ROOF SHEET ROLLER AND ROLLER SYSTEM

TECHNICAL FIELD

[0001] The present disclosure relates to roofing tools, and in particular, although not exclusively, to roofing rollers, for moving sheets of roofing on a roof for installation.

BACKGROUND ART

[0002] In commercial construction, a common form of roof installation is metal sheeting installed onto purlins (e.g. Z-purlins or C-purlins). In such case, metal sheets are lifted into position onto the purlins, and secured into place, e.g. using screws.

[0003] Traditionally, cranes have been used to lift the metal sheets into place, upon which they are secured. This process is repeated until the entire roof is installed.

[0004] A problem with such roof installation is that it is quite costly. As an illustrative example, crane time is high in such installations, and crane time is very expensive, particularly for cranes that are able to position sheets on a large building.

[0005] Several attempts have been made to enable roofing to be installed while minimising crane time and/or minimising the requirements of the crane. This has included lifting metal sheets onto an edge of the roof and distributing the sheets on the roof manually.

[0006] It is not, however, practical to use small sheets on large buildings, and as such, the sheets are heavy. This requires the use of trolleys or similar to move the sheets around the roof. A problem with trolleys of the prior art is that they are dangerous in roofing scenarios. In particular, sheeting may slide off the trolleys and cause injury to workers, and/or damage to the building.

[0007] Another problem with trolleys to move sheets is that it is difficult to remove sheets from the trolley when at a desired location. In short, either the sheets, which are heavy, must be lifted from the trolleys, or the trolleys must be tilted to enable the sheets to slide off. Tilting the trolleys with heavy sheets thereon is difficult, and may result in back injury.

[0008] As such, there is clearly a need for improved roofing tools, and in particular roofing tools that are easy and safe to use.

[0009] It will be clearly understood that, if a prior art publication is referred to herein, this reference does not constitute an admission that the publication forms part of the common general knowledge in the art in Australia or in any other country.

SUMMARY

[0010] The present disclosure relates to roof sheet rollers, which may at least partially overcome at least one of the abovementioned disadvantages or provide the consumer with a useful or commercial choice.

[0011] With the foregoing in view, the present disclosure in one form, resides broadly in a roof sheet roller comprising:

a body;

one or more rollers, coupled to the body, configured to roll the roof sheet roller on a support surface, such as a purlin; and

an elongate support surface associated with the body, on which a plurality of roof sheets may be laterally positioned;

wherein the elongate support surface is tiltable relative to the body, to assist in sliding the roof sheets from the elongate support surface.

[0012] Advantageously, the roof sheet rollers allow large roof sheets to be transported, e.g. on a roof, in a safe and reliable manner. In particular, the elongate support surface enables roof sheets to be laterally positioned such that they extend between adjacent like roof sheet rollers, which enables large sheets to be transported. The sheets may comprise structural steel sheets installed over the top of safety wire. The ability for the elongate support surface to tilt relative to the body, assists in sliding the roof sheets from the elongate support surface, thereby alleviating the need for the roof sheets to be manually lifted.

[0013] Preferably, the roof sheet roller includes an actuator, configured to tilt the elongate support surface relative to the body.

[0014] The actuator may be any suitable type of actuator. The actuator may comprise a linear actuator. The linear actuator may comprise a ram. The actuator may be a scissor actuator.

[0015] The actuator may be hydraulically driven. The actuator may comprise a hydraulic ram. The roof sheet roller may include a hydraulic pump, configured to drive the actuator. The hydraulic pump may be associated with a lever, configured to manually operate the pump. The lever may be configured to be driven by a user’s foot.

[0016] The actuator may be electrically driven. The actuator may include a motor.

[0017] The actuator may be mechanically driven.

[0018] The actuator may include or be associated with levers, cams, screws, gears, ratchets or the like.

[0019] The actuator may be associated with one or more arms, configured to lift the elongate support surface.

[0020] The elongate support surface may be coupled to the body by a hinge. The hinge may be located at a front end of the body. The hinge may include a pin. The pin may extend across a width of the elongate support surface.

[0021] The elongate support surface may include a retainer at a first end thereof.

[0022] The roof sheet roller may include a handle, extending upwardly and outwardly from the body.

[0023] Preferably, the one or more rollers are configured to support the roof sheet roller from below.

[0024] Preferably, the one or more rollers comprise a plurality of rollers.

[0025] Preferably, the one or more rollers each extend across a width of the body. Preferably, each of the rollers is configured to rotate around an axis perpendicular to a length of the elongate support surface.

[0026] Preferably, the one or more rollers comprise two rollers. The two rollers may be positioned at or near the first and second ends of the body.

[0027] Preferably, each of the one or more rollers comprises a cylindrical body, with flanges on opposing sides thereof.

[0028] The flanges may be radial flanges. The flanges may lie in planes perpendicular to an axis of the roller.

[0029] Preferably, each of the rollers is substantially spool or reel shaped.

[0030] Preferably, the flanges are configured to guide the rollers along a purlin on a roof. A spacing of the flanges may correspond approximately to a width of a purlin.

[0031] Preferably, the roof sheet roller comprises a brake.

[0032] The brake may be configured to brake at least one of the one or more rollers.

[0033] The brake may be automatically activated when the elongate support surface is tilted.

[0034] Alternatively or additionally, the brake may be selectively engageable by a user, e.g. using a handle or similar. Such configuration enables the user to lock the roof sheet roller at a desired location.

[0035] The one or more rollers may comprise a plurality of rollers, wherein the brake is configured to brake the plurality of rollers. Such configuration may assist in preventing movement of the roof sheet roller when the elongate support surface is tilted.

