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(54) **COIL LIFTERS**

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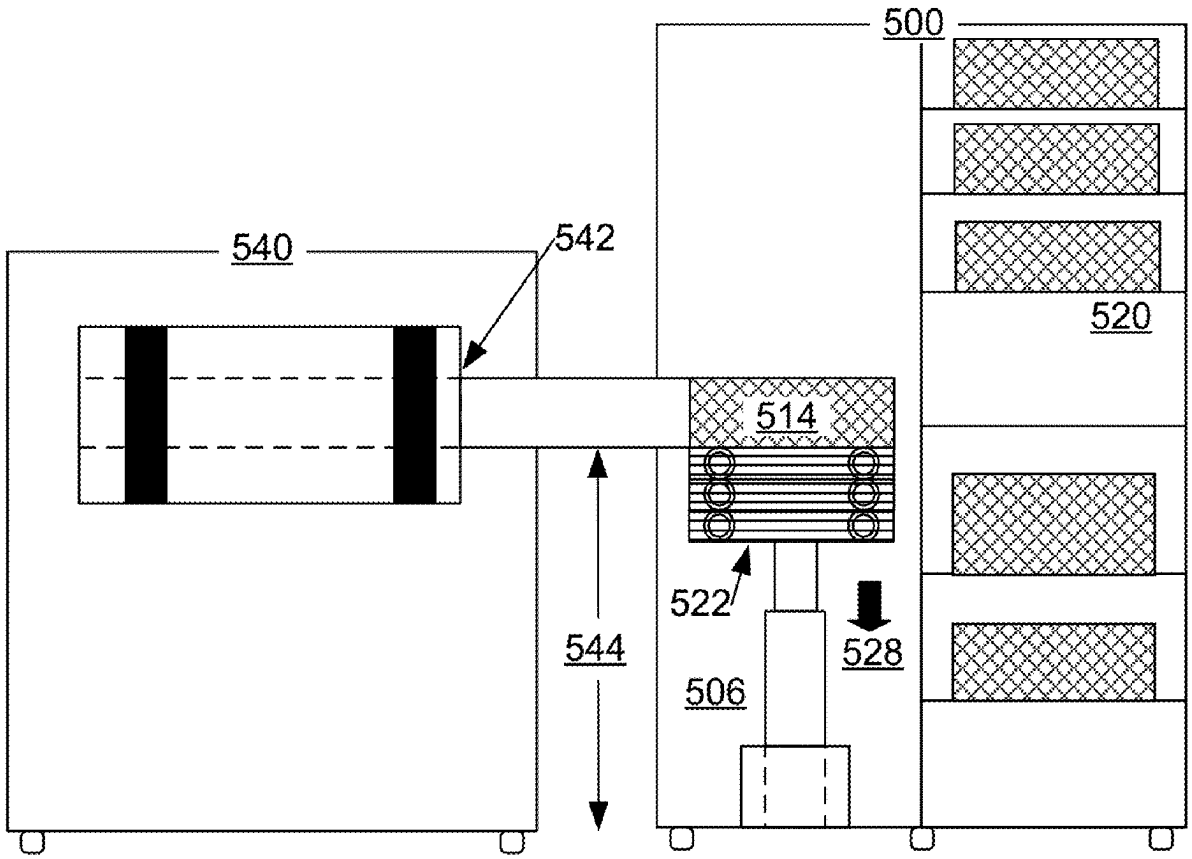
B21D 43/20 (2006.01)

(52) **U.S. Cl.**
CPC ***B21D 43/20*** (2013.01)

(57) **ABSTRACT**

A coil lifter including: a first rack including multiple slots configured to house metallic coils of various sizes, wherein a coil of a desired size is selected from the metallic coils in the multiple slots of the first rack; and a second rack coupled to the first rack and a bending machine for bending rules or profiles, the second rack including at least one movable slot to transfer the selected coil from the first rack to the at least one movable slot of the second rack, wherein an unspooled end of the selected coil is fed into the bending machine once the at least one movable slot of the second rack is appropriately positioned with respect to the bending machine.



