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(54) **KNEELING ROCKING CHAIR**

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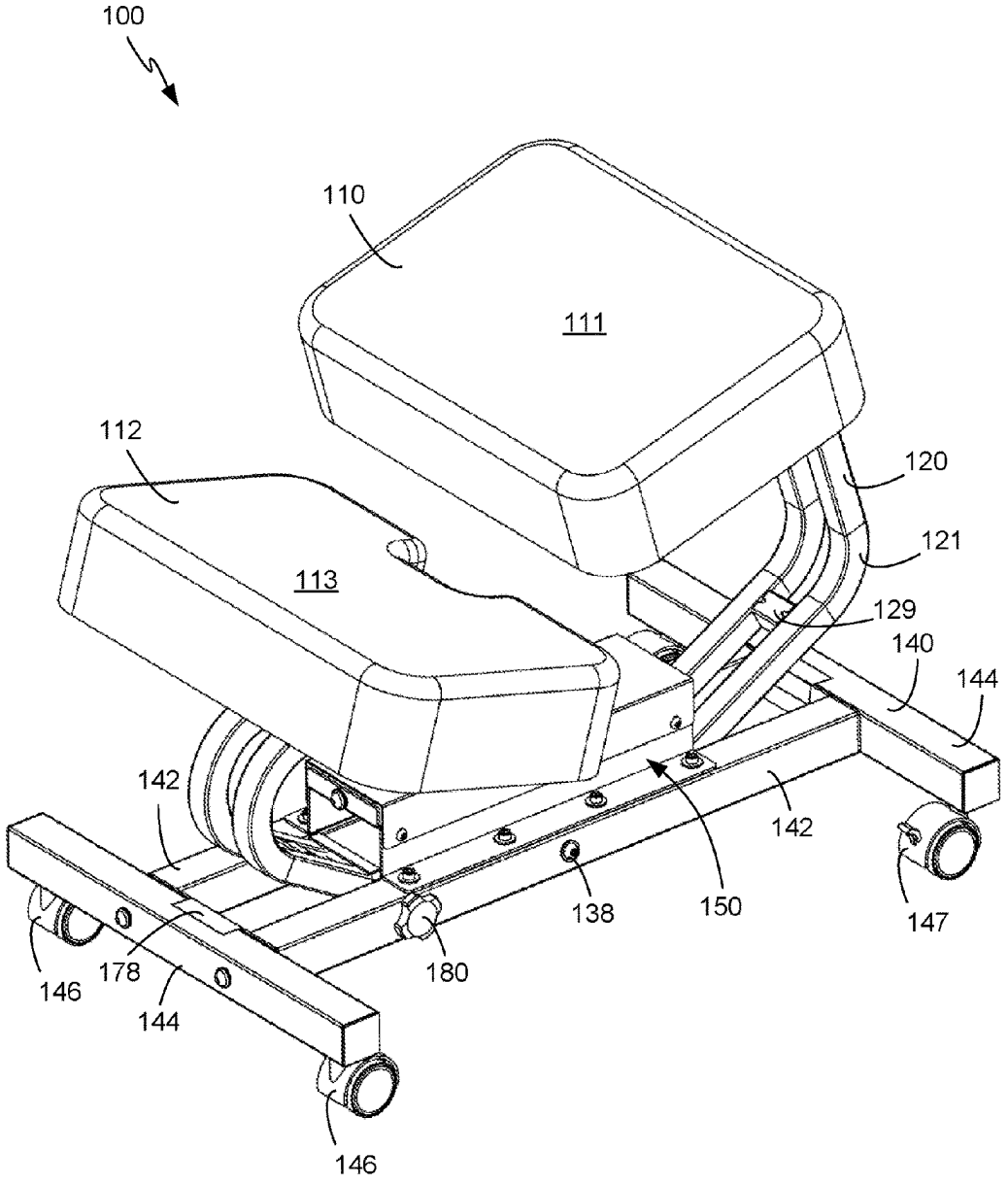
CPC ***A47C 9/005*** (2013.01); ***A47C 3/0255*** (2013.01); ***A47C 7/006*** (2013.01); ***A47C 7/345*** (2013.01)

(57) **ABSTRACT**

A kneeling rocking chair includes a base configured to support the chair on a floor, a common frame pivotably mounted to the base, the common frame supporting a seat and a shin rest, and an adjustable rocking mechanism coupled to the base and the common frame, the adjustable rocking mechanism configured to provide adjustable resistance to a rocking motion of the common frame relative to the base



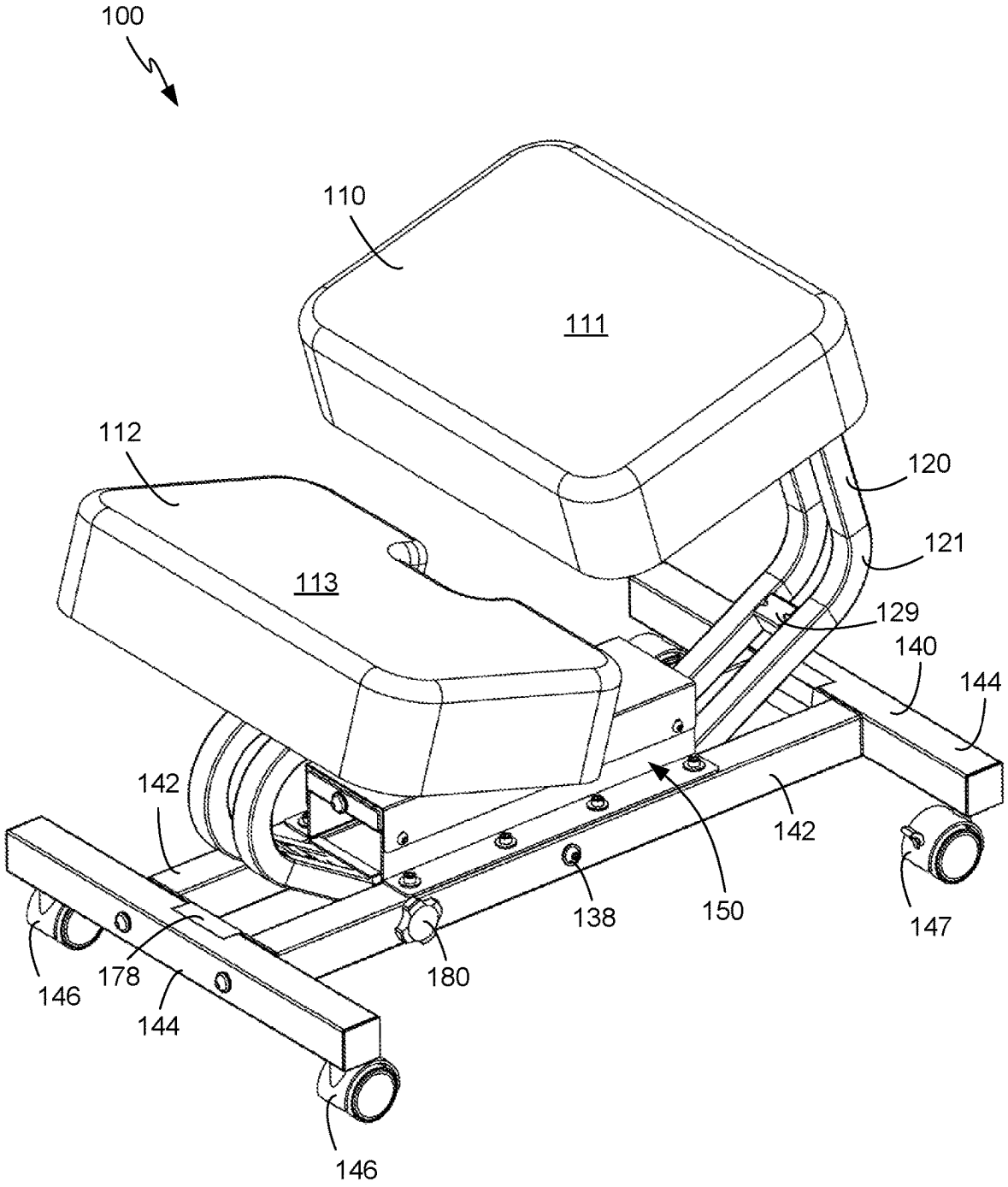

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FIG. 1A

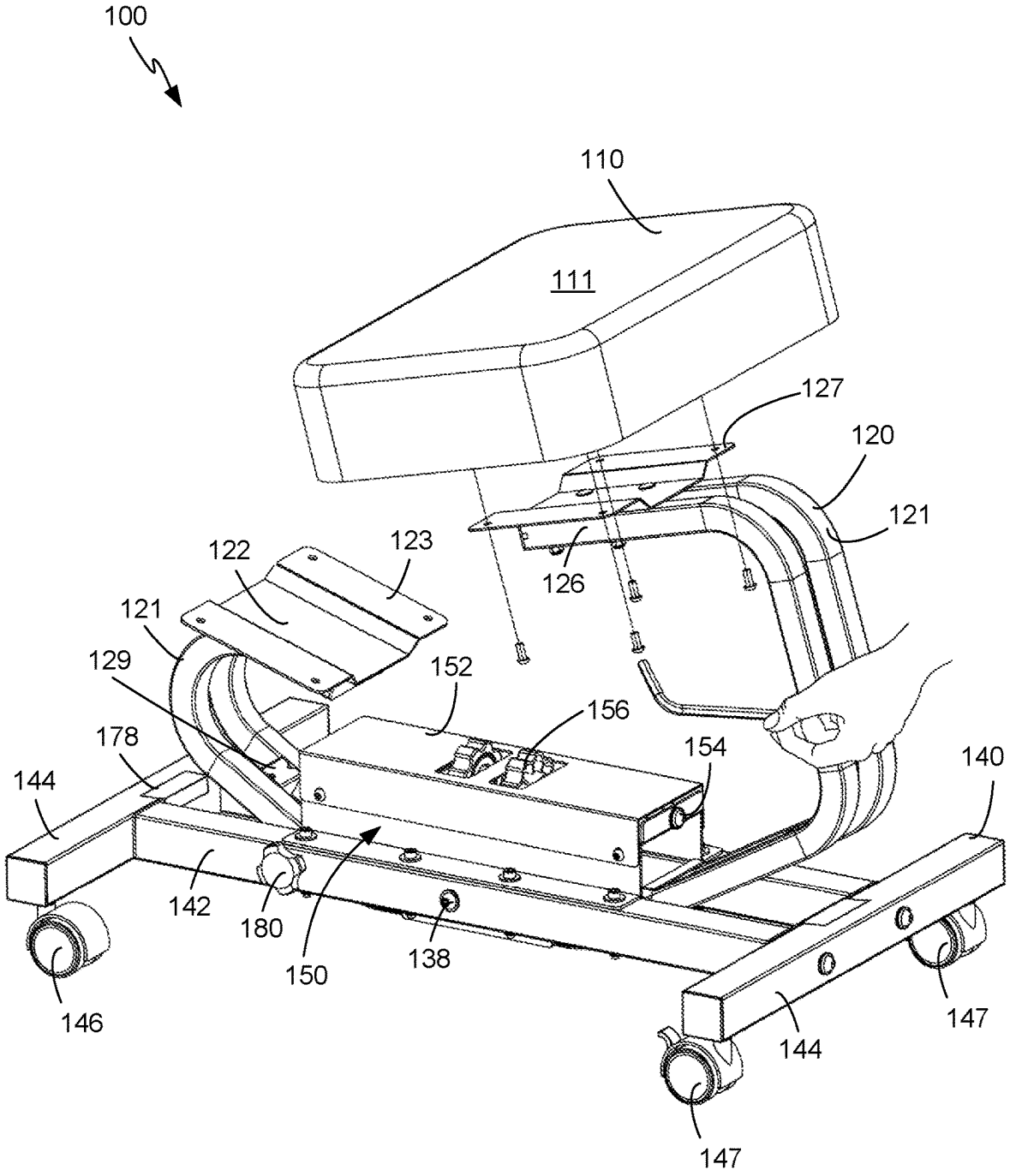
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FIG. 1B

