably positions the forward roller 60, and a support housing 150 that maintains and encloses the connection between the cam plate 132 and the idle arm 172. Additionally, the tension/release mechanism 100 includes a spring 190 located within the support housing 150 to bias the forward roller 60 forward to place tension in the roll of sand paper (not shown). Similar to the first embodiment discussed above, the release lever can be rotated between a tension position (similar to that shown in FIG. 1) and a release position (similar to that shown in FIG. 3).

**[0039]** As best shown in FIGs. 7 and 8, the cam plate 132 has a flat side surface 133, a curved surface 134 that tangentially meets the flat side surface 133 on a first end, and a flat front surface 135 that tangentially meets a second end of the curved surface 134. Preferably, the flat front surface 135 is perpendicular to the flat side surface 133. The flat front surface 135 is perpendicular to a second flat side surface 136 so that the two surfaces 135, 136 form an edge 136a. The cam plate 132 includes a non-circular aperture 137 to prevent relative rotation between the cam plate 132 and the cam shaft 140 that extends through the aperture 137. The aperture 137 can be formed of any geometry that prevents relative rotation with respect to the cam shaft 140.

**[0040]** The cam shaft 140 is connected to rotate with the release lever 120 and is inserted into the aperture 137 in the cam plate 132, as mentioned above. The cam shaft 140 includes an engagement section 142 formed with the same size and shape as the aperture 137 in the cam plate 132 to allow the engagement section 142 to be inserted into the aperture 137 to prevent relative rotation between the cam shaft 140 and the cam plate 132. The cam shaft 140 additionally includes an aperture 144 that receives a pin 127 to establish a connection between the release lever 120 and the cam shaft 140. Alternatively, the release lever 120 and the cam shaft 140 can be connected to prevent relative rotation using other structures known to those of ordinary skill in the art. The cam shaft 140 is also formed with a collar 146 that establishes an upper barrier of the support housing 150.

**[0041]** The cam plate 132 engages a recessed portion 173 in an idle arm 172, best shown in FIG. 6. The idle arm 172 is a rearwardly extending member from a first end of a central portion 182 of the support member 170. The central portion 182 is substantially perpendicular to the idle arm 172. The support member further includes a roller support arm 184 that extends in a forward direction (parallel to the idle arm 172) from a second end of the central member 182. The roller support arm 184 is connected to the forward roller 60 with a shaft (not shown) that extends through the forward roller 60 and an aperture 185 in the roller support arm 184, or other structure known in the art to rotatably support forward roller 60. As can be understood with reference to FIG. 4, when the idle arm 172 is moved rearwardly along the tool, the forward roller 60 is also moved rearwardly along the tool, which releases the tension in the roll of sand paper (not shown) that is wrapped between the forward roller 60 and the rear roller 14.

**[0042]** The recessed portion 173 is formed as a cut out, or recess, in the idle arm 172. The recessed portion 173 includes a rear side wall 174, a forward side wall 176, and center wall 175. The side walls 174, 176 each form edges 174a, 176a with a respective end of the center wall 175, such that an oblique angle is formed between each of the side walls 174, 176 and the center wall 175. In some embodiments the side walls 174, 176 are oriented to be perpendicular to each other. The recessed portion 173 includes a flat bottom wall 177.

**[0043]** When the components of the tension/release mechanism 100 are assembled (and when the release lever 120 is in the tension position as shown generally in FIG. 1), the cam plate 132 is positioned so that the side surfaces 133, 136 are parallel with the rear side wall 174 (as shown in FIG.7), and so that one of the side surfaces 133 contacts the rear side wall 174, and a bottom surface (not shown) of the cam plate 132 rests on the bottom wall 177. As is discussed below, the release lever 120 can be rotated by the user. This rotation removes the contact between the rear side wall 174 of the idle arm 172 and the side surface 133 of the cam plate 132, and causes the curved surface 134 to engage the side wall 174 with rolling contact between the components. After sufficient rotation of the release lever 120, the forward flat surface 135 of the cam plate 132 becomes parallel with and contacts the rear side wall 174 (as shown in FIG. 8).

**[0044]** When the forward flat surface 135 contacts the rear side wall 174, the release lever 120 has reached the release position (as generally shown in FIG. 3). The rotation of the cam plate 132 with respect to the idle arm 172 (and the rolling contact between the curved surface

134 of the cam plate 132 and rear side wall 174 of the idle arm 172) causes the idle arm 172 to move rearwardly within the support housing 150. This rearward movement of the idle arm 172 causes the roller support arm 184 (connected with the idle arm 172 by the center member 182) and therefore the forward roller 60 to move rearwardly within the belt sander 10 and remove the tension on the endless roll of sandpaper.

**[0045]** The rearward movement of the idle arm 172 compresses the spring 190 resulting in additional force applied between surface 135 on the cam plate 132 and surface 174 of the idle arm 172. These forces created by the spring 190 on the flat surface 135 on the cam plate 132 and the rear side wall 174 to retain the release arm 121 (and the front roller 60 is retained in the rearward position to allow the endless roll of sandpaper to be replaced) in the release position (as shown generally in FIG. 3) against the biasing force of the spring 190 without action by the user.