[0036] The brake may include a locking pin. The brake may be biased in a locked position.

[0037] The brake may be coupled to a lever. The lever may be associated with the handle. The lever may be provided at or adjacent to an upper end of the handle. The ability to lock the brake from the handle is beneficial when the roof sheet roller is loaded, as access to the rollers may be difficult.

[0038] Preferably, the rollers comprise locking portions, with which a corresponding locking portion of or associated with the body may engage to lock the rollers. The locking portion may comprise a locking pin. The locking portions may lock the rollers, and thus prevent the roller from rolling, much like a brake on the wheels of a vehicle.

[0039] Preferably, the rollers include apertures spaced around a periphery thereof, with which a locking member of the body may engage to prevent rotation of the roller.

[0040] Preferably, the rollers each comprise a metal core, with a polyurethane outer shell.

[0041] Preferably, the retainer comprises a retaining member. Preferably, the retaining member extends across a width of the body.

[0042] Preferably, the retaining member comprises a sloped member extending upwardly from an end of the support surface. The sloped member may be configured to allow the roof sheets to slide off from the support surface when the support surface is tilted, while retaining the roof sheets when the support surface is not tilted.

[0043] Preferably, the retaining member comprises an upwardly extending planar portion, followed by a downwardly extending planar portion.

[0044] The retaining member may also function as a handle.

[0045] Preferably, the retaining member extends about 20-40 mm above the support surface. Preferably, the retaining member extends upwardly at an angle of around 20 degrees relative to the support surface.

[0046] Preferably, the support surface includes at least one top roller. The at least one top roller may be configured to assist in rolling the plurality of roof sheets from the support surface.

[0047] Preferably, the support surface includes a plurality of top rollers.

[0048] Preferably, the top rollers each extend across a width of the support surface. Preferably, each of the rollers is configured to rotate around an axis perpendicular to a length of the elongate support surface.

[0049] Preferably, each of the top rollers is spaced along a length of the support surface.

[0050] Preferably, each of the top rollers is substantially cylindrical in shape.

[0051] The retainer may comprise a sloped member sloping upwardly from an end of the support surface, and wherein the at least one top roller is configured to assist the sheets in sliding off from the support surface and over the sloped member when the roof sheet roller is tilted.

[0052] As such, the upwardly sloped retainer may retain the sheets when the sheets are moved around, but allow the sheets to slide off (together with help from the rollers) when tilted, without needing to be reconfigured or removed. This may greatly simplify unloading of the sheets.

[0053] Preferably, the top rollers are about 70 mm in diameter.

[0054] Preferably, the handle comprises first and second elongate portions, extending from either side of the support surface, and a third portion extending between ends of the first and second elongate portions.

[0055] The first, second and third portions may each be substantially linear.

[0056] The third portion may extend across a width of the support surface.

[0057] The handle may comprise an open loop.

[0058] Such configuration generally provides more control than a single arm extending upwardly and outwardly from the body.

[0059] Preferably, the body is about 700-1300 mm long. More preferably, the body is about 1000 mm long.

[0060] Preferably, the body is about 140-200 mm wide. More preferably, the body is about 170 mm wide.

[0061] The support surface may be about 600-1200 mm long. More preferably, the support surface is about 820 mm long.

[0062] A width of the support surface may be substantially the same as a width of the body.

[0063] The first and second ends may be opposing ends.

[0064] Preferably, the body includes a lifting handle on a side thereof.

[0065] Preferably, the roof sheet roller is formed primarily of steel plate. More preferably, the roof sheet roller is formed primarily of about 3-5 mm steel plate.

[0066] Preferably, the roof sheet roller is engineered according to one or more standards or guidelines, such as Australian standards.

[0067] According to another embodiment, the disclosure resides broadly in a roof sheet roller system comprising a plurality of roof sheet rollers, arranged such that a plurality of roof sheets extend across the plurality of roof sheet rollers, such that the plurality of roof sheet rollers together support the plurality of roof sheets.

[0068] Any of the features described herein can be combined in any combination with any one or more of the other features described herein within the scope of the invention.

[0069] The reference to any prior art in this specification is not, and should not be taken as an acknowledgement or any form of suggestion that the prior art forms part of the common general knowledge.

BRIEF DESCRIPTION OF DRAWINGS

[0070] Various embodiments of the invention will be described with reference to the following drawings, in which:

[0071] Figure 1 illustrates an upper perspective view of a roof sheet roller, according to an embodiment of the present invention;

[0072] Figure 2 illustrates a side view of the roof sheet roller of Figure 1, according to an

embodiment of the present invention.

[0073] Figure 3 illustrates a top view of the roof sheet roller of Figure 1, according to an embodiment of the present invention.

[0074] Figure 4 illustrates a rear view of the roof sheet roller of Figure 1, according to an embodiment of the present invention.

[0075] Figure 5 illustrates a perspective view of a roller of the roof sheet roller of Figure 1, according to an embodiment of the present invention.

[0076] Figure 6 illustrates a side view of the roof sheet roller of Figure 1 in an unloading configuration, according to an embodiment of the present invention.

[0077] Figure 7 illustrates a side view of the roof sheet roller of Figure 1 in the unloading configuration, with dashed lines illustrating internal components of the roof sheet roller, according to an embodiment of the present invention

[0078] Exemplary features, embodiments and variations of the invention may be discerned from the following Detailed Description which provides sufficient information for those skilled in the art to perform the invention. The Detailed Description is not to be regarded as limiting the scope of the preceding Summary of the Invention in any way.