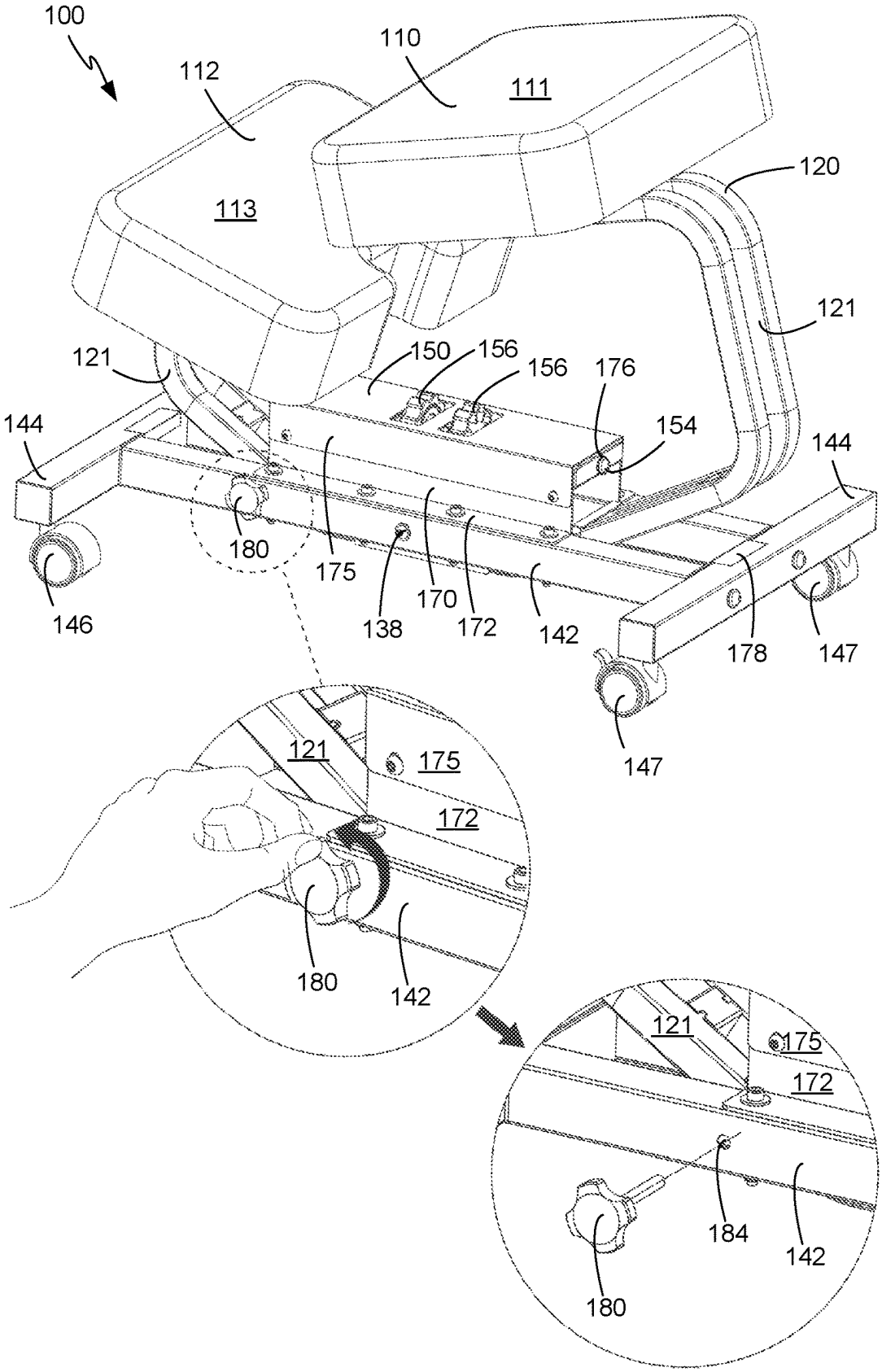
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FIG. 1C

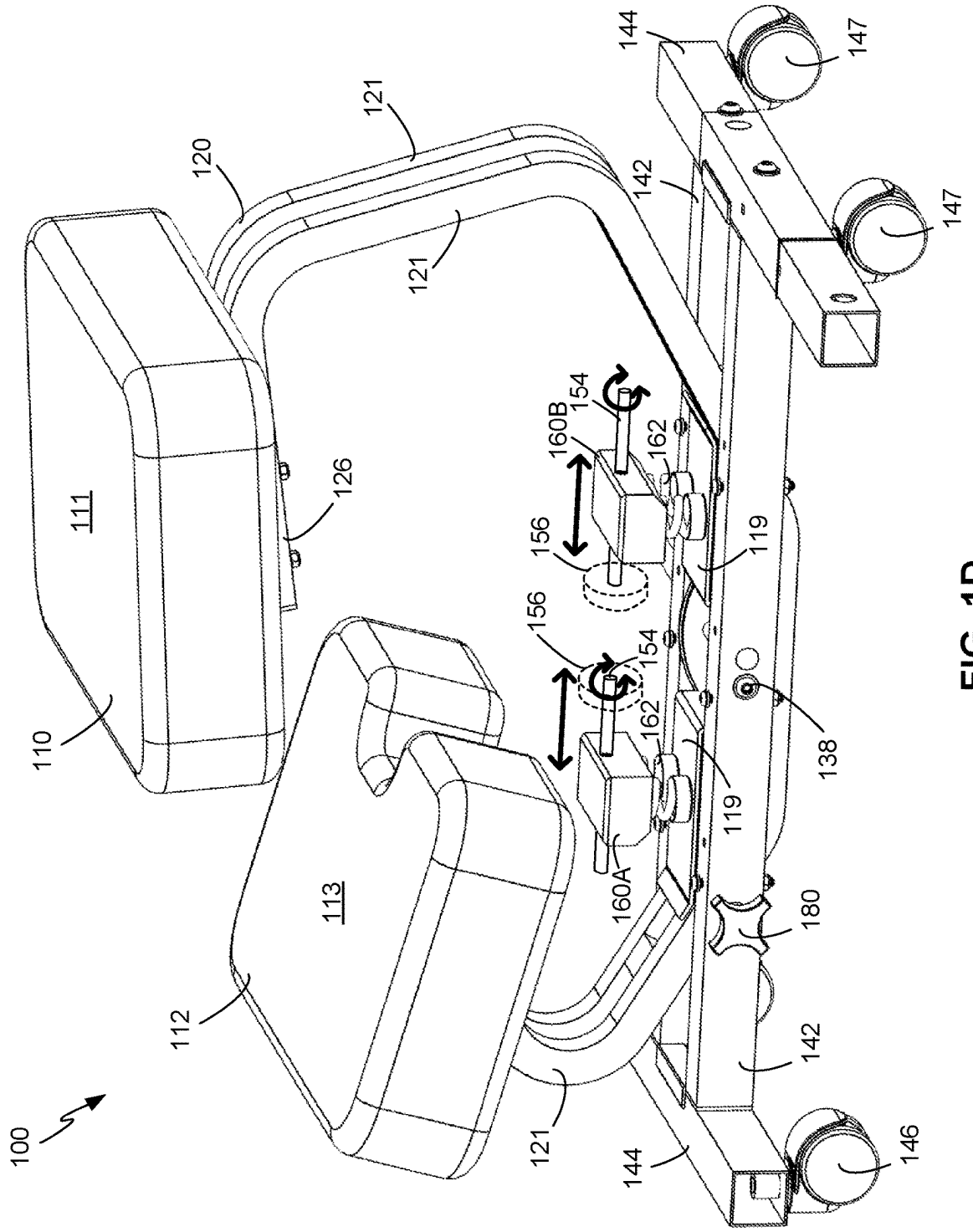
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FIG. 1D

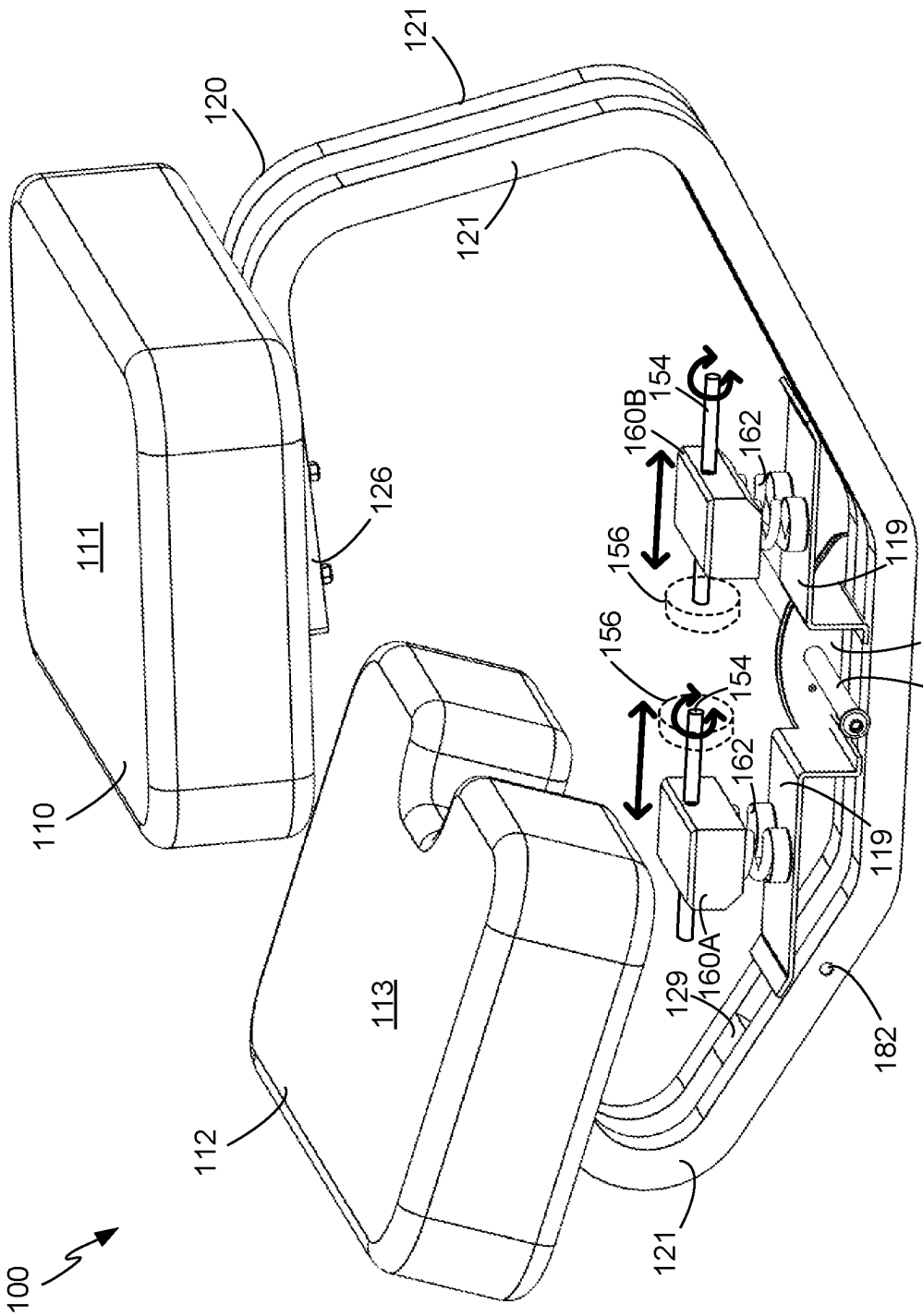
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FIG. 1E