**[0046]** As mentioned above, the cam plate 132 and the idle arm 172 are supported and enclosed by the support housing 150. The support housing 150 includes a central aperture 156 that accepts the idle arm 172 and a cam plate housing 160 that accepts and encloses the cam plate 132. The structure of the support housing 150 and the cam plate housing 160 supports the cam plate 132 and the idle arm 172 to maintain engagement between the two components. Additionally, a spring 190 is enclosed within the central aperture 156 of the support housing 150 between a rear end of the support housing 150 and an engagement surface 178a at a rear end 178 of the idle arm 172. The spring 190 biases the idle arm 172 toward the forward end of the belt sander 10 to maintain tension in the roll of sandpaper. Finally, as discussed above, the cam shaft 140 includes a collar 146 that provides an enclosure for the cam plate housing 160 where the cam shaft 140 and cam plate 132 are inserted into the support housing 150. The support housing 150 additionally includes a cover plate 154 that is connected to the support housing in a conventional means and retains the cam shaft 140 and cam plate 132 within the support housing 150.

**[0047]** The release lever 120 is connected to the cam shaft 140 and can be rotated to rotate the cam plate 132. The release lever 120 includes three sections, an engaging section 123, a central section 122 and a handle 121. The engaging section includes a top finger 124 and a bottom finger 129. The top finger 124 comprises two components 125, 126 that are connected together with a pin 127 through apertures 125c, 126c in each of the pieces. When the two components 125, 126 are connected together, they form a "C" shape (when viewed from the top of the belt sander), with the two internal surfaces 125a, 126a of the "C" that face each other being flat and parallel. The inner portion of the "C" shape is sized to receive the top portion 149 of the cam shaft 140, with the pin 127 extending through the apertures 125c, 126c in the engaging section 123 and an aperture 144 in the cam shaft 140. With this connection between the release lever 120 and the cam shaft 140, rotation of the release lever 120 causes complementary rotation of the cam shaft 140 and therefore the cam plate 132, as discussed above. The bottom finger 129 includes a concave surface 129a that engages a cylindrical exterior surface on the cam plate housing 160 to provide rotational stability to the release lever 120.

**[0048]** The central section 122 of the release lever 120 extends outward from the engaging section 123 and connects with the handle 121. Preferably the central section is formed to allow the users fingers to easily grab the handle 121. As shown in FIG. 4, the central section 122 is formed so that its bottom surface is along the same plane as the bottom of the engaging section 123 and the handle 121. Additionally, the central section 122 is formed with a relatively small thickness to allow room for the users fingers to grab the handle 121 above the central section 122. The handle 121 may be formed with any shape to allow for manipulation of the handle 121 for rotation of the release lever 120. As, shown in FIG. 4, the handle 121 may be oriented perpendicular to the central section 122 to allow the user to easily grab the handle 121 and rotate the release lever. In other embodiments, the handle 20 could be formed substantially as a "T" with the second portion 21 perpendicularly connected to the central portion 22, with the central portion 22 substantially bisecting the second portion 21.

**[0049]** In some embodiments, the tension/release mechanism 100 includes a detent and recess to selectively retain the release lever 120 in the tension position and prevent the movement of the release lever 120 during the operation of the belt sander 10. As best shown in FIG. 9, the top finger 124 of the engaging section 123 includes an aperture 206 that is oriented vertically through the top finger 124 to accept a detent ball 202 that is biased in the downward direction by a spring 204. The aperture 206 is formed with a through hole with a first diameter that is slightly smaller than the diameter of the detent ball 202 to allow a portion of the detent ball to project through the bottom surface (not shown) of the top finger 124 while maintaining the detent ball 202 within the top finger 124. The aperture 206 is additionally formed with a counter sunk bore that accepts a screw 209, or other type of fastener or device, that retains the detent ball 202 within the aperture 206. The screw 209 additionally maintains the downward biasing force acting on the detent ball 202 to maintain a portion of the detent ball 202 extending through the bottom surface of the top finger 124.

**[0050]** The cover plate 154 is formed with a recess 208 that accepts the detent ball 202 when the release lever 120 is in the tension position. The connection between the detent ball 202 and recess 208 is beneficial because it gives the user a perceptible "click" when the detent ball 202 is positioned within the recess 208, which notifies the user that the release lever 120 is in the tension position. Additionally, the use of the detent and recess is

preferred because it aides in retaining the release lever 120 in the tension position, which substantially eliminates any chattering or vibration of the release lever 120 during operation of the belt sander 10.