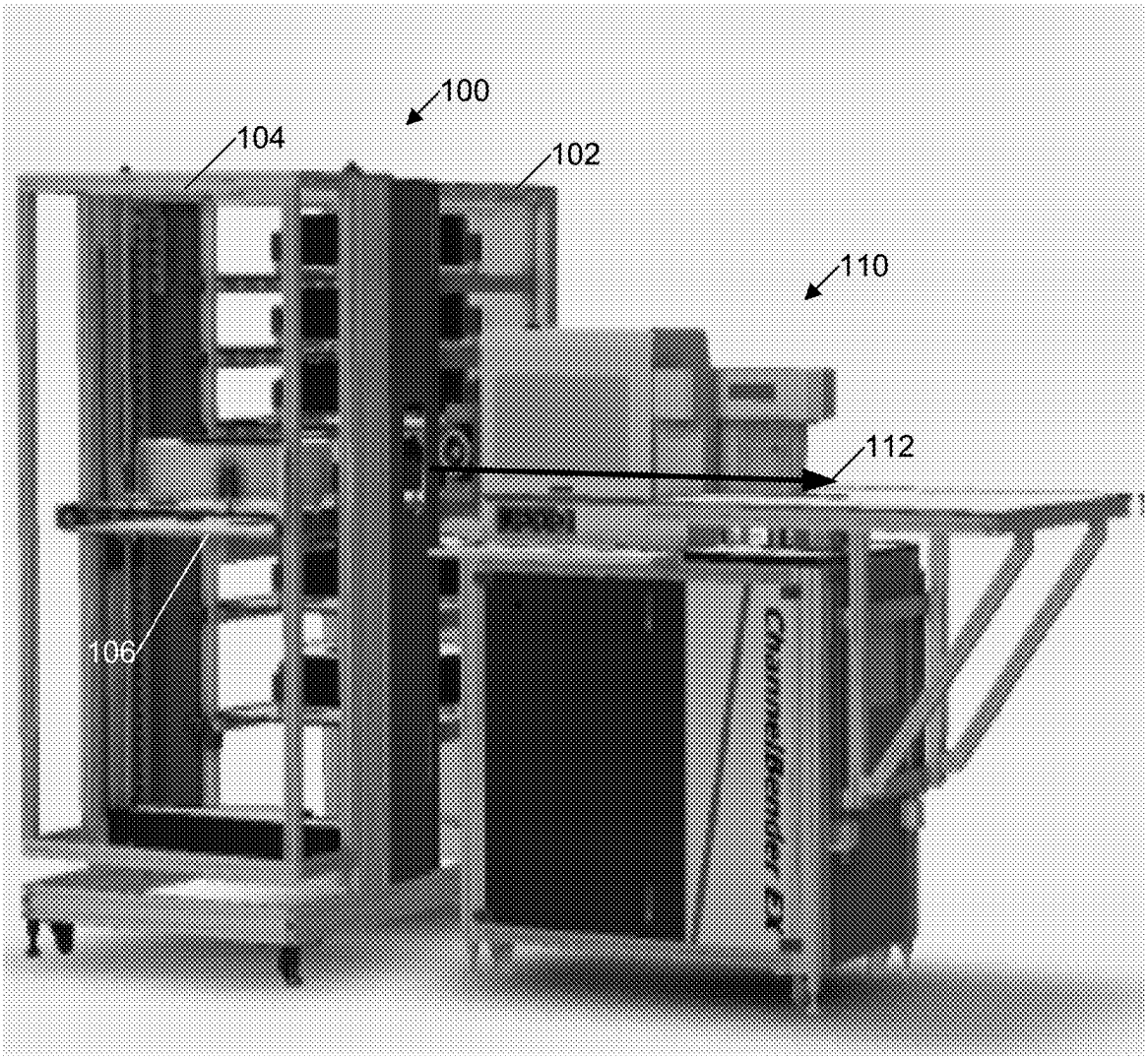


FIG. 1

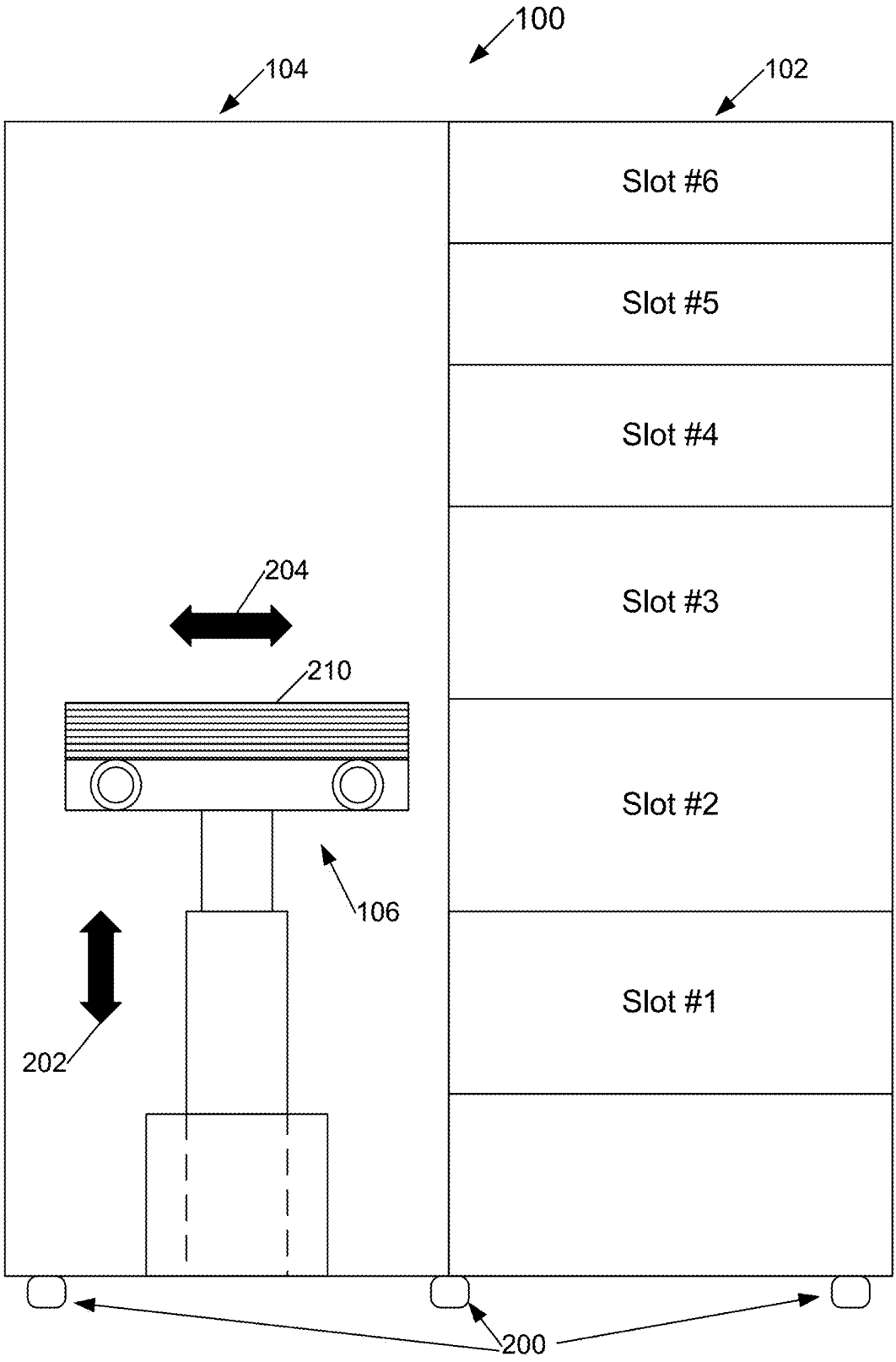

100
104
102
Slot #6
Slot #5
Slot #4
Slot #3
Slot #2
Slot #1
204
210
106
202
200

FIG. 2

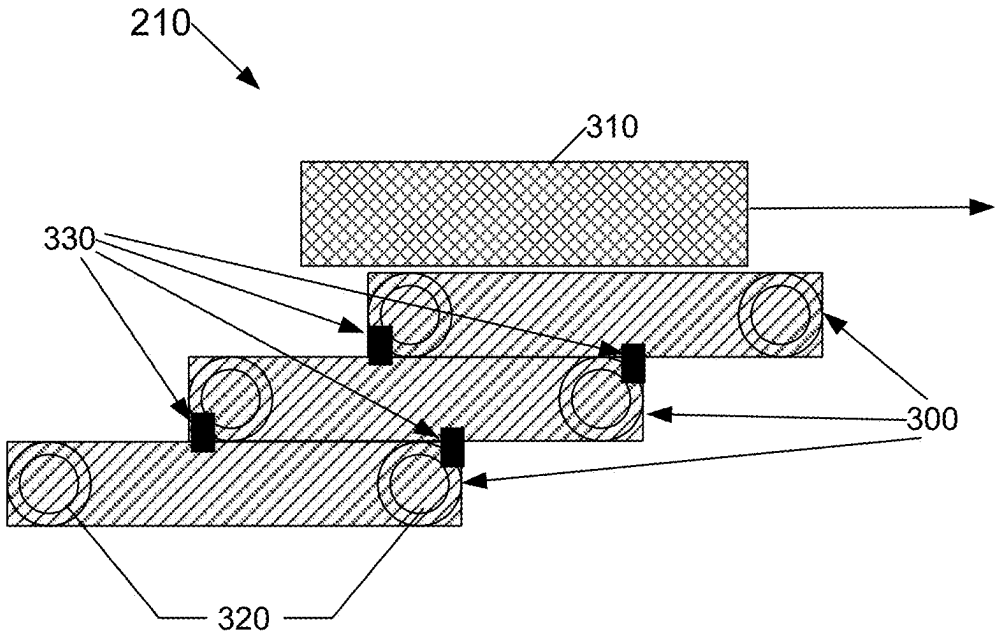


FIG. 3