DESCRIPTION OF EMBODIMENTS

[0079] Embodiments of roof sheet rollers and roof sheet roller systems are described below that allow large roof sheets to be transported, e.g. on a roof, in a safe and ergonomic manner. In particular, the elongate support surface enables roof sheets to be laterally positioned such that they extend between adjacent like roof sheet rollers, which enables large sheets to be transported. The actuator assists in removal of the roof sheets at a desired location.

[0080] Figure 1 illustrates an upper perspective view of a roof sheet roller 100, according to an embodiment of the present invention. Figure 2 illustrates a side view, Figure 3 illustrates a top view, and Figure 4 illustrates a rear view of the roof sheet roller 100, according to an embodiment of the present invention. Figures 1-4 illustrate the roof sheet roller 100 in a loading and transport configuration.

[0081] The roof sheet roller 100 includes a body 105 and an elongate support surface 110. The elongate support surface 110 is hingedly coupled to the body 105 at a front end thereof, and is configured to receive and support a plurality of roof sheets (not shown). The plurality of

roof sheets are generally sheet metal roof sheets that are stacked as a group, and are laterally positioned, such that they extend outwardly from the sides of the support surface 110.

[0082] The elongate support surface 110 includes a retainer in the form of a sloped retaining member 115, that extends upwardly from a front end of the support surface 110, and functions to prevent the plurality of roof sheets from sliding forward off the support surface 110 when in the loading and transport configuration. The sloped retaining member 115 also functions to allow the sheets to slide from the support surface 110, when the roof sheet roller 100 is in a tilted (unloading) configuration, as outlined below.

[0083] A handle 120 extends upwardly and outwardly from a rear end of the body 105, and is for moving the roof sheet roller 100. In particular, a worker will use the handle 120 to push/move the roof sheet roller 100 on a roof. The handle 120 comprises first and second elongate portions 120a, extending from either side of the support surface, and a third portion 120b extending between ends of the first and second elongate portions.

[0084] The first and second portions 120a and the third portion 120b are each substantially linear, and the handle 120 comprises an open loop therebetween. Such configuration provides more control than a single arm extending upwardly and outwardly from the body 105.

[0085] The handle 120, and the third portion 120b, extend across a width of the support surface 110. This provides a handle 120 that is wide, and therefore ergonomic, without being unnecessary bulky.

[0086] In the loading and transport configuration, the elongate support surface 110 is bound by the sloped retaining member 115 at the front end of the roof sheet roller 100, and by the handle 120 at the rear end of the roller. This ensures that the plurality of roof sheets positioned on the support surface 110 do not slide off from the support surface 110 forward or backward when in the loading and transport configuration. This simplifies the process of moving the sheets, and increases safety.

[0087] As outlined in further detail below, the support surface 110 is tiltable relative to the body 105. By providing a sloped retaining member 115 in such manner enables the plurality of roof sheets to be easily slid from the support surface 110 (forwards) when the support surface 110 is tilted forward in an unloading configuration.

[0088] The roof sheet roller 100 includes first and second rollers 125, coupled to the body 105, and are configured to roll the roof sheet roller 100 on a support surface, such as a purlin. In particular, the rollers 125 rotate relative to the body 105, which enables the support surface

110 to easily move relative to the purlin, without requiring a worker to drag the item or similar.

[0089] The rollers 125 are partially enclosed by the body 105, but extend downward from a lower surface thereof. The rollers 125 each extend across a width of the body 105, and are configured to rotate around an axis perpendicular to a length of the elongate support surface 110. This enables the roof sheet roller 100 to roll back and forth, while preventing the roof sheet roller 100 from moving side to side.

[0090] Figure 5 illustrates a perspective view of a roller 125 of the roof sheet roller 100, according to an embodiment of the present invention.

[0091] The roller 125 comprises a cylindrical body 505, with flanges 510 on opposing sides thereof. The flanges 510 comprise radial flanges, that lie substantially in planes perpendicular to an axis of the roller 125. As a result, the roller 125 is substantially spool or reel shaped.

[0092] The flanges 510 are configured to guide the roller 125 along a purlin on a roof. In particular, purlins are elongate and may have an upper surface having a width of about 100-120 mm. A spacing of the flanges may correspond approximately to, or be slightly larger than, a width of the purlin. As a result, the flanges 510 extend partially down sides of the purlin, and function as guides to prevent the roller 125 from rolling off the purlin.

[0093] The rollers 125 include a metal (aluminium) core 515, with a polyurethane outer shell 520. The outer shell 520 extends across the entire core 515, including the cylindrical body 505.

[0094] The core 515 includes a central aperture 525, which functions as a bearing, around which the roller 125 may rotate. In particular, a pin may extend from the body 105 through the aperture 525 to retain the roller 125 in position.

[0095] The core 515 further includes locking portions in the form of apertures 530, with which a corresponding a locking portion, in the form of a locking pin 130, may engage to lock the rollers 125. In particular, the locking pin 130 is fixed to a side of the body 105, and is configured to extend therefrom into the aperture 530. This prevents the roller 125 from rotating. The locking pin 130 may be spring loaded.

[0096] The apertures 530 are spaced around a periphery of the core 515 (and thereby roller 125). This enables the roller 125 to be locked into position without needing to carefully position the roller 125 relative to the body 105.

[0097] The support surface 110 includes a plurality of top rollers 135, extending upwardly from the surface. The top rollers 135 are spaced along the length of the support surface 110

and function to assist unrolling of roof sheets from the support surface 110 as outlined below.