**[0051]** In use, the tension/release mechanism 100 is operated as follows. To release the tension in the roll of sandpaper, the user rotates the release lever 120 from the tension position toward the front of the belt sander 10 (in the counter-clockwise direction as viewed from the top of the belt sander 10). The rotational axis of the release arm 20 is orthogonal to a plane formed along the bottom surface of the sandpaper roll. The rotation of the release lever 120 causes the cam plate 132, which is engaged with the rear side wall 174 of the idle arm 172, to rotate. The rotation of the cam plate 132 causes rolling contact between the curved side surface 134 of the cam plate 132 and the rear side wall 174 of the idle arm 172. This causes the idle arm 172 (and the remaining components of the support member 170 as attached to the front roller 60) to move linearly in a direction toward the rear of the belt sander 10 against the force of the biasing spring 190. This rearward movement of the front roller 60 removes the tension on the roll of sand paper for convenient replacement. When the release lever 120 is rotated approximately ninety degrees with respect to the sander, the front flat surface 135 of the cam plate 132 becomes parallel to the rear side wall 174. The flat front surface 135 and the rear side wall 174 make full contact with each other. This rotational movement compresses the spring 190 creating a biasing force which serves to retain the release lever 120 in the release position (as generally shown in FIG. 3). When the release lever 120 is in this position, the front roller 60 has moved sufficiently rearward within the sander to release the tension on the endless roll of sandpaper to allow it to be replaced.

**[0052]** After the roll of sandpaper has been replaced, the user rotates the release lever 120 in the opposite direction toward the tension position. With sufficient torque placed on the release lever 120, the lever overcomes the frictional contact between the front flat surface 135 of the cam plate 132 and the rear flat wall 174 of the idle arm 172 and rotates toward the tension position. When the release lever 120 is rotated, the curved side surface 134 of the cam plate makes rolling contact with the rear side wall 174 of the idle arm 172, which moves the idle arm 172, the remaining members of the support member 170 and the front roller 60 in the forward direction within the sander until tension is restored in the endless roll of sandpaper. In embodiments with the detent ball 202 located within the release lever 120 and the recess 208 on the cover plate 154, the detent ball 202 engages the recess 208 when the release lever 120 reaches the tension position.

**[0053]** It is therefore intended that the foregoing detailed description be regarded as illustrative rather than limiting, and that it be understood that it is the following claims, including all equivalents, that are intended to define the scope of this invention.

**Claims**

1. A latch for a belt sander having a pair of rollers that define a plane of travel for sandpaper comprising:

   (a) an arm rotatable about an axis orthogonal to the sandpaper plane of travel;
   (b) a rotational member operatively engaged with an end of the arm;
   (c) a support member having a first end engaged with the rotational member and a second end connected to a first roller such that rotation of the arm changes a distance between the first roller and a second roller.

2. The latch of claim 1 wherein the arm has a first end and a second end, the first end being engaged with the rotational member, and the second end oriented such that an axis through the length of the second end is generally perpendicular to an axis oriented through the length of the first end.

3. The latch of claim 1 or 2 wherein the support member is biased toward the front roller by a spring.

4. The latch of any one of claims 1 to 3 wherein the arm and the rotational member are operatively engaged with a pin.

5. The latch of claim 3 further comprising a retaining means to retain the first roller in a position to allow the sandpaper roll to be removed from the sander against the force of the spring.

6. The latch of any one of claims 1 to 3 wherein the arm and rotational member are formed as a single member.

7. The latch of any one of claims 1 to 5 wherein the rotational member is a pinion gear.

8. The latch of claim 7 wherein the support member includes a plurality of teeth that correspond to a plurality of teeth on the pinion gear.

9. The latch of any one of claims 1 to 5 wherein the rotational member is a cam plate.

10. The latch of claim 9 wherein the support member includes a recessed portion with a side wall that can be engaged by the cam plate.

11. A belt sander with a mechanism to allow removal and replacement of a roll of sandpaper comprising:

    a support member having a first end and a second end where the first end has grooves that cooperate with teeth formed on a pinion gear

and where the second end is operatively connected to a first roller, and
an arm that is rotatable about a first axis generally perpendicular to a second axis about which the first roller rotates and that is fixed to the pinion gear to selectively rotate the pinion gear.

**12.** The belt sander of claim 11 wherein the pinion gear and arm are formed in the same member.

**13.** The belt sander of claim 11 or 12 further comprising a spring to bias the support member toward the front roller.

**14.** The belt sander of any one of claims 11 to 13 further comprising a catch to maintain the first roller in a position to allow the sandpaper roll to be removed from the sander against the force of the spring.

**15.** A mechanism to provide and release tension for a sandpaper roll of a belt sander, comprising:

(a) a first roller and a second roller;
(b) an arm rotatable from a tension position to a release position;
(c) a cam plate operatively connected to the arm, having a flat surface and at least one curved surface with an end tangential to an end of the flat surface; and
(d) a support member formed with at least one flat wall that engages the flat wall of the cam plate when the handle is in the tension position, and that makes rolling contact with the curved surface of the cam plate when the handle is rotated toward the release position, wherein rotation of the arm causes linear motion of the support member along a longitudinal axis of the support member.

**16.** The mechanism of claim 15 further comprising a support housing attached to the belt sander which houses the cam plate and the first portion of the support member.

**17.** The mechanism of claim 16 further comprising a spring enclosed within the support housing that biases the support member toward a forward end of the belt sander.

**18.** The mechanism of any one of claims 15 to 17 wherein the arm and the cam plate are connected by a cam shaft.

**19.** The mechanism of claim 15 wherein the arm and the cam plate are formed from the same member.

**20.** The mechanism of any one of claims 15 to 19 wherein the cam plate further comprises a second flat surface with an end tangential to a second end of the curved surface, wherein the second flat surface is parallel with and contacts the flat wall of the support member when the arm is in the release position.