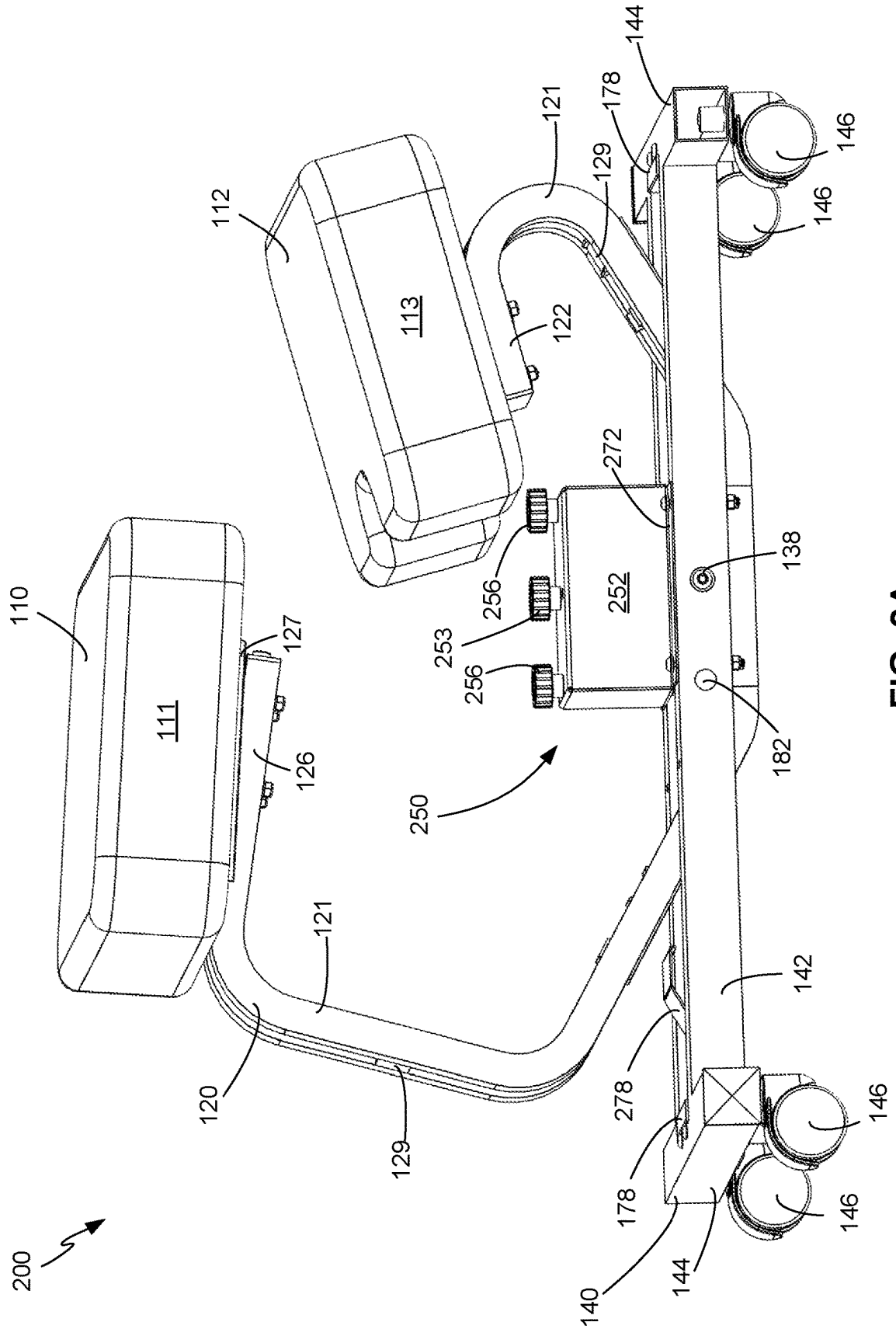
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FIG. 2A

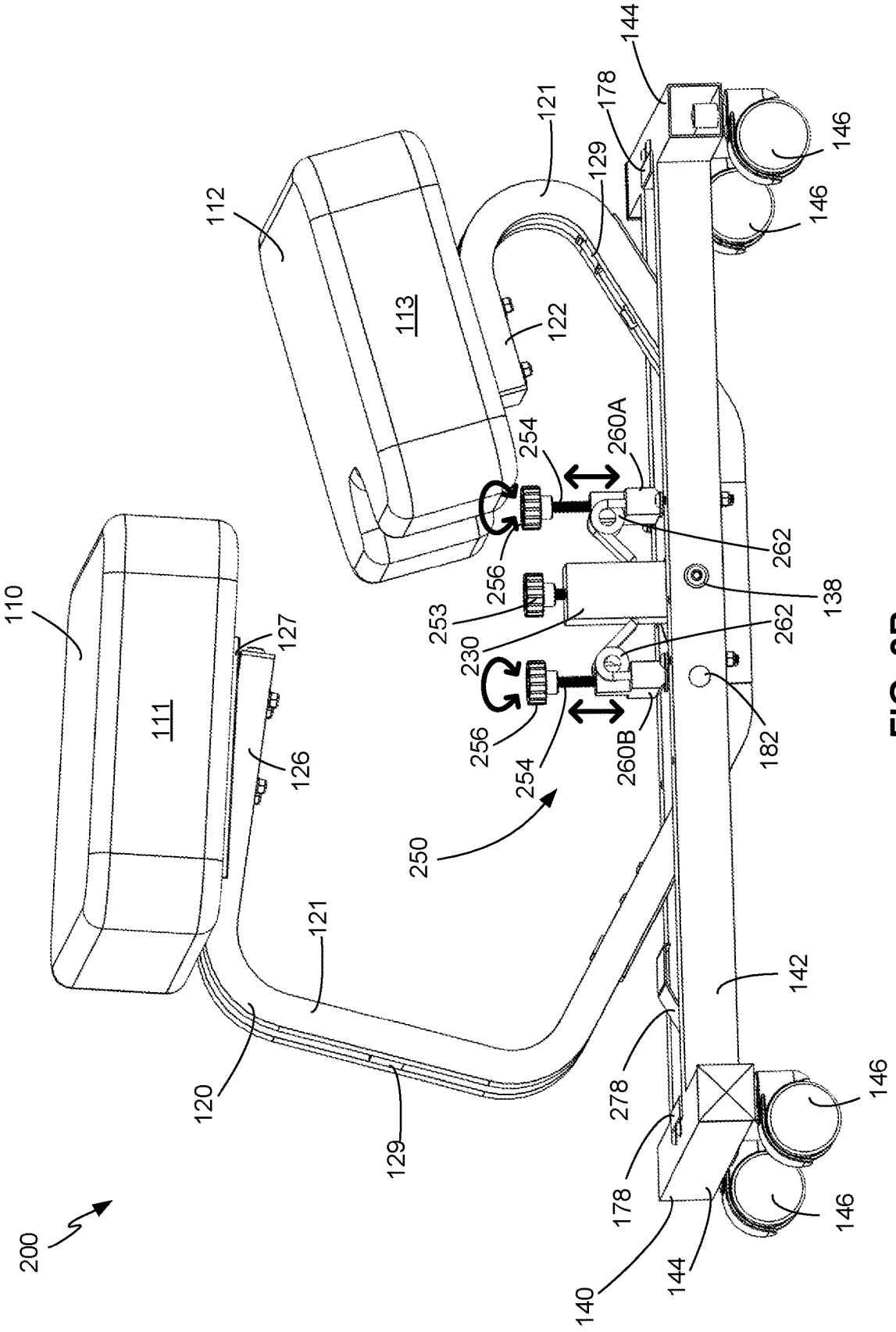
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FIG. 2B

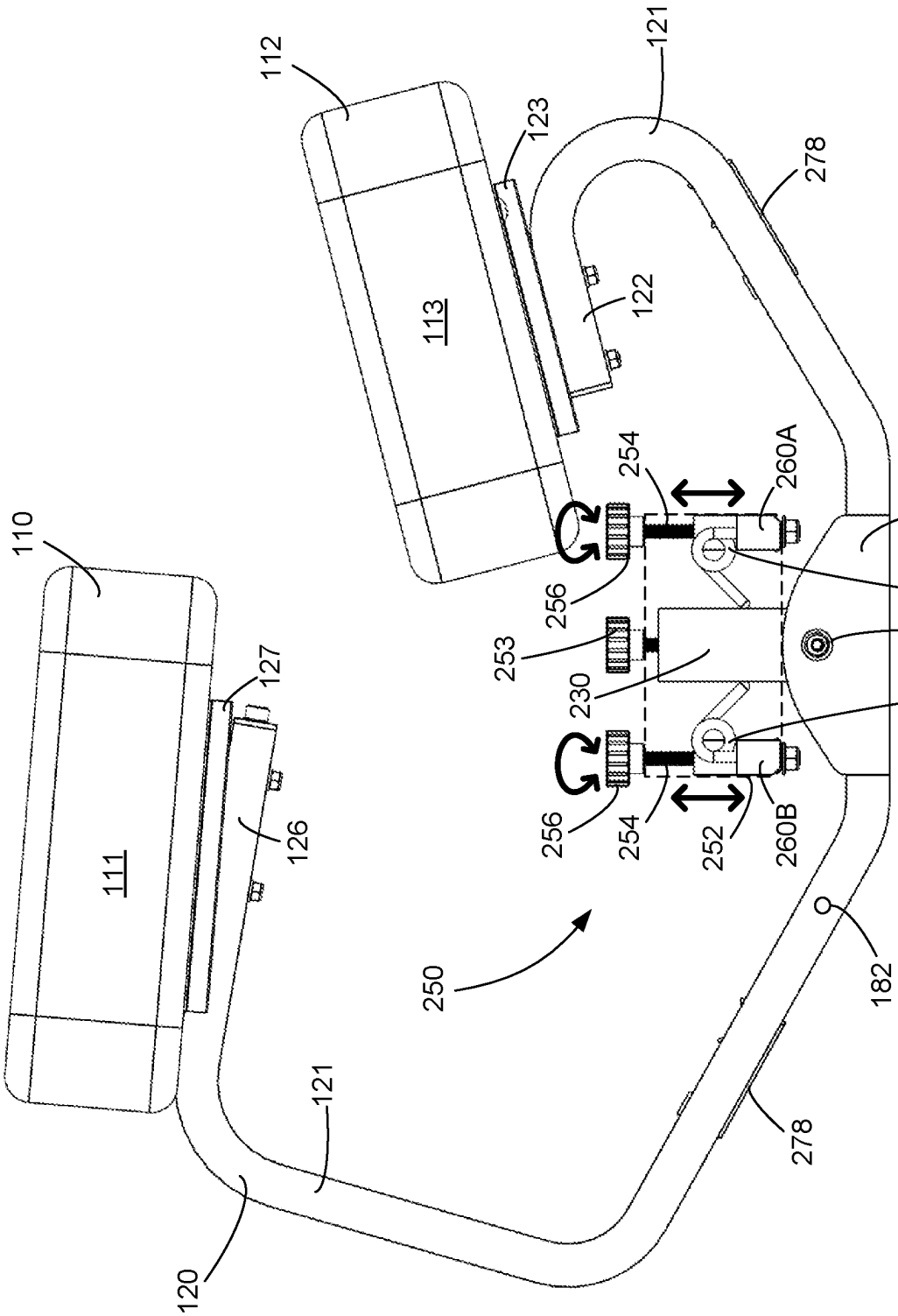
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FIG. 2C