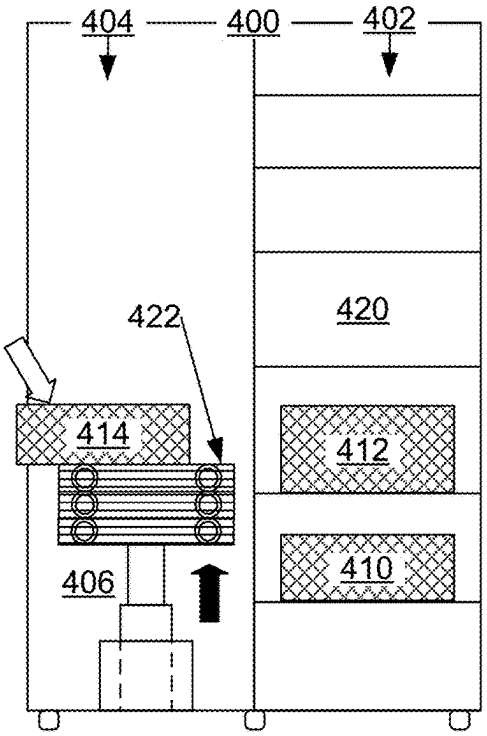


FIG. 4A

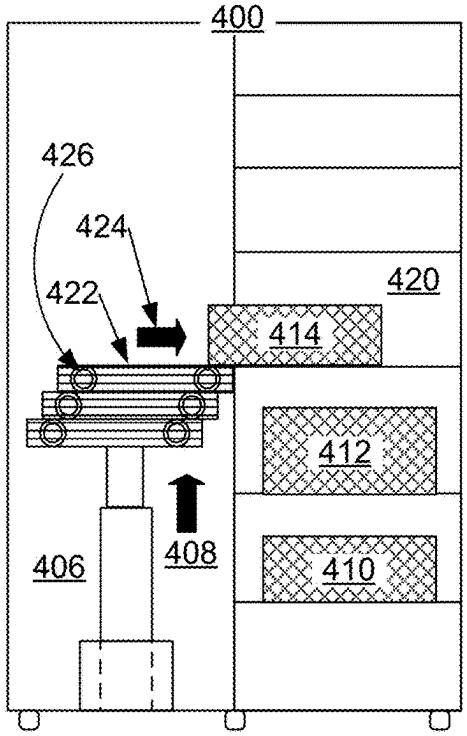


FIG. 4B

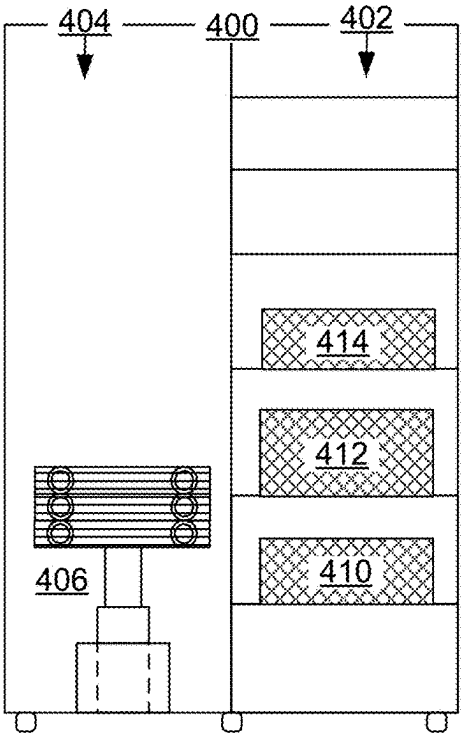


FIG. 4D

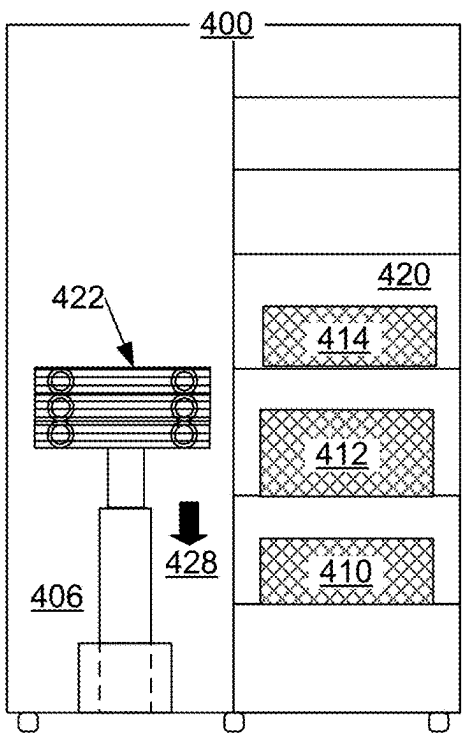


FIG. 4C

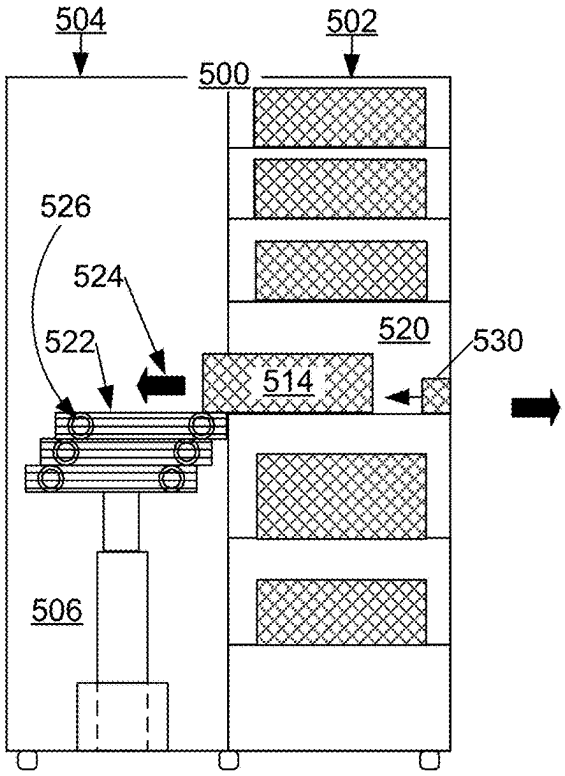


FIG. 5A