FIG. 1

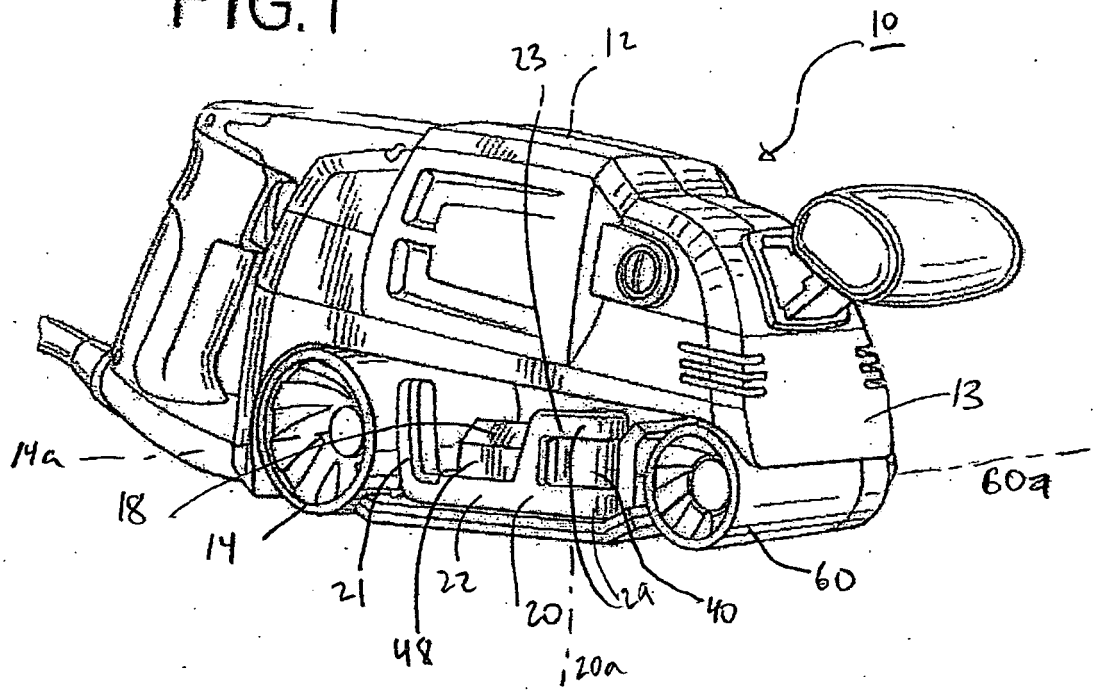
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FIG. 2