[0098] Each of the top rollers 135 extends across a width of the support surface 110, and is configured to rotate around an axis perpendicular to a length of the elongate support surface 110. This assists in helping the roof sheets roll on/off the support surface 110 along a direction of its length.

[0099] Each of the top rollers 135 is substantially cylindrical in shape and approximately 70 mm in diameter.

[00100] As outlined above, the elongate support surface 110 is tiltable relative to the body 105, to assist in sliding the roof sheets from the elongate support surface at a desired location, thereby alleviating the need for the roof sheets to be manually lifted, or the entire roof sheet roller to be lifted or tilted.

[00101] Figure 6 illustrates a side view of the roof sheet roller 100 in an unloading configuration, according to an embodiment of the present invention. Figure 7 illustrates a side view of the roof sheet roller 100 in the unloading configuration, with dashed lines illustrating internal components of the roof sheet roller 100, according to an embodiment of the present invention.

[00102] The elongate support surface 110 is coupled to the body 105 by a hinge 605. The hinge 605 may take any suitable form that allows the elongate support surface 110 to pivot or tilt relative to the body 105. As an illustrative example, the hinge 605 may comprise a pin and one or more barrels on each of the elongate support surface 110 and the body 105.

[00103] The roof sheet roller 100 further includes an actuator in the form of a hydraulic ram 610, and an arm 615, associated with the hydraulic ram 610, configured to tilt the elongate support surface 110 relative to the body 105.

[00104] A foot pump 620 is associated with the hydraulic ram 610, wherein the foot pump 620 functions as a lever to force hydraulic fluid into the hydraulic ram 610, causing the ram 610 to expand, thereby pushing the arm 615 and thereby the support surface 110 upwards.

[00105] The foot pump 620 may be associated with a piston, configured to pressurise hydraulic fluid when the foot pump is depressed, the piston associated with a cylinder of the hydraulic ram 610 using non-return (one-way) valves. Repeated depression of the foot pump 620 causes fluid to enter the hydraulic ram 610 under pressure, causing the hydraulic ram 610 to expand.

[00106] As the hydraulic ram 610 expands, it pushes an end of the arm 615, which is coupled to the support surface 110 at an opposite end, which causes the arm to lift, and push a rear end of the support surface 110 upwards, resulting in a tilting action.

[00107] The arm 615 and hydraulic ram 610 may be associated with guides and/or channels, to ensure smooth movement between the loading/transport configurations and the unloading configurations, and to prevent twisting and the like. Similarly, the arm 615 may comprise a pair of arms, coupled to each side of the support surface 110, or any other suitable arrangement.

[00108] The hydraulic ram 610 is further associated with a relief valve (not illustrated), which enables pressure in the hydraulic ram 610 to be released, enabling the support surface 110 to lower.

[00109] While the above example has been illustrated with reference to a hydraulic ram, the skilled addressee will readily appreciate that any suitable type of actuator may be used, including a linear actuator, a scissor actuator, or the like, and may be driven by any suitable means, including hydraulically, electrically or mechanically driven.

[00110] While not illustrated, the hydraulic ram 610 may be associated with a brake, to prevent the rollers 125 from moving while the support surface 110 is tilted. Hydraulic pressure may be used to press a brake disc or similar element against each of the rollers 125, thereby using friction to prevent movement of the rollers 125 relative to the body 105. The skilled addressee will, however, readily appreciate that any suitable way of locking or braking the rollers 125 may be used.

[00111] Finally, the body 105 includes a side handle 140, extending from a side of the body 105. The side handle 140 is useful when the roof sheet roller 100 is transported, etc, as it enables a worker to lift or manipulate the roof sheet roller 100 in an area close to its centre of mass. The sloped retaining member 115 may similarly function as a handle, e.g. though an opening associated therewith. The skilled addressee will, however, readily appreciate that any suitable arrangement of handles, anchor points or the like may be used.

[00112] In use, a plurality of roof sheet rollers 100 are lifted onto a roof portion of a building where roofing is to be installed. The roof sheet rollers 100 are positioned in a line on purlins, near an edge of the building, and in a direction away from the edge of the building.

[00113] A plurality of stacked roof sheets are then lifted onto the roof portion, e.g. by a crane, and placed across the support surfaces 110 of the roof sheet rollers 100 such that they extend across and between the support surfaces 110 of the rollers.

[00114] Workers may then push the sheet rollers 100 to move the sheets into position. This is done using the handle 120, which enables the workers to get their weight behind the sheet rollers 100.

[00115] When in position, the workers may depress the foot pump 620, causing the hydraulic ram to expand, thereby tilting the support surface 110. This then causes the roof sheets to roll/slide from the support surface 110, over the sloped retaining member 115 and onto the purlins. The roof sheets may then be installed, as it known in the art.

[00116] The sloped retaining member 115 extends about 20-40 mm above the support surface and at an angle of around 20 degrees relative to the support surface. Such configuration is useful in that it prevents the sheets from sliding off from the support surface 110 when the sheet rollers are pushed (in the transport configuration), but also does not significantly inhibit unloading of the sheets when the support surface 110 is tilted forwards (in the unloading configuration).

[00117] The roof sheet roller is formed primarily of steel plate (e.g. 3-5 mm) that is welded together. In particular, the sides of the body 105, the support surface 110 and the sloped retaining member 115 are all formed of steel plate.

[00118] The body 105 may have any suitable size, but is generally about 700-1300 mm long (preferably about 1000 mm long), and about 140-200 mm wide (preferably about 170 mm wide).