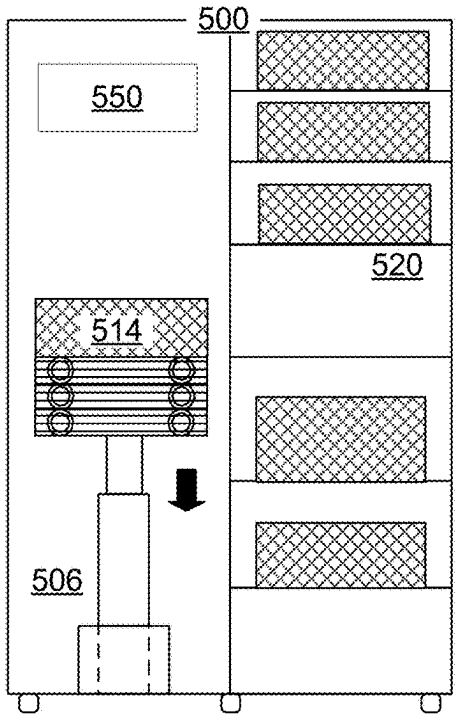


FIG. 5B

FIG. 5C

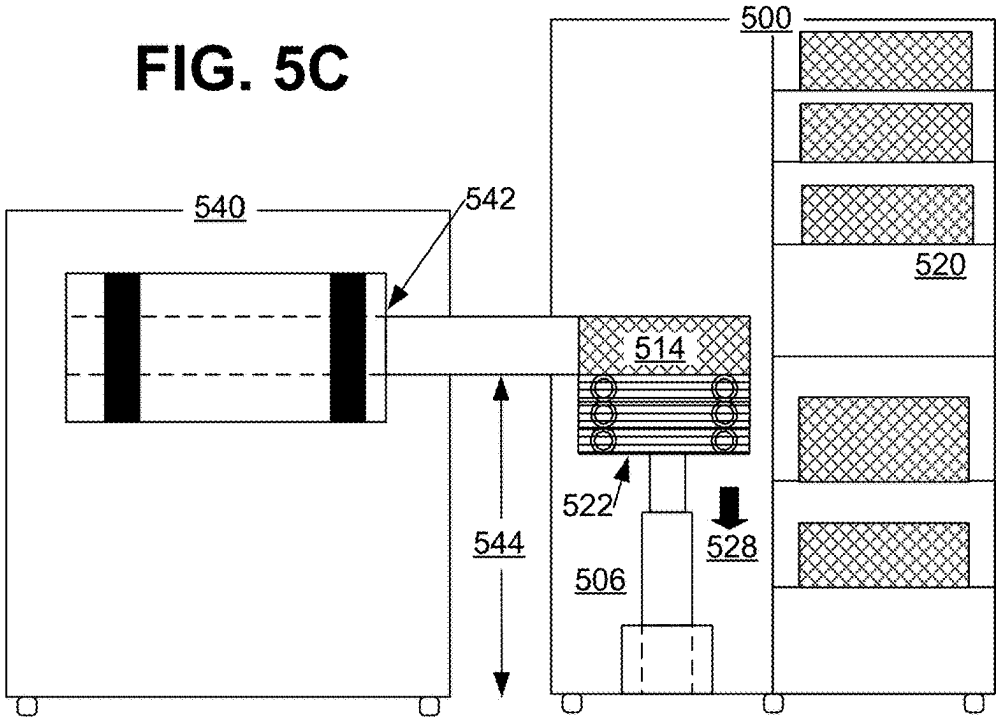


FIG. 6A

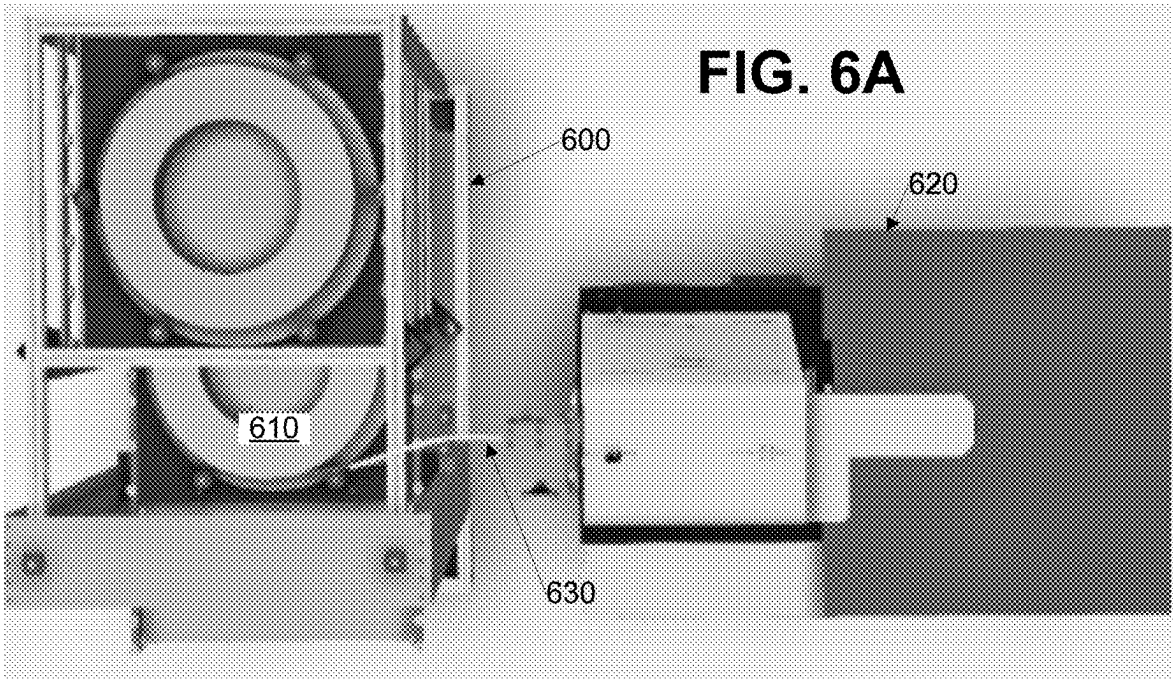
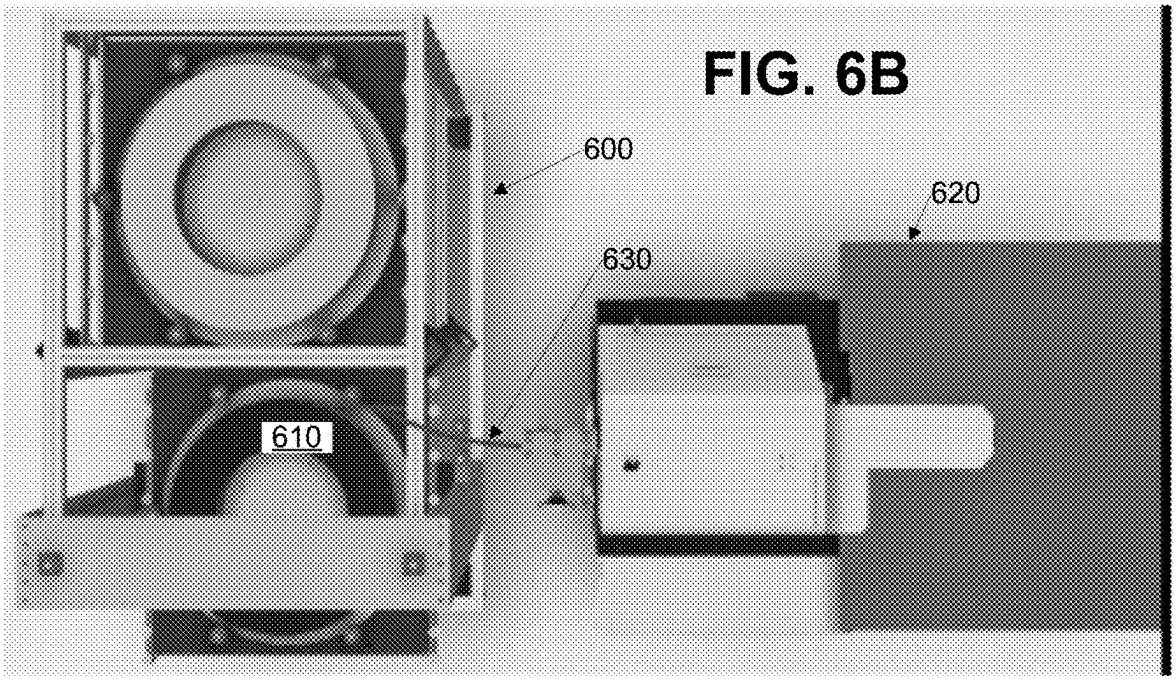


FIG. 6B



COIL LIFTERS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of priority under 35 U.S.C. § 119 (e) of co-pending U.S. Provisional Patent Application No. 63/554, 638, filed Feb. 16, 2024, entitled "Coil Lifters." The disclosure of the above-referenced application is incorporated herein by reference.