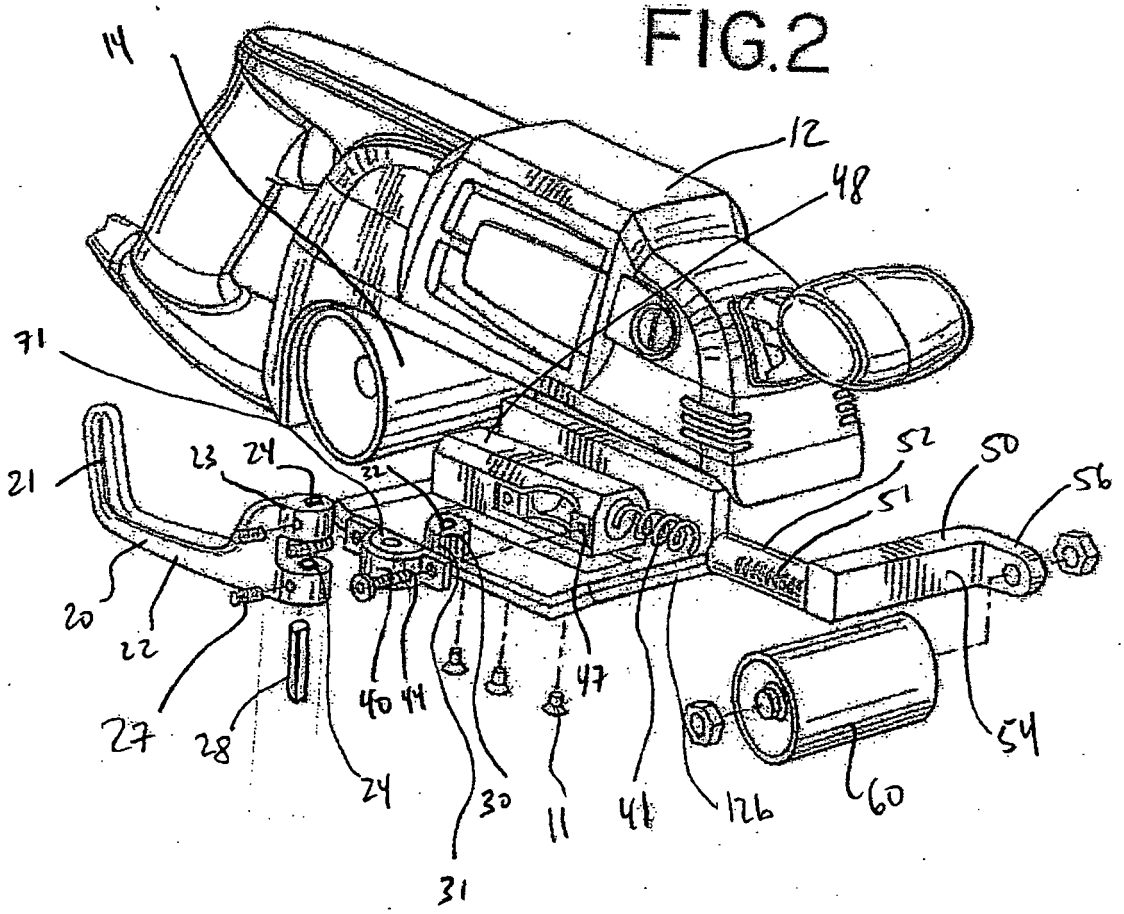
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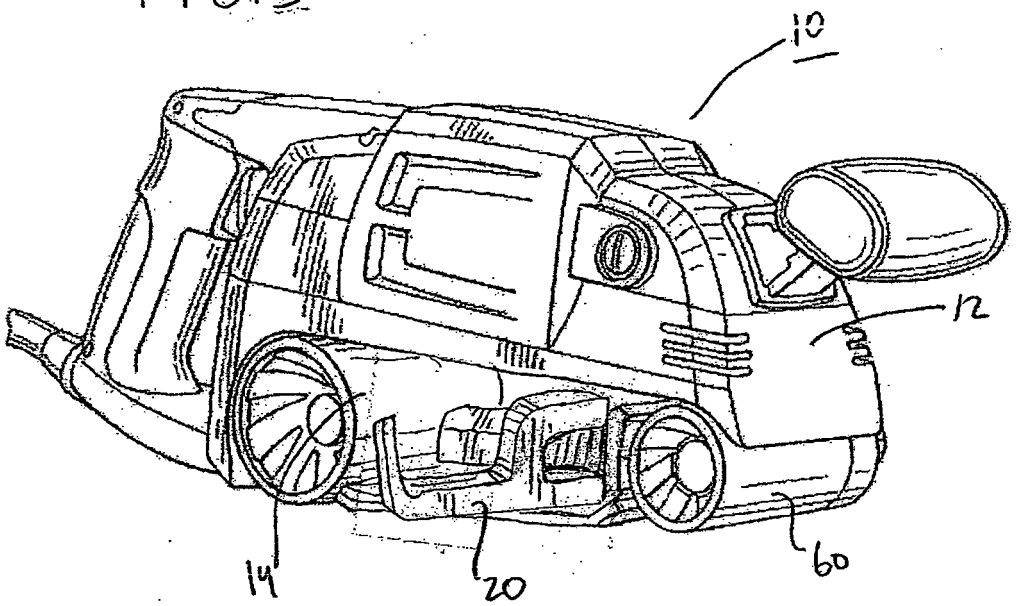
FIG. 3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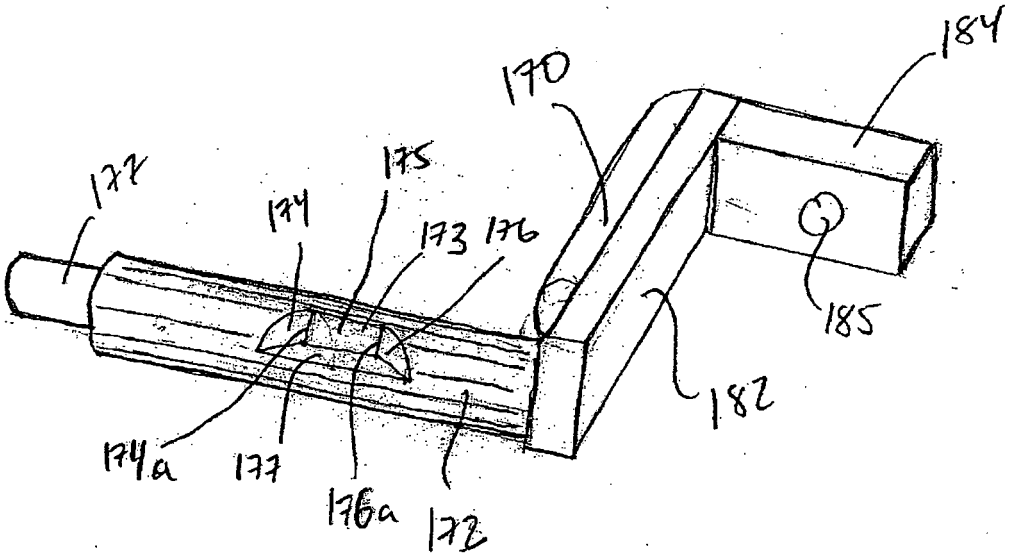
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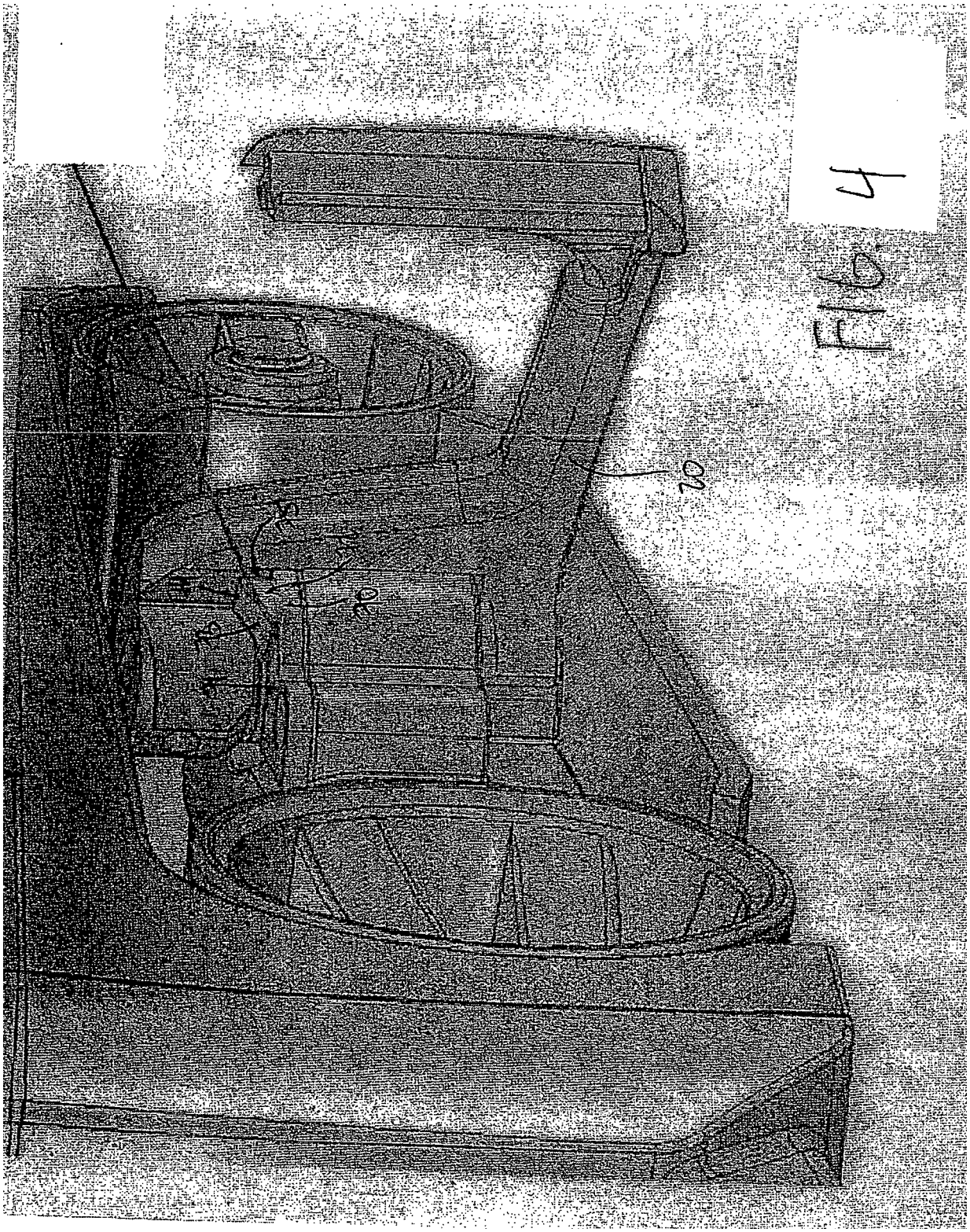
FIG. 6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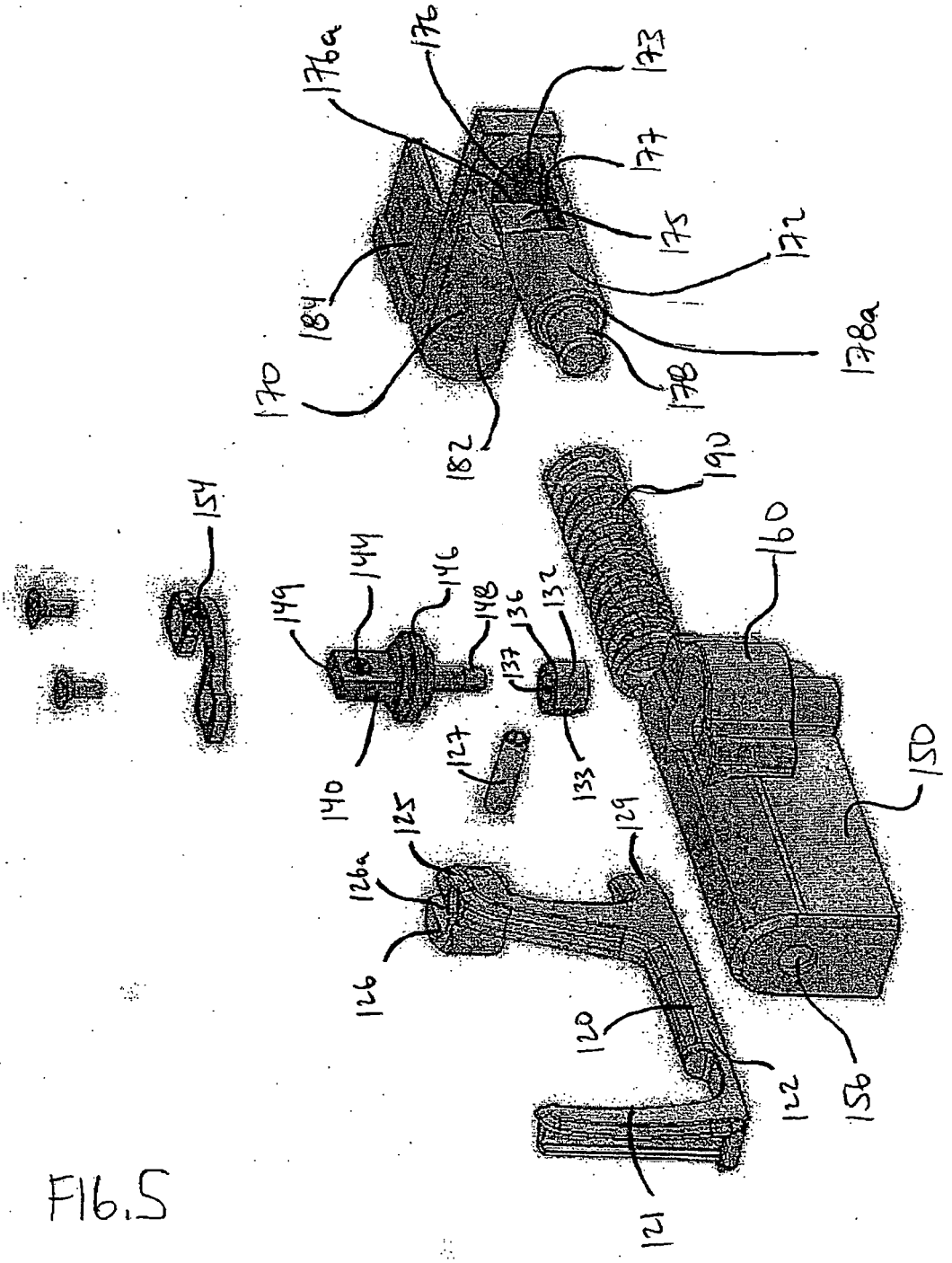
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FIG.5