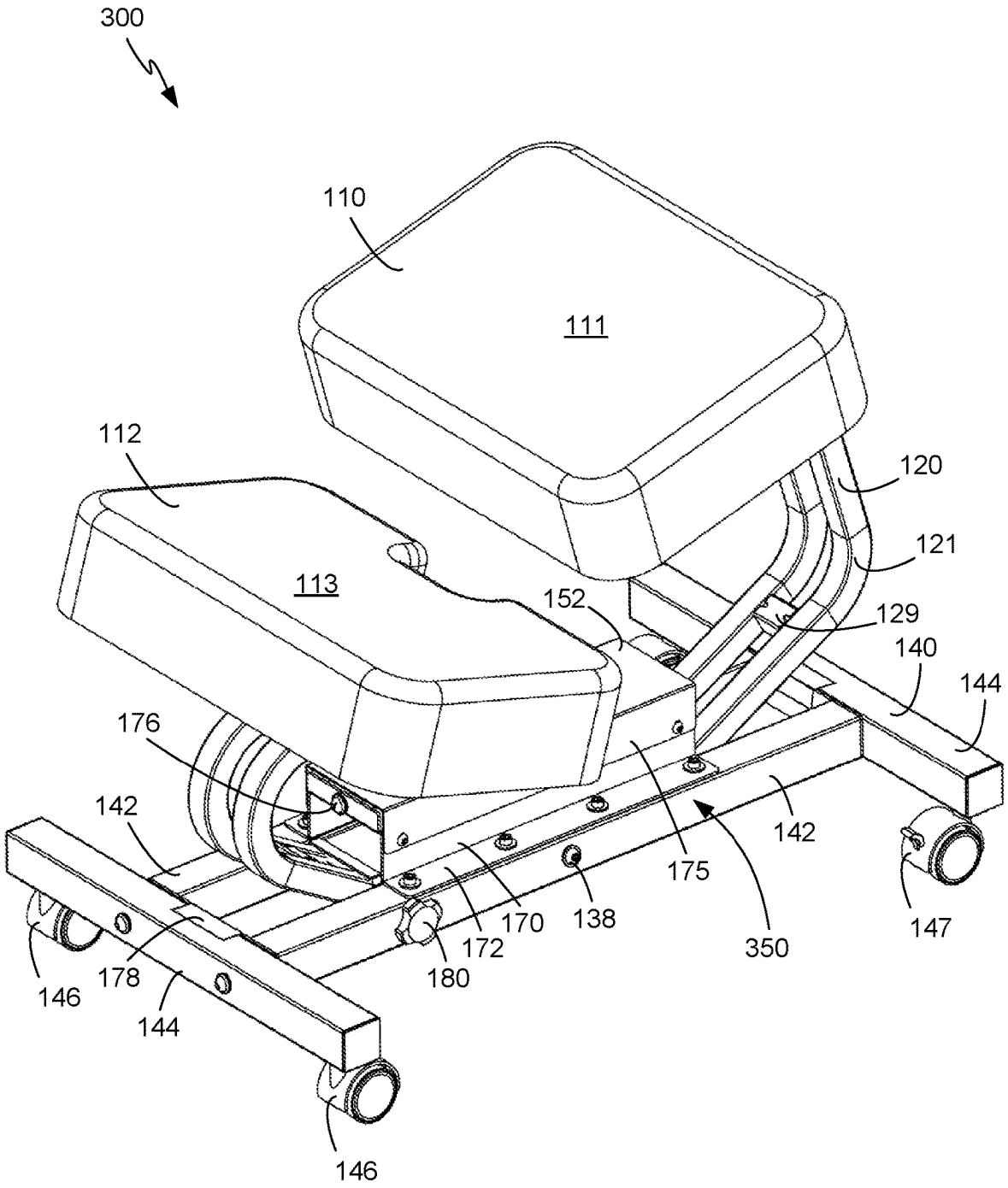
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FIG. 3A

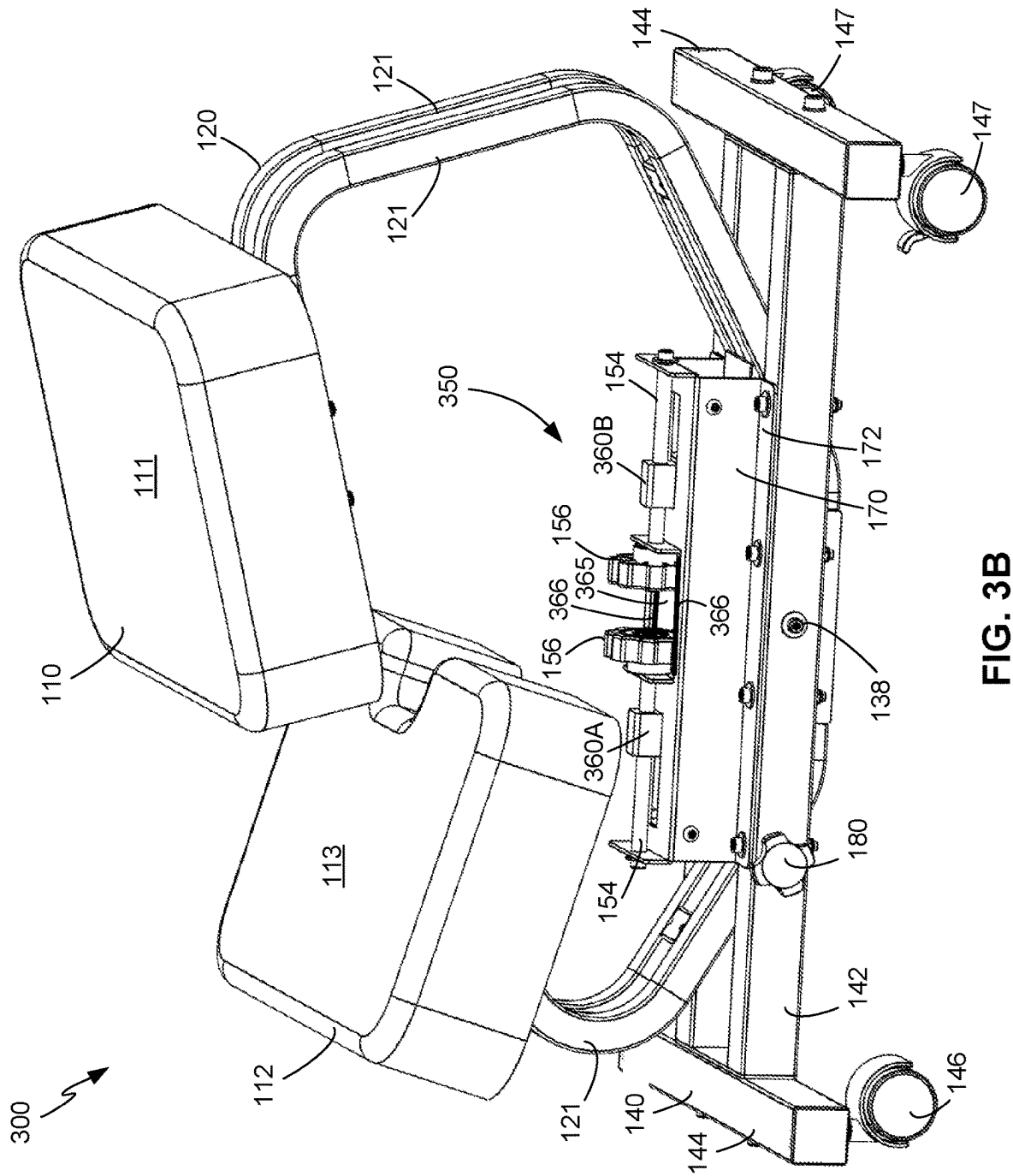
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FIG. 3B

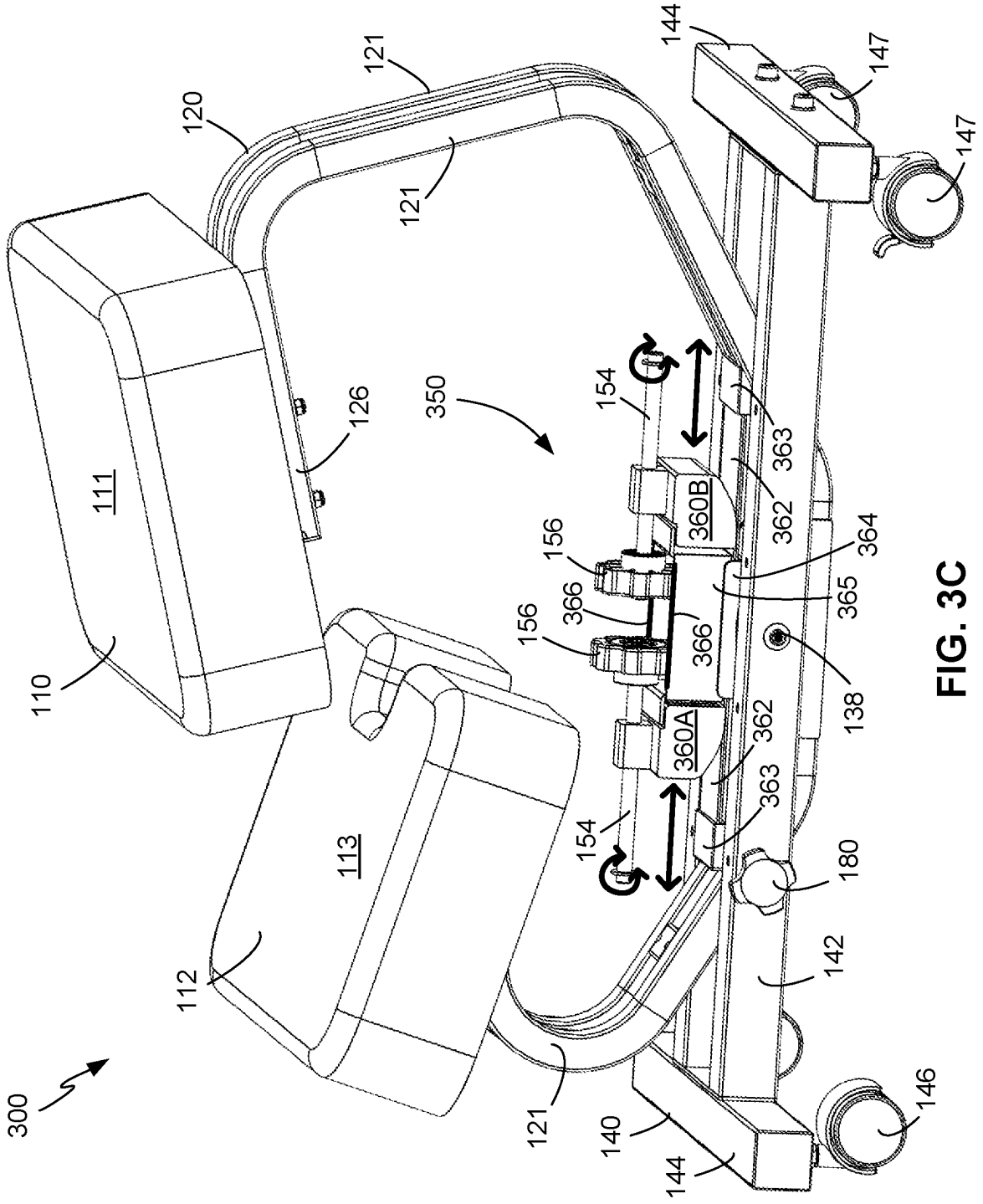
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FIG. 3C