BACKGROUND

Field of the Disclosure

[0002] The present disclosure relates to machines for bending rules or profiles, and more specifically, to a coil lifter coupled to a bending machine.

Background

[0003] A strip of rule or profile is used to form a channel letter or cutting blade pattern by bending the rule or profile using a bending machine. In one example, the profile used to form the channel letter may include at least one rib including an upper rib and a lower rib. In another example, the strip of rule used to form the cutting blade pattern is attached to a die-board for use in pressing a folding or a cutting line on plate matters such as paper, canvas, leather, plastic, etc.

[0004] The strip of rule or profile fed into the bending machine may be generally prepared in a large roll. However, the large roll of metallic material may be extremely heavy (e.g., heavier than what a person of an average weight can lift), where a single large roll needs to provide long enough material to produce multiple channel letters or cutting blade patterns. Therefore, multiple operators or heavy machineries are needed to lift the roll up onto a feeding table for feeding the roll into the bending machine. Accordingly, a need exists for easier means for an operator of the bending machine to lift and feed the roll of metallic material into the bending machine.

SUMMARY

[0005] The present disclosure discloses a coil lifter coupled to a bending machine.

[0006] In one implementation, a coil lifter is disclosed. The coil lifter includes: a first rack including multiple slots configured to house metallic coils of various sizes, wherein a coil of a desired size is selected from the metallic coils in the multiple slots of the first rack; and a second rack coupled to the first rack and a bending machine for bending rules or profiles, the second rack including at least one movable slot to transfer the selected coil from the first rack to the at least one movable slot of the second rack, wherein an unspooled end of the selected coil is fed into the bending machine once the at least one movable slot of the second rack is appropriately positioned with respect to the bending machine.

[0007] In another implementation, a coil lifter is disclosed. The coil lifter includes: a first rack including multiple slots configured to house metallic coils of various sizes; and a second rack coupled to the first rack, the second rack including at least one movable slot to receive a metallic coil loaded onto the at least one movable slot, wherein the loaded metallic coil is transferred to a selected slot of the multiple slots using at least one sliding plate to move the loaded metallic coil to the second rack.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. **1** shows one example of a coil lifter coupled to a bending machine in accordance with one implementation of the present disclosure;

[0009] FIG. **2** shows a side view of the coil lifter in accordance with one implementation of the present disclosure;

[0010] FIG. **3** shows a closeup side view of the slider in accordance with one implementation of the present disclosure;

[0011] FIGS. **4**A through **4**D show a process of loading coils onto the slots of a first rack of a coil lifter in accordance with one implementation of the present disclosure;

[0012] FIGS. **5**A through **5**C show a process of unloading a coil from a selected slot of a first rack of a coil lifter and feeding the coil into a bending machine in accordance with one implementation of the present disclosure;

[0013] FIG. **6**A is a top view of a coil lifter coupled to a bending machine in accordance with one implementation of the present disclosure; and

[0014] FIG. **6**B is a top view of the coil lifter coupled to the bending machine in accordance with another implementation of the present disclosure.

DETAILED DESCRIPTION

[0015] As described above, the strip of rule or profile fed into the bending machine may be generally prepared in a large roll. However, the large roll of metallic material may be extremely heavy, and multiple operators or heavy machineries are needed to lift the roll up onto a feeding table for feeding the roll into the bending machine. Accordingly, a need exists for easier means for an operator of the bending machine to lift and feed the roll of metallic material into the bending machine.

[0016] Certain implementations of the present disclosure provide for a coil lifter which provides an easier means to move and load the large coil of metallic material. After reading the below descriptions, it will become apparent how to implement the disclosure in various implementations and applications. Although various implementations of the present disclosure will be described herein, it is understood that these implementations are presented by way of example only, and not limitation. As such, the detailed description of various implementations should not be construed to limit the scope or breadth of the present disclosure.

[0017] FIG. **1** shows one example of a coil lifter **100** coupled to a bending machine **110** in accordance with one implementation of the present disclosure. In one implementation, the coil lifter **100** includes a rack **102** with multiple slots pre-filled with coils of various sizes, where a coil (which fits the coupled bending machine **110**) is selected from the coils in the multiple slots.

[0018] In the illustrated implementation of FIG. **1**, the coil lifter **100** includes at least two attached racks **102**, **104**, wherein a first rack **102** includes multiple slots to house coils/rolls of multiple different sizes in a vertical configuration. In one implementation, a particular coil is selected from the multiple slots of the first rack **102** and is transferred over to a second rack **104** with a vertically movable slot **106**. In other implementations, a first rack includes multiple slots

arranged in a horizontal configuration and a second rack is arranged with a horizontally movable slot.

[0019] In one implementation, once the movable slot **106** of the second rack **104** is appropriately positioned (e.g., in a longitudinal axis **112** with a feeding axis of the bending machine), the selected coil (of rule or profile) is fed into the bending machine **110**.

[0020] FIG. **2** shows a side view of the coil lifter **100** in accordance with one implementation of the present disclosure. In the illustrated implementation of FIG. **2**, the coil lifter **100** includes two racks **102**, **104**. As described above, the first rack **102** includes multiple slots (e.g., slot #**1** through slot #**6**), while the second rack **104** includes a movable slot **106** which can be moved vertically to receive and load coils of different sizes into the multiple slots of the first rack **102**. In one implementation, the coil lifter **100** includes a plurality of wheels **200** for ease of transportation of the coil lifter **100**.

[0021] In one implementation, the movable slot **106** of the second rack **104** is moved up and down in a vertical direction **202**. Further, the movable slot **106** also includes at least one slider **210** to slide the coil (e.g., received coil or selected coil) into and out of the slots in the first rack **102** in a horizontal direction **204**.