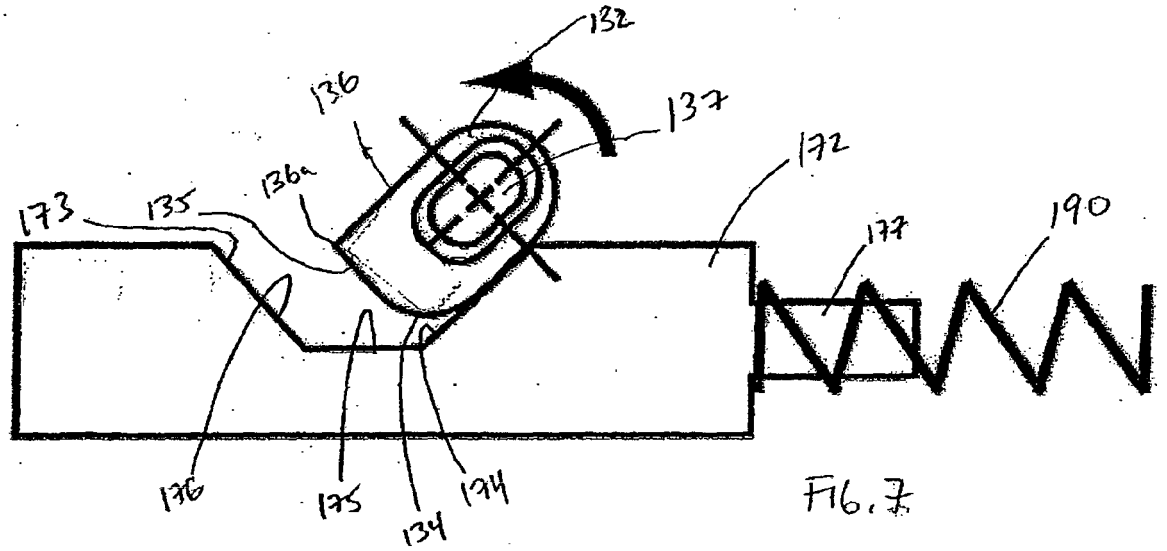
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Fig. 7