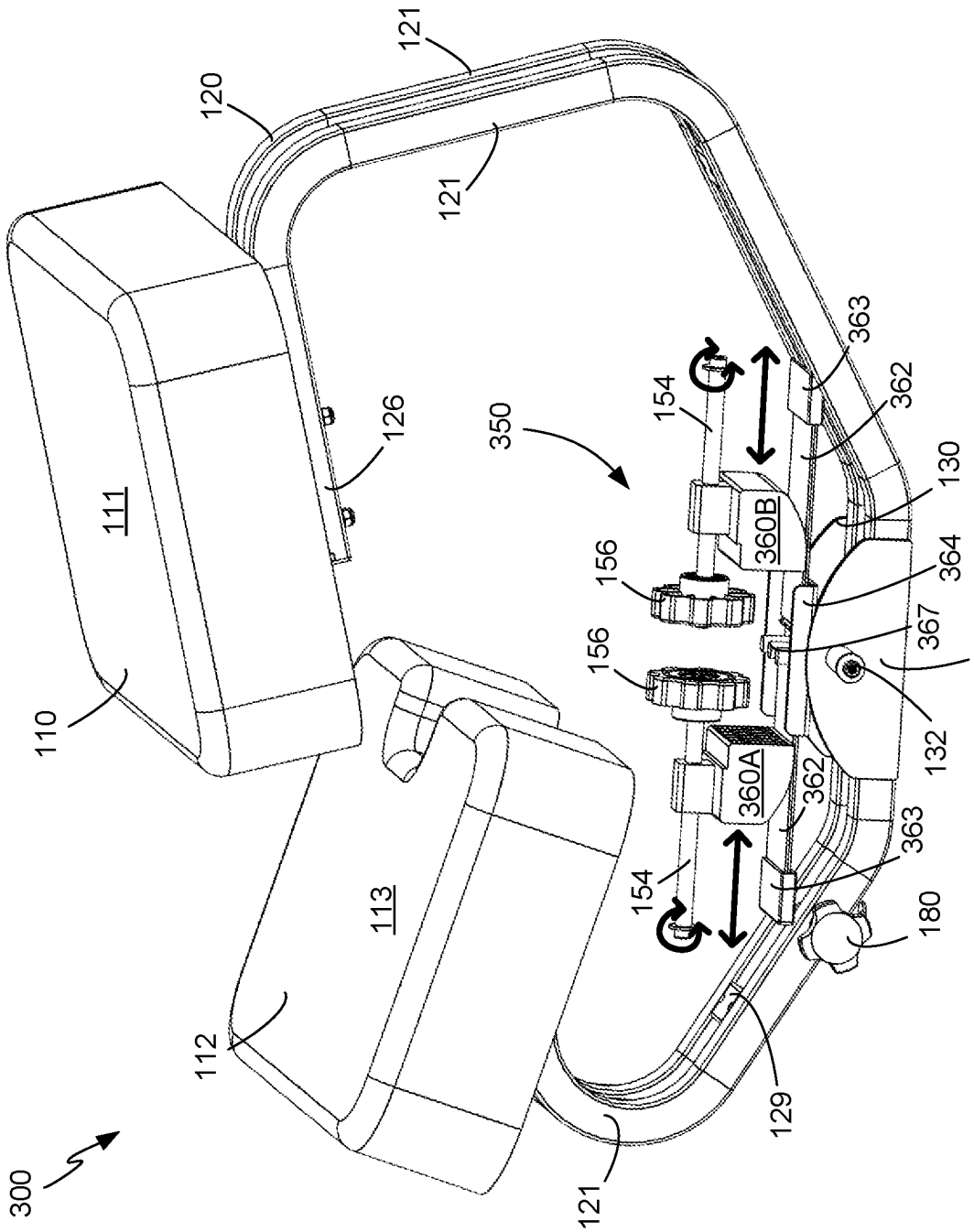
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FIG. 3D

KNEELING ROCKING CHAIR

TECHNICAL FIELD

[0001] This disclosure relates to kneeling chairs.

BACKGROUND

[0002] Kneeling chairs include a forwardly slanted seat and a shin rest, encouraging an upright posture and an open hip angle. Users can sit on the slanted seat with legs tucked back and shin resting on the shin rest. In this position, users can adjust their weight between their butt and shins. User can also sit with their feet on the floor and adjust their weight between their butt and feet. In either position, the open hip angle resulting from the forward slant of the seat encourages good posture.

BRIEF SUMMARY

[0003] Kneeling chairs disclosed herein include a forwardly slanted seat, a supportive shin rest, and an adjustable rocking mechanism. This chair not merely facilitates a static kneeling posture but also introduces dynamic movement, allowing users to rock while maintaining an ergonomic position. The adjustable rocking mechanism offers customizable resistance, enabling users to tailor the rocking motion to their individual preferences.

[0004] In one example, a kneeling rocking chair includes a base configured to support the chair on a floor, a common frame pivotably mounted to the base, the common frame supporting a seat and a shin rest, and an adjustable rocking mechanism coupled to the base and the common frame, the adjustable rocking mechanism configured to provide adjustable resistance to a rocking motion of the common frame relative to the base.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] FIGS. **1**A-**1**E illustrate a kneeling rocking chair including an adjustable rocking mechanism with compression springs.

[0006] FIGS. **2**A-**2**C illustrate a kneeling rocking chair including an adjustable rocking mechanism with torsion springs.

[0007] FIGS. **3**A-**3**D illustrate a kneeling rocking chair including an adjustable rocking mechanism with plate springs.

DETAILED DESCRIPTION

[0008] FIGS. **1**A-**1**E illustrate a kneeling rocking chair **100** including an adjustable rocking mechanism **150** with compression springs **162**. More specifically, FIG. **1**A is a perspective view of chair **100**, FIG. **1**B is a perspective view of chair **100** during assembly of forwardly slanted padded seat **110**, FIG. **1**C is a perspective view of chair **100** illustrating the operation of locking thumb screw **180**, and FIGS. **1**D and **1**E illustrate the components of the adjustable rocking mechanism **150**. In FIG. **1**D, the cover **152** of the adjustable rocking mechanism **150** is removed to illustrate the its internal components, whereas in FIG. **1**E, the cover **152** and the base **140** of kneeling rocking chair **100** is removed.

[0009] Chair **100** includes slanted padded seat **110** and a padded shin rest **112** connected to a common frame **120**. The common frame **120** is pivotably mounted to a base **140** by way of a simple pivot connection **138** to facilitate a rocking motion of the frame **120** relative to the base **140**. Adjustable rocking mechanism **150** is coupled to the frame **120** and the base **140** to resist the rocking motion of the frame **120** relative to the base **140** by way of two coiled compression springs **162**.

[0010] Forwardly slanted padded seat **110** includes a forward slant relative to the base **140**, whereas padded shin rest **112** includes an opposing slant relative to the base **140**. A gap between the padded seat **110** and the shin rest **112** is large enough for a user's lower legs, such that the user may sit on the padded seat **110** while resting their shins on the shin rest **112** with their feet tucked under the padded seat **110** and toes on the floor.

[0011] The user may rock in this position while remaining supported by the slanted padded seat **110** and the shin rest **112**. Rocking includes pivoting the common frame **120** with sufficient force to overcome the resistance of the adjustable rocking mechanism **150** in both forward and backwards directions, e.g., by leaning and/or by pushing on the floor with the user's feet. As described in further detail below, the adjustable rocking mechanism **150** provides adjustable resistance to pivoting the common frame **120** relative to the base **140** in both forward and backwards directions.

[0012] As best illustrated in FIG. **1**E, common frame **120** forms both a shin support **122** and a seat support **126**. A seat pad **111** is mounted to the seat support **126** to form the padded seat **110**, and a shin pad **113** is mounted to the shin support **122** to form the padded shin rest **112**.

[0013] In the example of kneeling rocking chair **100**, common frame **120** is formed from two elongated parallel frame members **121** separated by spacers **129**. Parallel frame members **121** connect shin support **122** and seat support **126** to each other and to pivot connection **138**. The parallel frame members **121** form a series of bends such that the parallel frame members **121** approximate a C-shape with the shin support **122** and seat support **126** on opposite sides with the pivot connection to base **140** between the shin support **122** and seat support **126**.

[0014] In some examples, various components of common frame **120**, such as parallel frame members **121** and spacers **129**, may be formed from bent tubular stock, such steel or aluminum metal. Any suitable technique may be used to join components of common frame **120**, such as parallel frame members **121** and spacers **129**, including but not limited to, screws, rivets, welds, brazing, friction fit, etcetera. In other examples, various components, or the entirety of common frame **120** may be unitary components formed form a single piece of material.

[0015] Shin support **122** includes a bent plate **123** (FIG. **1**B) spanning the two parallel frame members **121**. Shin pad **113** is mounted on top of plate **123** with screws through the mounting holes of plate **123**. Seat support **126** includes a bent plate **127** (FIG. **1**B) spanning the two parallel frame members **121**. Seat pad **111** is mounted on top of plate **127** with screws through the mounting holes of plate **127**.

[0016] In the example of chair **100**, pivot connection **138** between the base **140** and the common frame **120** is a simple pivot connection in that the common frame **120** is rotatable about a stationary axis of the pivot relative to the base **140**. As shown in FIG. **1**E, the pivot connection includes a stationary axel **132** extending through a plate **130** attached

to a center portion of the common frame **120**. The axel **132** further extends through holes in base **140** to form the pivot connection **138**.

[0017] In other examples, the pivot connection **138** may be replaced with a different mechanism, such as a hinge, a four bar linkage including the base **140** and the common frame **120**, a hanging pivot in which the base **140** can both swing and pivot relative to the common frame **120**, or other simple or complex rotating connection.