[0022] FIG. **3** shows a closeup side view of the slider **210** in accordance with one implementation of the present disclosure. In the illustrated implementation of FIG. **3**, the slider **210** includes at least one sliding plate **300** (preferably two or more) used to transfer the received coil **310** onto a slot in one of the multiple slots in the first rack **102**. In one implementation, each plate of the at least one sliding plate **300** includes at least one sliding wheel **320**, which enables each plate to slide on top of each other. In another implementation, each plate of the least one sliding plate **300** includes a mechanism or stopper (e.g., **330**) to prevent other plate(s) contacting each plate from sliding out of contact. The received coil **310** is placed on a top plate of the at least one sliding plate **300**.

[0023] FIGS. **4**A through **4**D show a process of loading the coils **410**, **412**, **414** onto the slots of a first rack **402** of a coil lifter **400** in accordance with one implementation of the present disclosure.

[0024] FIG. **4**A shows the coils **410**, **412** already loaded onto the slots of the first rack **402**, while the coil **414** is received on a movable slot **406** of a second rack **404**. In one implementation, the coil **414** is placed onto the movable slot **406** by various means such as a forklift. Once the coil **414** is placed on the movable slot **406**, the slot **406** (which includes a slider **422**) is vertically moved up to place the coil **414** onto a selected slot (e.g., slot **420**).

[0025] FIG. **4**B shows the coil **414** being placed on the selected slot **420** by moving the slot **406** vertically up (as shown by arrow **408**) so that top of a slider **422** is flush with the bottom surface of the slot **420**. Once the top of the slider **422** is flush with the bottom surface of the slot **420**, the coil **414** is moved horizontally (as shown by arrow **424**) onto the selected slot **420**. In one implementation, the coil **414** is moved onto the selected slot **420** by moving the rollers **426** of the slider **422** clockwise. In another implementation, the coil **414** is pushed into the selected slot **420** using a pushing means (e.g., a hydraulic pump) with the rollers **426** moving due to the push force of the coil **414**.

[0026] FIG. **4**C shows the coil **414** placed on the selected slot **420** with the rollers **422** retracted and the movable slot **406** prepared to be moved vertically (as shown by arrow **428**).

[0027] FIG. **4**D shows the coils **410**, **412**, **414** placed on the slots of the first rack **402** and the movable slot **406** of the second rack **404** ready to receive additional coils.

[0028] FIGS. **5**A through **5**C show a process of unloading a coil **514** from a selected slot (e.g., slot **520**) of a first rack **502** of a coil lifter **500** and feeding the coil **514** into a bending machine in accordance with one implementation of the present disclosure.

[0029] FIG. **5**A shows the coil **514** being moved horizontally (as shown by arrow **524**) out of the selected slot **520** and onto a slider **522** of a movable slot **506** so that the coil **514** can be placed in a proper position to be fed into a bending machine. In one implementation, the coil **514** is moved onto the slider **522** of the movable slot **506** by moving the rollers **526** of the slider **522** counter-clockwise. In some implementations, the coil **514** is also initially pushed onto the slider **522** of the movable slot **506** using a pushing means (e.g., an electronically-controlled spring **530**).

[0030] FIG. **5**B shows the coil **514** placed on the slider **522** of the movable slot **506** after being moved out of the selected slot **520**. Once the coil **514** is placed on the slider **522**, plates of the slider **522** are retracted and the movable slot **506** is prepared for a vertical movement.

[0031] FIG. **5**C shows the movable slot **506** being moved down **528** (or up) to properly position the coil **514** so that when the coil **514** is unspooled, the unspooled end of the coil **514** correctly inserts and fits into bending mechanisms **542** (e.g., bending fingers, pullers, etc.) of the bending machine **540**. In one implementation, the coil lifter **500** also includes a processor and a memory **550** for calculating and storing the position (e.g., vertical height **544**) of the movable slot **506** that provides correct insertion/fitting is known to the coil lifter **500**.

[0032] FIG. **6**A is a top view of a coil lifter **600** coupled to a bending machine **620** in accordance with one implementation of the present disclosure. The illustrated implementation of FIG. **6**A shows a selected coil **610** feeding an unspooled end **630** into the bending machine **620**. In this implementation, the coil **610** is being unspooled in a counter-clockwise direction.

[0033] FIG. **6**B is a top view of the coil lifter **600** coupled to the bending machine **620** in accordance with another implementation of the present disclosure. The illustrated implementation of FIG. **6**B shows the selected coil **610** feeding the unspooled end **630** into the bending machine **620**. In this implementation, the coil **610** is being unspooled in a clockwise direction.

[0034] In a particular implementation, a coil lifter is disclosed. The coil lifter includes: a first rack including multiple slots configured to house metallic coils of various sizes, wherein a coil of a desired size is selected from the metallic coils in the multiple slots of the first rack; and a second rack coupled to the first rack and a bending machine for bending rules or profiles, the second rack including at least one movable slot to transfer the selected coil from the first rack to the at least one movable slot of the second rack, wherein an unspooled end of the selected coil is fed into the

bending machine once the at least one movable slot of the second rack is appropriately positioned with respect to the bending machine.

[0035] In one implementation, the multiple slots of the first rack are stacked vertically. In one implementation, the at least one movable slot of the second rack includes at least one vertically movable slot. In one implementation, the multiple slots of the first rack are arranged in a horizontal configuration and the second rack includes at least one horizontally movable slot. In one implementation, the at least one movable slot of the second rack being appropriately positioned with respect to the bending machine includes said at least one movable slot of the second rack being in a longitudinal axis with a feeding axis of the bending machine. In one implementation, the first rack and the second rack include a plurality of wheels. In one implementation, the at least one movable slot of the second rack includes at least one sliding plate to transfer the selected coil into and out of the multiple slots in the first rack. In one implementation, each plate of the at least one sliding plate includes a mechanism or stopper to prevent other plates contacting each plate from sliding out of contact. In one implementation, each plate of the at least one sliding plate includes at least one sliding wheel. In one implementation, at least one slot of the multiple slots of the first rack includes a pushing means to push the selected coil onto the at least one sliding plate of the at least one movable slot. In one implementation, the coil lifter further includes a processor and a memory to calculate and store a position of the at least one movable slot of the second rack when the at least one movable slot is appropriately positioned with respect to the bending machine.