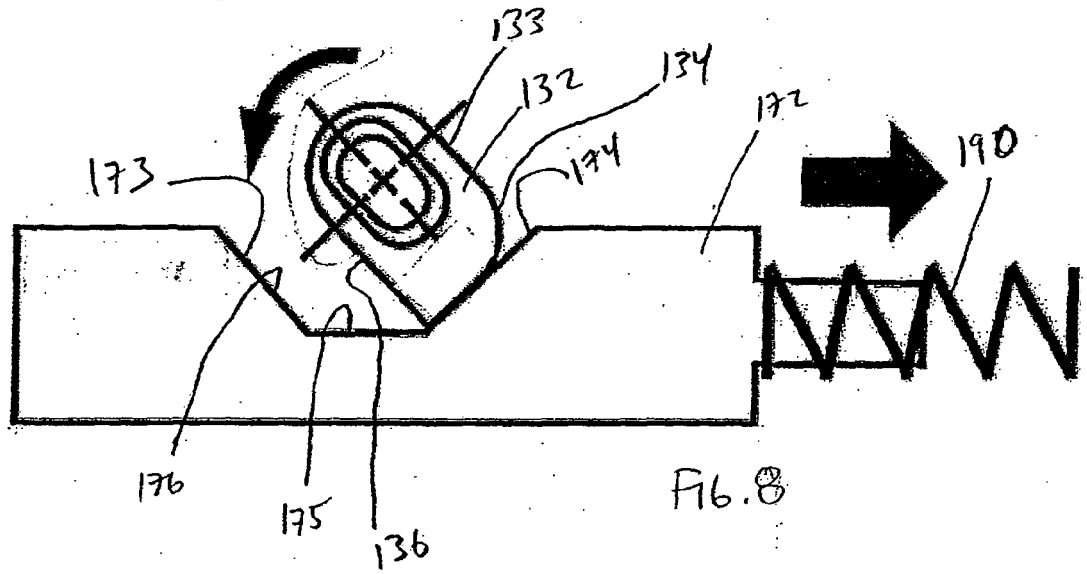
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Fig. 8