[00119] Similarly, the support surface may have any suitable size, but is generally about 600-1200 mm long (preferably about 820 mm long) and about the same width as the body (i.e. it extends across an entire front surface of the body).

[00120] While a locking pin is used on the above embodiments, any sort of braking mechanism may be used, including a friction based locking mechanism, e.g. similar to a drum or disc brake.

[00121] Similarly, the handle 120 may be hingedly attached to the body 105 using a lockable hinge, which enables the handle 120 to fold down over the elongate support surface 110, and thus provides a compact configuration of the roof sheet roller 100 for transportation.

[00122] Advantageously, the roof sheet rollers allow large roof sheets to be transported, e.g. on a roof, in a safe and reliable manner. In particular, the elongate support surface enables roof sheets to be laterally positioned such that they extend between adjacent like roof sheet rollers, which enables large sheets to be transported. The handle and retaining member at the first and second ends prevent the roof sheets from sliding forward or backwards.

[00123] The hydraulic ram (or actuator) enables the roof sheets to be easily delivered to a desired location, without requiring a worker to manually lift the sheets or manually tilt the roof roller, which may otherwise cause injury to the worker. As a result, the roof sheet rollers are safe and ergonomic to use.

[00124] Any of the features described herein can be combined in any combination with any one or more of the other features described herein within the scope of the invention.

[00125] In the present specification and claims (if any), the word ‘comprising’ and its derivatives including ‘comprises’ and ‘comprise’ include each of the stated integers but does not exclude the inclusion of one or more further integers.

[00126] Reference throughout this specification to ‘one embodiment’ or ‘an embodiment’ means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present disclosure. Thus, the appearance of the phrases ‘in one embodiment’ or ‘in an embodiment’ in various places throughout this specification are not necessarily all referring to the same embodiment. Furthermore, the particular features, structures, or characteristics may be combined in any suitable manner in one or more combinations.

[00127] In compliance with the statute, the disclosure has been described in language more or less specific to structural or methodical features. It is to be understood that the disclosure is not limited to specific features shown or described since the means herein described comprises preferred forms of putting the disclosure into effect. The disclosure is, therefore, claimed in any of its forms or modifications within the proper scope of the appended claims (if any) appropriately interpreted by those skilled in the art.

CLAIMS

1. A roof sheet roller comprising:

a body;

one or more rollers, coupled to the body, configured to roll the roof sheet roller on a support surface, such as a purlin,

an elongate support surface associated with the body, on which a plurality of roof sheets may be laterally positioned;

wherein the elongate support surface is tiltable relative to the body, to assist in sliding the roof sheets from the elongate support surface.

ABSTRACT

A roof sheet roller is provided that allows large roof sheets to be transported on a roof in a safe and reliable manner. The roof sheet roller comprises: a body; one or more rollers, coupled to the body, configured to roll the roof sheet roller on a support surface, such as a purlin; and an elongate support surface associated with the body, on which a plurality of roof sheets may be laterally positioned. The elongate support surface is tiltable relative to the body, to assist in sliding the roof sheets from the elongate support surface.