[0018] Base **140** is configured to rest on the floor and serve as a platform for the common frame **120** via the pivot connection **138**. In the example of kneeling rocking chair **100**, base **140** is formed from four tubular frame members: two parallel base members **142** and two foot members **144** that extend transversely to the two parallel base members **142**. The base members **142** include holes to receive the axel **132** for the pivot connection **138** to common frame **120**. Foot members **144** form joints at the ends of the parallel base members **142**. Foot members **144** are secured to the ends of the parallel base members **142** with screws extending through holes in the foot members **144** and engaged with threaded holes in caps in the base members **142**. In other examples, any suitable technique may be used to join the base members **142** with the foot members **144**, including but not limited to, screws, rivets, welds, brazing, friction fit, etcetera. In other examples, various components, or the entirety of base **140** may be unitary components formed form a single piece of material. While base **140** includes foot members **144** in line with the base members **142**, other examples may include the foot members **144** below the two parallel base members **142**.

[0019] Base **140** also includes optional swiveling rollers **146**, **147**. Rollers **146** are free rolling, whereas rollers **147** include a locking mechanism. Any combination of free-rolling or locking wheels, swiveling or non-swiveling, may be used. Other examples may not include any rollers, such that base **140** is configured to remain stationary on the floor.

[0020] As mentioned above, kneeling rocking chair **100** further includes adjustable rocking mechanism **150** with compression springs **162** to resist the forward and backward motion of the common frame **120** relative to the base **140** on the pivot connection **138**.

[0021] As best shown in FIG. **1**C, the adjustable rocking mechanism **150** includes a cover **152** with two threaded adjustment bolts **154** with protruding knobs **156** extending through holes in the cover **152**. A user may adjust the resistance of the forward and backward motion of the common frame **120** relative to the base **140** on the pivot connection **138** using the protruding knobs **156** of the threaded adjustment bolts **154**.

[0022] The cover **152** is fixedly attached to the two parallel base members **142**, and further forms pivot support on either end of the threaded adjustment bolts **154**. Cover **152** may be formed from one or more bent metal components. In the example of chair **100**, cover **152** includes a bottom portion **170** with flanges **172** screwed to the upper surfaces of the parallel base members **142**, and a top portion **175** with the pivot supports **176** for the threaded adjustment bolts **154**. For example, the pivot supports **176** may be through holes sized to receive the threaded adjustment bolts **154** in flanges of the top portion **175**. In this manner, threaded adjustment bolts **154** are rotatable relative to cover **152** along an axis fixed relative to the base **140**.

[0023] The adjustable rocking mechanism **150** includes a front spring block **160**A and a rear spring block **160**B (collectively, "spring blocks **160**"), which serve as mounts for the compression springs **162**. The front spring block **160**A is fixed relative to the base **140** and provides an anchor point, holding one end of a first compression spring **162**, while the rear spring block **160**B serves a similar purpose for the second compression spring **162**. These spring blocks **160**A and **160**B are secured to the base **140** and do not move with the common frame **120**, thereby providing a stationary mount for the springs **162** to exert force against the pivoting motion of the common frame **120**.

[0024] The adjustable resistance to the forward and reverse rocking motion occurs within the cover **152**. Specifically, each of the threaded adjustment bolts **154** engages a threaded hole of one of spring blocks **160**A, **160**B. Two coiled compression springs **162** extend between each spring blocks **160** and the common frame **120**. In the example of chair **100**, the common frame **120** includes plates **119** with an extended spring contact surfaces attached to the upper side of the parallel frame members **121** on either side of the pivot connection **138**. The plates **119** move in conjunction with the common frame **120** as the common frame **120** pivots relative to the base **140**. In contrast, the spring blocks **160** remain fixed relative to the base **140** by their connection to the cover **152** via the threaded adjustment bolts **154**. When pivoting forward past a neutral position, springs **162** on the front spring block **160**A are deflected in compression. When pivoting backwards past the neutral position, springs **162** on the rear spring block **160**B are deflected in compression. In an alternative configuration, springs may instead be deflected by stretching. For example, rear springs may be stretched when pivoting forward past the neutral position, whereas front springs may be stretched when pivoting backwards past the neutral position. Such an alternative configuration would require the springs to be attached on both ends, whereas springs **162** are only attached to spring blocks **160**A with spring contacts free to slide on the plates **119**.

[0025] The adjustable rocking mechanism **150** is equipped with protruding knobs **156** attached to the threaded adjustment bolts **154**. These knobs **156** are designed for manual operation, allowing the user to easily adjust the resistance of the rocking motion by rotating the knobs. By turning the protruding knobs **156**, the user can individually move either of the spring blocks **160**A and **160**B closer to or further from the pivot connection **138**, thereby adjusting the tension of the compression springs **162** and customizing the rocking resistance to their preference. More specifically, turning one of threaded adjustment bolts **154** with the associated protruding knob **156** moves the position of the associated spring block **160** relative to the extended spring contact surfaces of the corresponding plate **119**. The outer sides and upper surfaces of the spring blocks **160** register with the inner surfaces of the cover **152** to keep the spring blocks **160** oriented in a common direction when being actuated by their associated threaded adjustment bolt **154**.

[0026] Moving the spring block **160** further from the pivot connection **138** increases the rocking resistance as the spring compression increases for a given angle of the common frame **120** relative to the base **140**. Conversely, moving the spring block **160** closer to the pivot connection **138**

decreases the rocking resistance as the spring compression decreases for a given angle of the common frame **120** relative to the base **140**.

[0027] Compression springs **162** can be fabricated from a variety of materials depending on the requirements for strength, corrosion resistance, and cost-effectiveness. High carbon steel is commonly used for its high tensile strength and fatigue life, making it suitable for a broad range of applications. Stainless steel is another option that provides excellent corrosion resistance, which is beneficial in environments where the chair may be exposed to moisture or chemicals. Alloy steels, such as chrome silicon or chrome vanadium, offer superior properties for high stress applications, including enhanced strength at higher temperatures and better resistance to shock loads.

[0028] The dimensions of the compression springs **162** is determined by the space available within the adjustable rocking mechanism **150** and the desired range of motion for the chair. The physical dimensions of the springs, including the outer diameter, inner diameter, wire diameter, and free length, are selected to fit within the confines of the mechanism while providing the requisite force to support the rocking motion. The size of the springs also influences the spring rate, which is the amount of force per unit of deflection.

[0029] The strength of compression springs **162** is characterized by the spring rate and the maximum load they can withstand. The spring rate is chosen based on the desired responsiveness and the weight of the user, ensuring that the chair can accommodate a wide range of body types without bottoming out or being too stiff. The maximum load is related to the material's tensile strength and the spring's design, including the number of active coils and the type of ends (closed and ground, closed and not ground, open and ground, or open and not ground). The springs are designed to operate within the elastic limit of the material to prevent permanent deformation after repeated use.

[0030] While the adjustable rocking mechanism **150** allows adjustable resistance to rocking, both forwards and backwards, the overall motion of the common frame **120** relative to the base **140** is limited by contact between the parallel frame members **121** and the foot members **144**. Optional anti-collision pads **178** are located between the contact points of the parallel frame members **121** and the foot members **144**. In the example of chair **100**, anti-collision pads **178** are located on the upper inside corner of each foot member **144** cushions the contact to increase comfort for the user and reduce noise from the contact. Such anti-collision pads may be made from any elastomeric material suitable for such purpose, including but not limited to rubber, foam, polyurethane, and the like. The elastomeric material may be attached to either the common frame **120** or the base **140** with an adhesive.

[0031] The kneeling rocking chair **100**, **200** includes a tilt lock mechanism that allows the user to selectively fix the position of the common frame **120** relative to the base **140**. As best shown in FIG. **1**C, the tilt lock mechanism includes a tilt locking thumb screw **180** including a threaded shaft extending through a hole **184** in the base **140** and engaged with a threaded hole **182** (FIG. **1**E) in the frame **120**. Removal of the thumb screw **180** from the threaded hole **182** in the frame **120** allows frame **120** to pivot about pivot connection **138**. Conversely, a user may reinsert the thumb screw **180** through the hole **184** in the base **140** and engaged the threaded hole **182** in the frame **120** to lock the position of the frame relative to the base **140**.

[0032] FIGS. **2**A-**2**C illustrate a kneeling rocking chair **200** including an adjustable rocking mechanism **250** with torsion springs **262**. More specifically, FIG. **2**A is a perspective view of chair **200**, FIGS. **2**B and **2**C illustrate the components of the adjustable rocking mechanism **150**. In FIG. **2**B, the cover **252** of the adjustable rocking mechanism **250** is removed to illustrate the its internal components, whereas in FIG. **2**C, the cover **252** and the base **140** of kneeling rocking chair **200** is removed.

[0033] Kneeling rocking chair **200** is substantially similar to kneeling rocking chair **100** except that adjustable rocking mechanism **150** has been replaced with adjustable rocking mechanism **250**. Details, examples, and variations described with respect to kneeling rocking chair **100** are equally applicable to kneeling rocking chair **200**. Conversely, details, examples, and variations described with respect to kneeling rocking chair **200** are equally applicable to kneeling rocking chair **100**. Common elements between kneeling rocking chair **100** and kneeling rocking chair **200** include the same element labels.

[0034] As previously described with respect to kneeling rocking chair **100**, the common frame **120** of kneeling rocking chair **200** is the primary support structure for the slanted padded seat **110** and the padded shin rest **112**. It is composed of two elongated parallel frame members **121**, which are held apart by spacers **129**. These frame members **121** are bent to approximate a C-shape, with the shin support **122** and seat support **126** positioned at either end of the C-shape. The common frame **120** is pivotably mounted to the base **140** via pivot connection **138**, which allows for a rocking motion.

[0035] The slanted padded seat **110** includes a seat pad **111** mounted on the seat support **126**, which is part of the common frame **120**. The padded shin rest **112** comprises a shin pad **113** mounted on the shin support **122**. The seat **110** and shin rest **112** are designed to support the user in a kneeling position with an open hip angle.

[0036] The base **140** is configured to rest on the floor and support the common frame **120**. It consists of parallel base members **142** and foot members **144** that extend transversely to the base members **142**. Swiveling rollers **146** are attached to the base **140** to allow for mobility, although swiveling rollers **147** including locking mechanism may also be used. The base **140** is connected to the common frame **120** through pivot connection **138**, which includes a stationary axel **132** that extends through a plate **130** attached to the common frame **120** and through holes in the base **140**.

[0037] The adjustable rocking mechanism **250** of kneeling rocking chair **200** includes torsion springs **262** held by spring blocks **260**, which are front spring block **260**A and rear spring block **260**B. The mechanism allows for adjustable resistance to the rocking motion of the common frame **120** relative to the base **140**. The resistance can be adjusted by turning threaded adjustment bolts **254** with protruding knobs **256**. The cover **252** is fixedly attached to the base **140** and provides pivot supports for the adjustment bolts **254**.