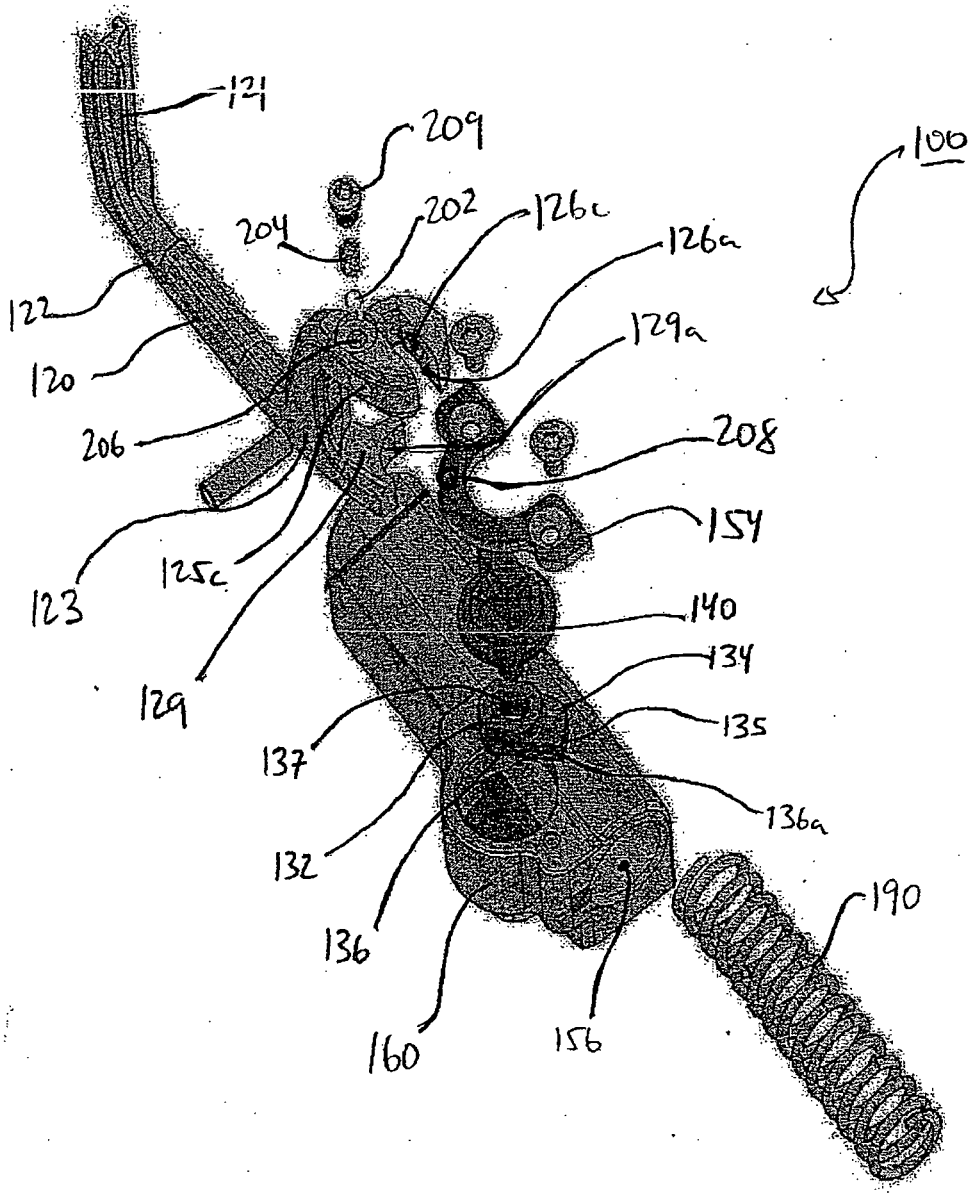
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FIG. 9

European Patent Office

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Application Number
EP 07 25 2306

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| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 27 November 2007 | Sluimer, Paul |

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