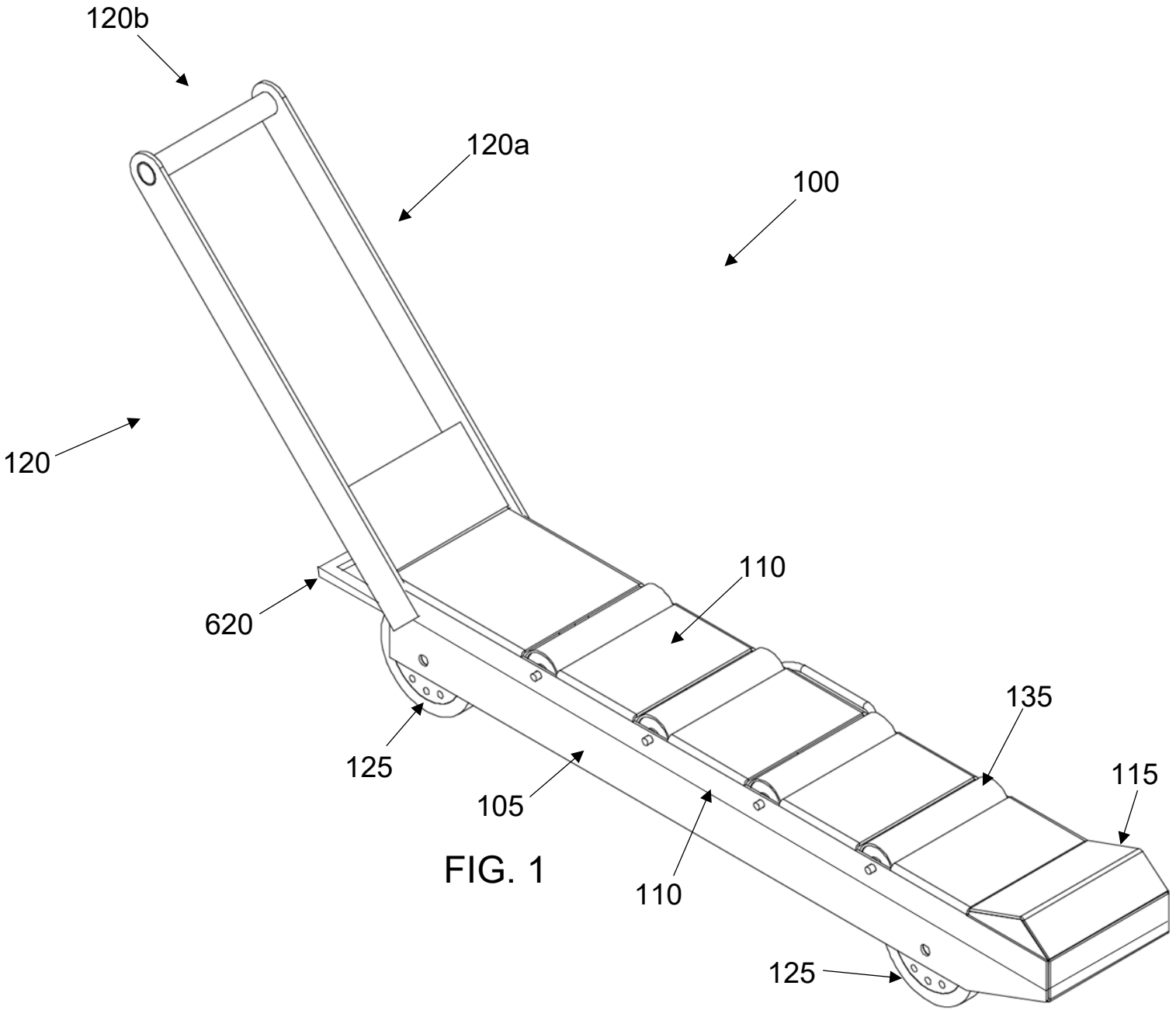

FIG. 1

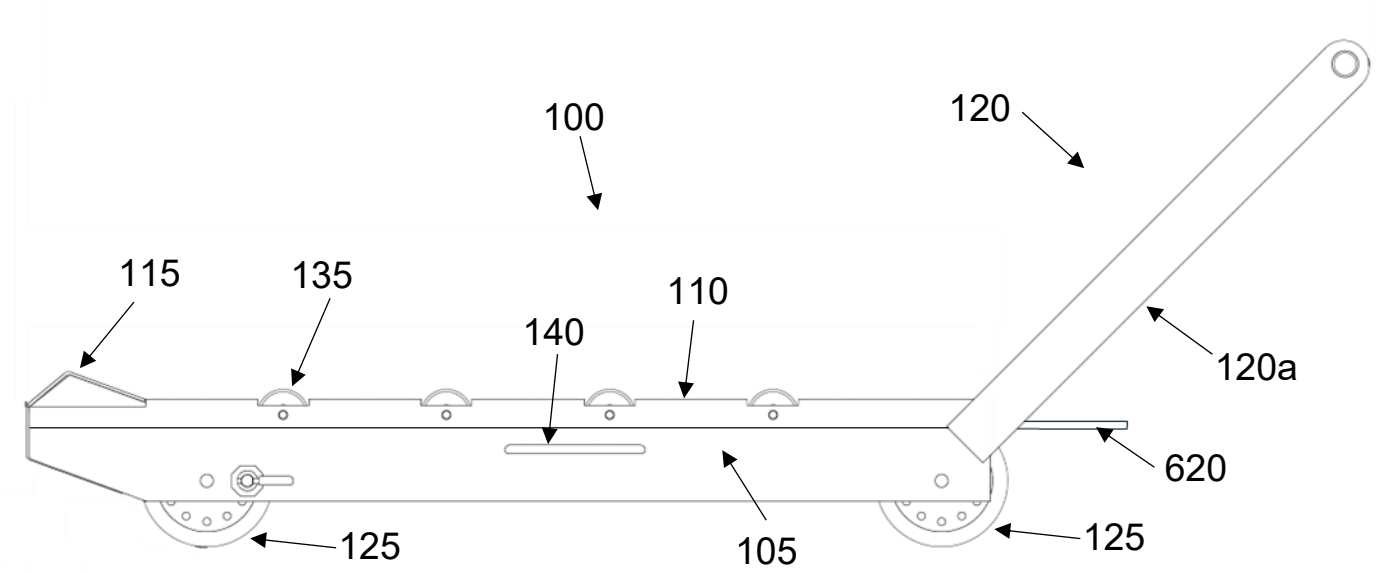
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FIG. 2

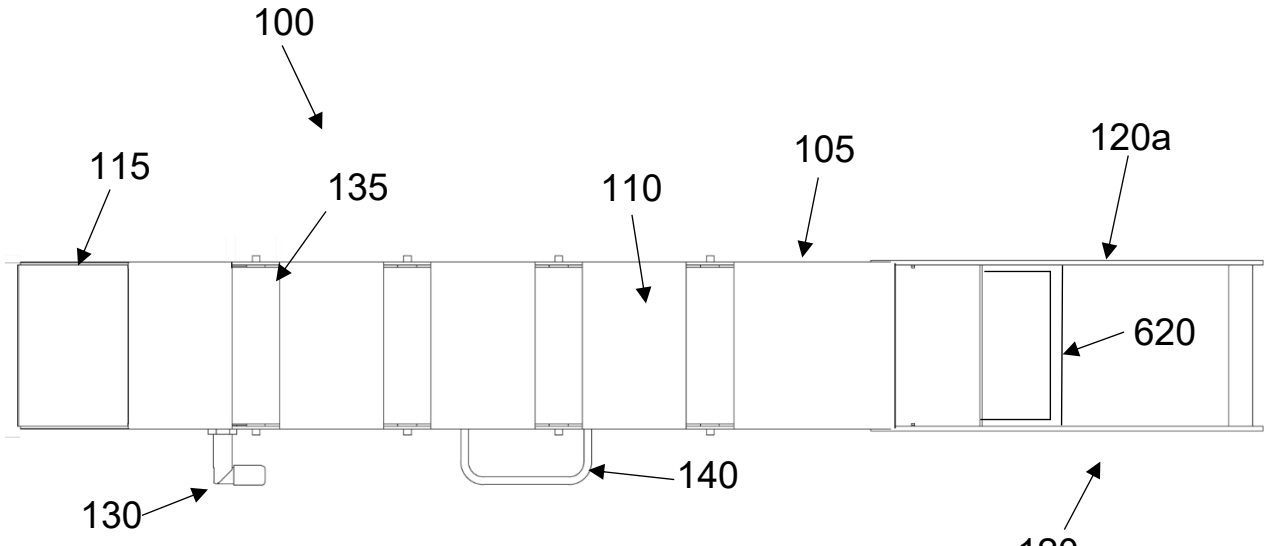
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FIG. 3