[0038] Common frame **120** includes a stanchion **230**, which is a structural component extending between the locations of the torsion springs **262**. The stanchion **230** serves as a point of action for the torsion springs **262**, transferring the resistive force generated by the springs to the common frame **120**. The first torsion spring **262** is

secured to a front spring block **260**A fixed relative to the base **140** with a second end of the front spring block **260**A acting on the stanchion **230** when the common frame **120** is pivoted forward relative to the neutral position. Similarly, a first end of a second torsion spring **262** is secured to a rear spring block **260**B fixed relative to the base **140** with a second end of the rear spring block **260**B acting on the stanchion **230** when the common frame **120** is pivoted backward relative to the neutral position.

[0039] As the common frame **120** pivots, the stanchion **230** acts on the torsion springs **262** to deflect the torsion springs **262**. The adjustable rocking mechanism further comprises a first threaded adjustment bolt **254** that engages with the front spring block **260**A to vary resistance to the rocking motion of the common frame **120** when pivoting forward by varying a ratio of torsional compression of the first torsion spring **262** relative to forward rotation of the common frame **120** relative to the base **140**. A second threaded adjustment bolt **254** engages with the rear spring block **260**B to vary resistance to the rocking motion of the common frame **120** when pivoting backwards by varying a ratio of torsional compression of the second torsion spring **262** relative to backward rotation of the common frame **120** relative to the base **140**.

[0040] Any suitable spring material may be used for torsion springs **262**. Commonly utilized materials include high-carbon steel, which is known for its high tensile strength and fatigue resistance, making it suitable for the cyclic loading of the rocking chair. Stainless steel is another option, offering corrosion resistance and durability, particularly in environments with high humidity or exposure to corrosive substances. For applications requiring enhanced resistance to high stresses and temperatures, alloy steels such as chrome silicon or chrome vanadium can be employed. These materials maintain their strength under high stress and temperature conditions, providing a consistent performance over the life of the chair.

[0041] The dimensions of torsion springs **262** are determined by the space constraints within the adjustable rocking mechanism **250** and the mechanical requirements of the rocking motion. The dimensions include the wire diameter, spring diameter, body length, and leg length, which are all tailored to fit within the mechanism and to provide the correct torque for the desired rocking resistance. The wire diameter affects the strength of the spring, with thicker wires providing greater resistance. The spring diameter and body length are chosen to ensure that the spring fits within the housing of the mechanism and interacts correctly with the stanchion **230** and spring blocks **260**. The leg length is designed to provide the appropriate leverage for the spring to exert the correct amount of force on the common frame **120**.

[0042] The strength of torsion springs **262** is characterized by the torque they can exert and their ability to withstand repeated cycles without failure. The torque is a function of the material's modulus of elasticity, the wire diameter, the spring diameter, and the number of active coils. The springs are designed to provide a range of resistance levels that can be adjusted by the user through the threaded adjustment bolts **254**, allowing for customization of the rocking resistance. The maximum load capacity of the springs is determined to ensure that they remain within their elastic limit during use, preventing permanent deformation or failure. The strength of the springs is also matched to the expected weight range of users to ensure that the chair can accommodate a wide variety of individuals.

[0043] The adjustable rocking mechanism comprises a cover **252** fixedly attached to the base **140** and providing pivot supports for the first threaded adjustment bolt **254** and the second threaded adjustment bolt **254**. The cover **252** is fixedly secured to the base **140** by way of flanges **272** and by thumb screw **253** which passes through a hole in the cover **252** to engage a threaded hole on the top surface of the stanchion **230**. The outer surfaces of the spring blocks **260** register with the inner surfaces of the cover **152** to keep the spring blocks **260** oriented in a common direction when being actuated by their associated threaded adjustment bolt **254**.

[0044] Anti-collision pads **178** and anti-collision plates **278** are located between the common frame **120** and the base **140** to cushion the contact points during the rocking motion. These pads and plates are made from materials suitable for absorbing impact and reducing noise.

[0045] A tilt lock mechanism is incorporated into kneeling rocking chair **200**, featuring a thumb screw **180** that can be inserted through a hole **184** in the base **140** and engaged with a threaded hole **182** in the common frame **120**. This mechanism allows the user to lock the common frame **120** in a stationary position relative to the base **140**.

[0046] FIGS. **3**A-**3**D illustrate a kneeling rocking chair **300** including an adjustable rocking mechanism **350** with plate springs **362**. More specifically, FIG. **3**A is a perspective view of chair **300**, FIG. **3**B is a perspective view of chair **300** with the top portion **175** of cover **152** of the adjustable rocking mechanism **350** removed, while FIG. **3**C is a perspective view of chair **300** with the cover **152**, including the bottom portion **170** and the top portion **175**, whereas in FIG. **3**D, the cover **152** and the base **140** of kneeling rocking chair **300** are removed.

[0047] Kneeling rocking chair **300** is substantially similar to kneeling rocking chair **100** except that adjustable rocking mechanism **150** has been replaced with adjustable rocking mechanism **350**. Details, examples, and variations described with respect to kneeling rocking chair **100** and kneeling rocking chair **200** are equally applicable to kneeling rocking chair **300**. Conversely, details, examples, and variations described with respect to kneeling rocking chair **300** are equally applicable to kneeling rocking chair **100** and kneeling rocking chair **200**. Common elements between kneeling rocking chair **100** and kneeling rocking chair **300** include the same element labels.

[0048] As previously described with respect to kneeling rocking chair **100**, the common frame **120** of kneeling rocking chair **300** is the primary support structure for the slanted padded seat **110** and the padded shin rest **112**. It is composed of two elongated parallel frame members **121**, which are held apart by spacers **129**. These frame members **121** are bent to approximate a C-shape, with the shin support **122** and seat support **126** positioned at either end of the C-shape. The common frame **120** is pivotably mounted to the base **140** via pivot connection **138**, which allows for a rocking motion.

[0049] The slanted padded seat **110** includes a seat pad **111** mounted on the seat support **126**, which is part of the common frame **120**. The padded shin rest **112** comprises a shin pad **113** mounted on the shin support **122**. The seat **110** and shin rest **112** are designed to support the user in a kneeling position with an open hip angle.

[0050] The base **140** is configured to rest on the floor and support the common frame **120**. It consists of parallel base members **142** and foot members **144** that extend transversely to the base members **142**. Swiveling rollers **146** and swiveling rollers **147** including locking mechanism are attached to the base **140** to allow for mobility. The base **140** is connected to the common frame **120** through pivot connection **138**, which includes a stationary axel **132** that extends through a plate **130** attached to the common frame **120** and through holes in the base **140**.

[0051] As best shown in FIG. **3**A, the adjustable rocking mechanism **350** includes a cover **152** with two threaded adjustment bolts **154** with protruding knobs **156** extending through holes in the cover **152**. A user may adjust the resistance of the forward and backward motion of the common frame **120** relative to the base **140** on the pivot connection **138** using the protruding knobs **156** of the threaded adjustment bolts **154**.

[0052] The cover **152** is fixedly attached to the two parallel base members **142**, and further forms pivot support on either end of the threaded adjustment bolts **154**. Cover **152** may be formed from one or more bent metal components. In the example of chair **300**, cover **152** includes a bottom portion **170** with flanges **172** screwed to the upper surfaces of the parallel base members **142**, and a top portion **175** with the pivot supports **176** for the threaded adjustment bolts **154**. For example, the pivot supports **176** may be through holes sized to receive the threaded adjustment bolts **154** in flanges of the top portion **175**. In this manner, threaded adjustment bolts **154** are rotatable relative to cover **152** along an axis fixed relative to the base **140**.

[0053] The adjustable rocking mechanism **350** of kneeling rocking chair **300** includes plate springs **362** fixed relative to the base **40**. A distal end of a first plate spring **362** engaging the common frame **20** when the common frame **20** is pivoted forward relative to the neutral position, and a distal end of the second plate spring **362** engages the common frame **20** when the common frame **20** is pivoted backwards relative to the neutral position. The distal ends of plate springs **362** are held by a compression fit between lower clip **364** and upper clip **365**. More specifically, screws **367** (FIG. **3**D) extend through holes in lower clip **364** and engage threaded holes in upper clip **365**. Tightening screws **367** pinches the proximal ends of both plate springs **362** to secure them in place. The use of a compression fit for the proximal ends of both plate springs **362**, reduces stress concentrations compared to other techniques, improving the service life of plate springs **362**.

[0054] The upper clip **365** is fixedly attached to the bottom portion **170** of cover **152**. While any suitable fixation technique may be used, in the illustrated example, weld joints **366** (FIG. **3**B) secure the upper clip **365** to the bottom portion **170** of cover **152**. The weld joints **366** are on either side of the aperture for protruding knobs **156** in the bottom portion **170** of cover **152**. With upper clip **365** secured to the bottom portion **170** of cover **152**, and flanges **172** of bottom portion **170** screwed to the upper surfaces of the parallel base members **142**, the proximal ends of plate springs **362** are held in place with base **140**. In other examples, upper clip **365** may be secured to the bottom portion **170** of cover **152** using screws, bolts, rivets, brazing, or other suitable techniques.

[0055] The adjustable rocking mechanism **350** further includes plate spring contacts **360**, which are front plate spring contact **360**A and rear plate spring contact **360**B. Plate spring contacts **360** include spring contact surfaces adjacent the plate springs **362**. Each plate spring contact includes a spring contact surface adjacent to a corresponding plate spring **362**. This surface is contoured to match the profile of the plate spring **362**. The spring contact surface facilitates the bending of the plate spring **362**, facilitating a smooth and controlled rocking motion. The front plate spring contact **360**A is fixed relative to the base **40** during rocking of the common frame **20** relative to the base **40**. The front plate spring contact **360**A sets a free spring length of the first plate spring as measured from the front plate spring contact **360**A to the distal end of the first plate spring **362** engaging the common frame **20**. Likewise, the rear plate spring contact **360**B is fixed relative to the base **40** during rocking of the common frame **20** relative to the base **40**. The front plate spring contact **360**B sets a free spring length of the second plate spring **362** as measured from the rear plate spring contact **360**B to the distal end of the second plate spring **362** engaging the common frame **20**.

[0056] As the common frame **120** pivots relative to the base **140** the parallel frame members **121** actuate the distal ends of the plate springs **362** to bend the plate springs **362**. When pivoting forward past a neutral position, plate spring **362** in contact with the front plate spring contact **360**A is deflected. When pivoting backwards past the neutral position, plate spring **362** in contact with the rear plate spring contact **360**B is deflected. The plate spring contacts **360** engage with the plate springs **362**. Each plate spring contact includes a spring contact surface that is positioned adjacent to a corresponding plate spring **362**. This surface is contoured to match the profile of the plate spring **362**, ensuring a secure and effective interaction as the common frame **120** pivots. The spring contact surface facilitates the bending of the plate spring **362**, providing a smooth and controlled rocking motion.

[0057] Plate springs **362** can be fabricated from a variety of materials depending on the requirements for strength, corrosion resistance, and cost-effectiveness. High carbon steel is commonly used for its high tensile strength and fatigue life, making it suitable for a broad range of applications. Stainless steel is another option that provides excellent corrosion resistance, which is beneficial in environments where the chair may be exposed to moisture or chemicals. Alloy steels, such as chrome silicon or chrome vanadium, offer superior properties for high stress applications, including enhanced strength at higher temperatures and better resistance to shock loads.