[0036] In another implementation, a coil lifter is disclosed. The coil lifter includes: a first rack including multiple slots configured to house metallic coils of various sizes; and a second rack coupled to the first rack, the second rack including at least one movable slot to receive a metallic coil loaded onto the at least one movable slot, wherein the loaded metallic coil is transferred to a selected slot of the multiple slots using at least one sliding plate to move the loaded metallic coil to the second rack.

[0037] In one implementation, the multiple slots of the first rack are stacked vertically. In one implementation, the at least one movable slot of the second rack includes at least one vertically movable slot. In one implementation, the coil lifter further includes a hydraulic pump configured to vertically move the at least one vertically movable slot. In one implementation, the multiple slots of the first rack are arranged in a horizontal configuration and the second rack includes at least one horizontally movable slot. In one implementation, each plate of the at least one sliding plate includes a mechanism or stopper to prevent other plates contacting each plate from sliding out of contact. In one implementation, each plate of the at least one sliding plate includes at least one sliding wheel. In one implementation, the coil lifter further includes a processor to determine the selected slot from the multiple slots of the first rack to transfer the loaded metallic coil from the second rack. In one implementation, the processor calculates a position of the at least one movable slot of the second rack when the at least one movable slot is positioned to transfer the metallic coil to the selected slot.

[0038] The description herein of the disclosed implementations is provided to enable any person skilled in the art to make or use the present disclosure. Numerous modifications to these implementations would be readily apparent to those skilled in the art, and the principles defined herein may be applied to other implementations without departing from the spirit or scope of the present disclosure. Thus, the present disclosure is not intended to be limited to the implementations shown herein but is to be accorded the widest scope consistent with the principal and novel features disclosed herein. Accordingly, additional variations and implementations are also possible.

[0039] All features of each of the above-discussed examples are not necessarily required in a particular implementation of the present disclosure. Further, it is to be understood that the description and drawings presented herein are representative of the subject matter which is broadly contemplated by the present disclosure. It is further understood that the scope of the present disclosure fully encompasses other implementations that may become obvious to those skilled in the art and that the scope of the present disclosure is accordingly limited by nothing other than the appended claims.

1. A coil lifter comprising:
- a first rack including multiple slots configured to house metallic coils of various sizes,
- wherein a coil of a desired size is selected from the metallic coils in the multiple slots of the first rack; and
- a second rack coupled to the first rack and a bending machine for bending rules or profiles,
- the second rack including at least one movable slot to transfer the selected coil from the first rack to the at least one movable slot of the second rack,
- wherein an unspooled end of the selected coil is fed into the bending machine once the at least one movable slot of the second rack is appropriately positioned with respect to the bending machine.

2. The coil lifer of claim **1**, wherein the multiple slots of the first rack are stacked vertically.

3. The coil lifter of claim **1**, wherein the at least one movable slot of the second rack includes at least one vertically movable slot.

4. The coil lifter of claim **1**, wherein the multiple slots of the first rack are arranged in a horizontal configuration and the second rack includes at least one horizontally movable slot.

5. The coil lifter of claim **1**, wherein the at least one movable slot of the second rack being appropriately positioned with respect to the bending machine includes
- said at least one movable slot of the second rack being in a longitudinal axis with a feeding axis of the bending machine.

6. The coil lifter of claim **1**, wherein the first rack and the second rack include a plurality of wheels.

7. The coil lifter of claim **1**, wherein the at least one movable slot of the second rack includes
- at least one sliding plate to transfer the selected coil into and out of the multiple slots in the first rack.

8. The coil lifter of claim **7**, wherein each plate of the at least one sliding plate includes a mechanism or stopper to prevent other plates contacting each plate from sliding out of contact.

9. The coil lifter of claim **7**, wherein each plate of the at least one sliding plate includes at least one sliding wheel.

10. The coil lifter of claim **7**, wherein at least one slot of the multiple slots of the first rack includes

a pushing means to push the selected coil onto the at least one sliding plate of the at least one movable slot.

11. The coil lifter of claim **1**, further comprising

a processor and a memory to calculate and store a position of the at least one movable slot of the second rack when the at least one movable slot is appropriately positioned with respect to the bending machine.

12. A coil lifter comprising:

a first rack including multiple slots configured to house metallic coils of various sizes; and

a second rack coupled to the first rack,

the second rack including at least one movable slot to receive a metallic coil loaded onto the at least one movable slot,

wherein the loaded metallic coil is transferred to a selected slot of the multiple slots using at least one sliding plate to move the loaded metallic coil to the second rack.

13. The coil lifer of claim **12**, wherein the multiple slots of the first rack are stacked vertically.

14. The coil lifter of claim **12**, wherein the at least one movable slot of the second rack includes at least one vertically movable slot.

15. The coil lifter of claim **14**, further comprising

a hydraulic pump configured to vertically move the at least one vertically movable slot.

16. The coil lifter of claim **12**, wherein the multiple slots of the first rack are arranged in a horizontal configuration and the second rack includes at least one horizontally movable slot.

17. The coil lifter of claim **12**, wherein each plate of the at least one sliding plate includes a mechanism or stopper to prevent other plates contacting each plate from sliding out of contact.

18. The coil lifter of claim **12**, wherein each plate of the at least one sliding plate includes at least one sliding wheel.

19. The coil lifter of claim **12**, further comprising

a processor to determine the selected slot from the multiple slots of the first rack to transfer the loaded metallic coil from the second rack.

20. The coil lifter of claim **12**, wherein the processor

calculates a position of the at least one movable slot of the second rack when the at least one movable slot is positioned to transfer the metallic coil to the selected slot.

* * * * *