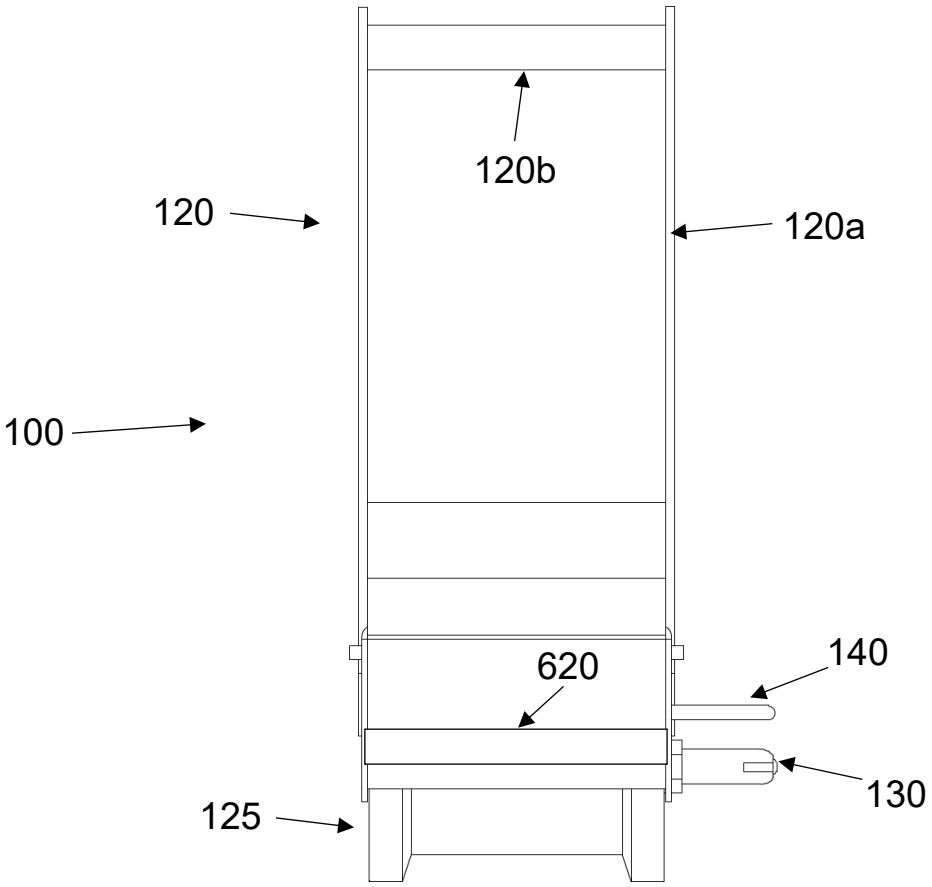
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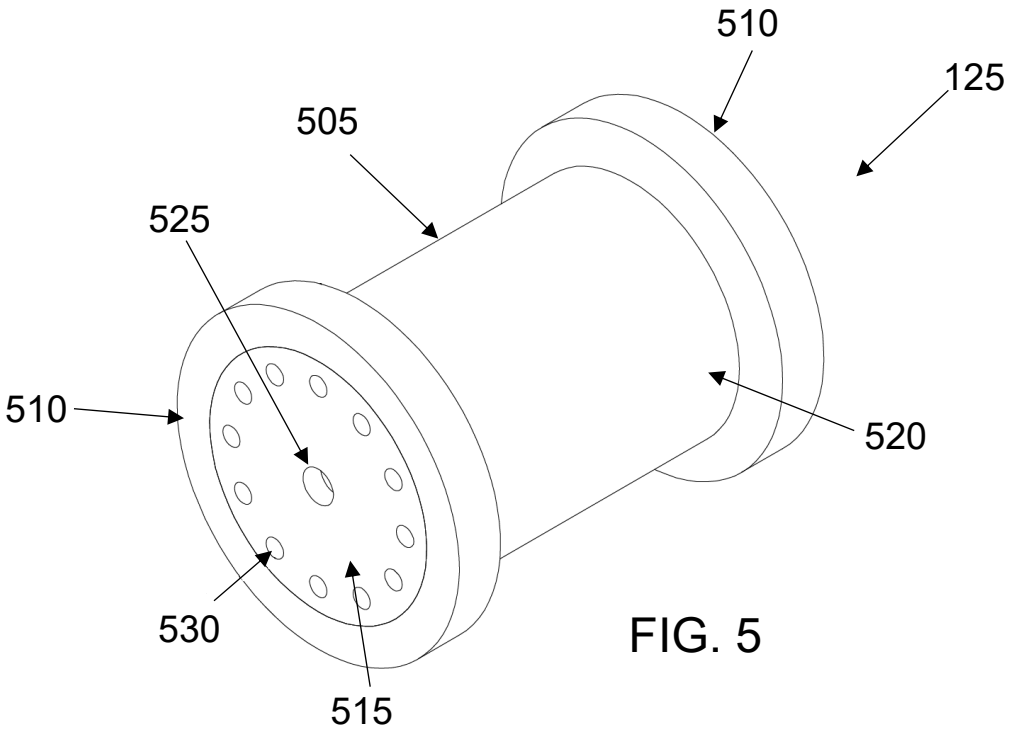
FIG. 4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515