[0058] The dimensions of the plate springs **362** is determined by the space available within the adjustable rocking mechanism **150** and the desired range of motion for the chair. The physical dimensions of the springs, including the thickness, width, and free length, are selected to fit within the confines of the mechanism while providing the requisite force to support the rocking motion. The thickness of the springs directly affects their bending resistance, with thicker springs offering greater stiffness. The width and length are selected to ensure that the springs can deliver the desired force without exceeding the material's yield strength during operation.

[0059] The strength of plate springs **362** is characterized by the spring rate and the maximum load they can withstand. The spring rate is chosen based on the desired responsiveness and the weight of the user, ensuring that the chair can

accommodate a wide range of body types without bottoming out or being too stiff. The strength is characterized by the ability of the springs to withstand the applied loads without permanent deformation. This includes considering the yield strength of the material and ensuring that the spring design, including its dimensions, does not subject the springs to stresses that exceed this limit. The plate springs **362** should be selected to provide sufficient flexibility for the rocking motion while maintaining the structural integrity of the springs throughout the chair's lifespan.

[0060] The adjustable rocking mechanism **350** allows for adjustable resistance to the rocking motion of the common frame **120** relative to the base **140**. The adjustable rocking mechanism **350** includes threaded adjustment bolts **154** operatively connected to the front and rear plate spring contacts **360**, the threaded adjustment bolts **154** configured to adjust the position of the plate spring contacts **360** by translating rotational input from a user into linear movement of the plate spring contacts **360**. The linear movement of the plate spring contacts **360** varies the free spring lengths to adjust the resistance to the rocking motion of the common frame **20** relative to the base **40**. The resistance can be adjusted by turning threaded adjustment bolts **154** with protruding knobs **156**.

[0061] The cover **152** is fixedly attached to the base **140** and provides pivot support for the adjustment bolts **154**. The cover **152** of the adjustable rocking mechanism **350** serves a dual purpose. Firstly, it provides pivot supports **176** for the threaded adjustment bolts **154**, ensuring their stable operation during adjustments. Secondly, the cover **152** is designed to enclose and house the plate springs **362**, protecting them from external elements and potential interference. The cover's **152** construction forms a protective shell around the plate springs **362**, while still allowing for their free movement and the effective transmission of force as the common frame **120** pivots relative to base **140**.

[0062] The locations of plate spring contacts **360** are individually adjustable to adjust the rocking resistance of common frame **120** relative to the base. A larger space between the distal end of a plate spring **362** and the associated plate spring contact **360** provides a lower rocking resistance. This feature allows for precise control over the resistance of the rocking motion of the common frame **120** relative to the base **140**. The individual adjustability enables the user to fine-tune the tension of each plate spring **362** separately, customizing the rocking experience to their preference.

[0063] Spring contact pads **363** are located on the distal ends of the plate springs **362**. Spring contact pads **363** cushion the contact points against the common frame **120** during the rocking motion. Spring contact pads **363** are made from materials suitable for absorbing impact and reducing noise.

[0064] A tilt lock mechanism is incorporated into kneeling rocking chair **300**, featuring a thumb screw **180** that can be inserted through a hole **184** in the base **140** and engaged with a threaded hole **182** in the common frame **120**. This mechanism allows the user to lock the common frame **120** in a stationary position relative to the base **140**.

[0065] As used herein, terms such as "upper," "lower," "side," "front," "back," "top," "bottom," and similar relational descriptors are used to convey the relative positions of components within a device or system. These terms do not denote absolute positions, but rather to describe the spatial relationships between elements as they are typically oriented during standard use or as depicted in the accompanying figures. For instance, "upper" may refer to an element that is above another component when the device is in its intended operational orientation, while "lower" would refer to a component situated beneath it. Similarly, "side" could refer to a lateral aspect of an element relative to the central axis or main body of the device. It is understood that the actual orientation of the device may change during use, and thus these terms are flexible and relative to the context provided in the description.

[0066] In variations of the described techniques, for kneeling rocking chairs **100**, **200**, **300**, any type of spring may be utilized. Various spring types that could be considered as alternatives to springs **162**, **262**, and **362** in the kneeling rocking chair include leaf springs, coil springs, torsion springs, Belleville washers, wave springs, gas springs, die springs, disc springs, rubber springs, and air springs (with adjustable air pressure). In other variations, a damping material may be used in place of the springs, either directly in replace of one of springs **162**, **262**, **362** or in a modified design. Options for such damping materials include, but are not limited to, open-cell foam, closed-cell foam, viscoelastic memory foam, and polyurethane foam, neoprene, silicone, butyl rubber, cork, as well as fibrous materials such as fiberglass insulation and mineral wools. Other options include engineered damping plastics, composite layers with constrained damping properties, and specialized materials like Sorbothane bumpers for targeted shock absorption and vibration isolation.

[0067] The specific techniques for kneeling rocking chairs, including techniques described with respect to kneeling rocking chairs **100**, **200**, **300** are merely illustrative of the general inventive concepts included in this disclosure as defined by the following claims.

What is claimed is:

1. A kneeling rocking chair comprising:

a base configured to support the chair on a floor;

a common frame pivotably mounted to the base, the common frame supporting a seat and a shin rest; and

an adjustable rocking mechanism coupled to the base and the common frame, the adjustable rocking mechanism configured to provide adjustable resistance to a rocking motion of the common frame relative to the base.

2. The kneeling rocking chair of claim **1**, wherein the adjustable rocking mechanism includes:

a first spring that is deflected when the common frame pivots forward beyond a neutral position; and

a second spring that is deflected with the common frame pivots backwards past the neutral position.

3. The kneeling rocking chair of claim **2**,

wherein the first spring extends between a first mount fixed relative to the base and a first portion of the common frame, and

wherein the first spring extends between a second mount fixed relative to the base and a second portion of the common frame.

4. The kneeling rocking chair of claim **2**, wherein the adjustable rocking mechanism includes:

a front spring block holding a first end of the first spring;

a first threaded adjustment bolt that engages with the front spring block to vary resistance to the rocking motion of the common frame when pivoting forward by varying

a ratio of compression of the first spring relative to forward rotation of the common frame relative to the base;

a rear spring block holding a first end of the second spring; and

a second threaded adjustment bolt that engages with the rear spring block to vary resistance to the rocking motion of the common frame when pivoting backwards by varying a ratio of compression of the second spring relative to backward rotation of the common frame relative to the base.

5. The kneeling rocking chair of claim **4**,

wherein the front spring block and the rear spring block are held relative to the base during rotation of the common frame relative to the base,

wherein a second end of the first spring acts on the common frame when the common frame pivots forward relative to the neutral position, and

wherein a second end of the second spring acts on the common frame when the common frame pivots backwards relative to the neutral position.

6. The kneeling rocking chair of claim **4**, wherein the adjustable rocking mechanism comprises a cover fixedly attached to the base and providing pivot supports for the first threaded adjustment bolt and the second threaded adjustment bolt.

7. The kneeling rocking chair of claim **4**, wherein the adjustable rocking mechanism includes protruding knobs attached to the first and second threaded adjustment bolts, allowing a user to manually adjust the resistance of the rocking motion by rotating the protruding knobs.

8. The kneeling rocking chair of claim **2**, wherein the first spring is a first compression spring and the second spring is a second compression spring.

9. The kneeling rocking chair of claim **2**, wherein the first spring is a first torsion spring and the second spring is a second torsion spring.

10. The kneeling rocking chair of claim **9**,

wherein the common frame includes a stanchion extending between the first torsion spring and the second torsion spring,

wherein a first end of the first torsion spring is secured to a front spring block fixed relative to the base with a second end of the front spring block acting on the stanchion when the common frame is pivoted forward relative to the neutral position, and

wherein a first end of the second torsion spring is secured to a rear spring block fixed relative to the base with a second end of the rear spring block acting on the stanchion when the common frame is pivoted backward relative to the neutral position.

11. The kneeling rocking chair of claim **10**, wherein the adjustable rocking mechanism further comprises:

a first threaded adjustment bolt that engages with the front spring block to vary resistance to the rocking motion of the common frame when pivoting forward by varying a ratio of torsional compression of the first spring relative to forward rotation of the common frame relative to the base;

a rear spring block holding a first end of the second spring; and

a second threaded adjustment bolt that engages with the rear spring block to vary resistance to the rocking motion of the common frame when pivoting backwards by varying a ratio of torsional compression of the second spring relative to backward rotation of the common frame relative to the base.

12. The kneeling rocking chair of claim **11**, wherein the adjustable rocking mechanism comprises a cover fixedly attached to the base and providing pivot supports for the first threaded adjustment bolt and the second threaded adjustment bolt.

13. The kneeling rocking chair of claim **2**, wherein the first spring is a first plate spring and the second spring is a second plate spring.

14. The kneeling rocking chair of claim **13**,

wherein a proximal end of the first plate spring is fixed relative to the base with a distal end of the first plate spring engaging the common frame when the common frame is pivoted forward relative to the neutral position, and

wherein a proximal end of the second plate spring is fixed relative to the base with a distal end of the second plate spring engaging on the common frame when the common frame is pivoted backwards relative to the neutral position.

15. The kneeling rocking chair of claim **14**, wherein the adjustable rocking mechanism comprises:

a front plate spring contact fixed relative to the base during rocking of the common frame relative to the base, the front plate spring contact setting a free spring length of the first plate spring as measured from the front plate spring contact to the distal end of the first plate spring engaging the common frame; and

a rear plate spring contact fixed relative to the base during rocking of the common frame relative to the base, the rear plate spring contact setting a free spring length of the second plate spring as measured from the rear plate spring contact to the distal end of the second plate spring engaging the common frame.

16. The kneeling rocking chair of claim **15**, wherein the adjustable rocking mechanism comprises threaded adjustment bolts operatively connected to the front and rear plate spring contacts, the threaded adjustment bolts configured to adjust the position of the plate spring contacts by translating rotational input from a user into linear movement of the plate spring contacts,

wherein linear movement of the plate spring contacts varies the free spring lengths to adjust the resistance to the rocking motion of the common frame relative to the base.

17. The kneeling rocking chair of claim **1**, wherein the base includes two parallel base members and two foot members extending transversely to the parallel base members.

18. The kneeling rocking chair of claim **1**, wherein the base is equipped with swiveling rollers to facilitate movement of the kneeling rocking chair relative to a floor.

19. The kneeling rocking chair of claim **1**, wherein the common frame is formed from two elongated parallel frame members separated by spacers.

20. The kneeling rocking chair of claim **19**, wherein the two parallel frame members are configured to approximate a C-shape with the seat and the shin rest on opposite sides of the C-shape.

21. The kneeling rocking chair of claim **19**,
wherein the common frame includes a seat support and a shin support on opposing sides of a pivot connection pivotably mounting the common frame to the base,
wherein the seat support includes a first plate spanning the two parallel frame members,
wherein the shin support includes a second plate spanning the two parallel frame members,
wherein the seat includes a seat pad mounted to the seat support, and
wherein the shin rest includes a shin pad mounted to the shin support.

22. The kneeling rocking chair of claim **1**, wherein a pivot connection pivotably mounting the common frame to the base includes a stationary axel extending through a plate attached to the common frame and through holes in the base.

23. The kneeling rocking chair of claim **1**, further comprising a tilt lock mechanism operable to selectively fix the common frame relative to the base.

24. The kneeling rocking chair of claim **1**, further comprising anti-collision pads located between contact points of the common frame and the base.

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