FIG. 5

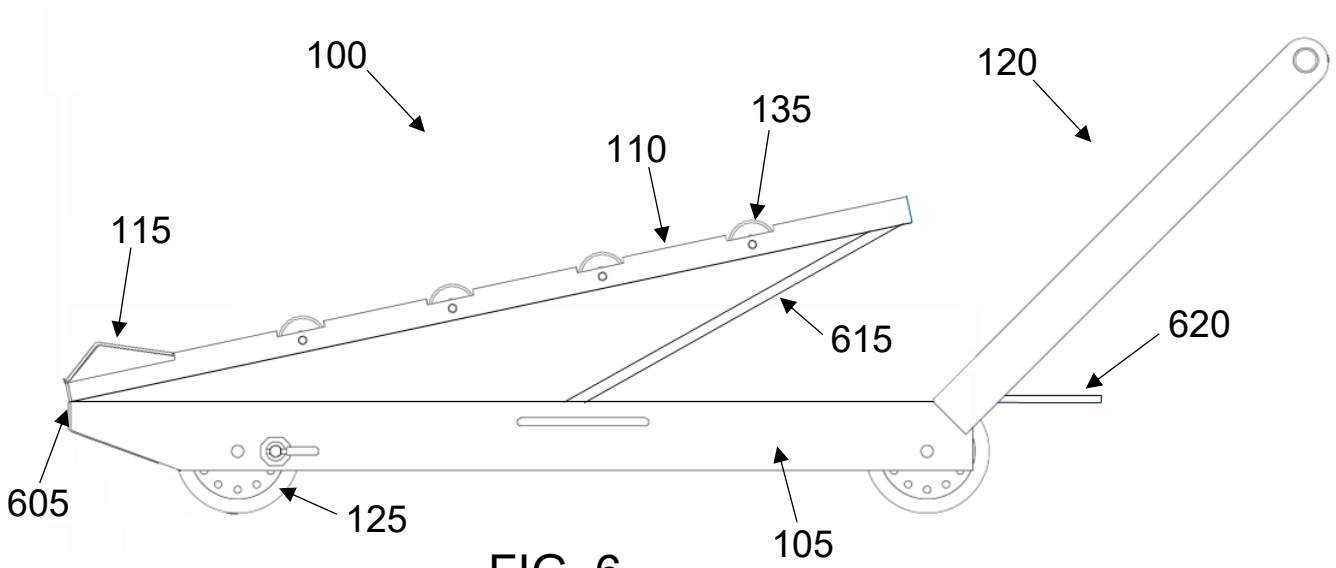
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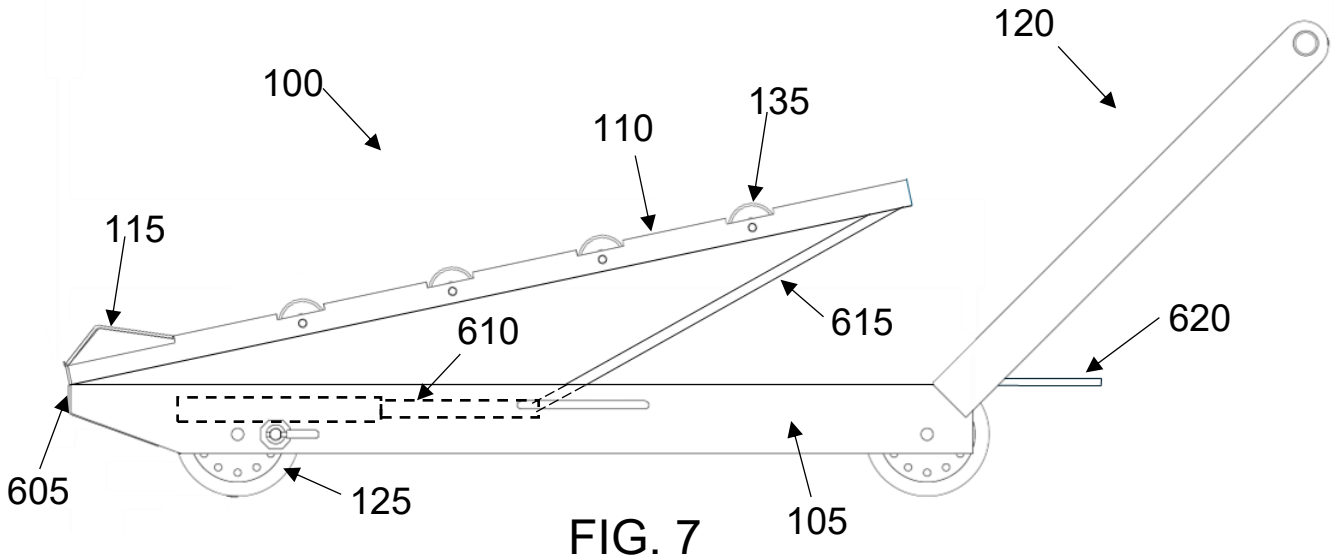
FIG. 6


120
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610
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125
105

FIG. 7