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Bechen

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(54) **APPARATUS, SYSTEM, AND METHOD FOR PRODUCING AND POSITIONING MULTI-TIRE STRUCTURAL FEATURES**

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(51) **Int. Cl.**

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B27F 7/19	(2006.01)
B27F 7/30	(2006.01)
B66C 1/42	(2006.01)

(52) **U.S. Cl.**
CPC ***B27F 7/003*** (2013.01); ***B27F 7/19*** (2013.01); ***B27F 7/30*** (2013.01); *B66C 1/42* (2013.01)

(58) **Field of Classification Search**
CPC B27F 7/30; B27F 7/19; B27F 7/003; B65B 11/02; B65B 51/05
See application file for complete search history.

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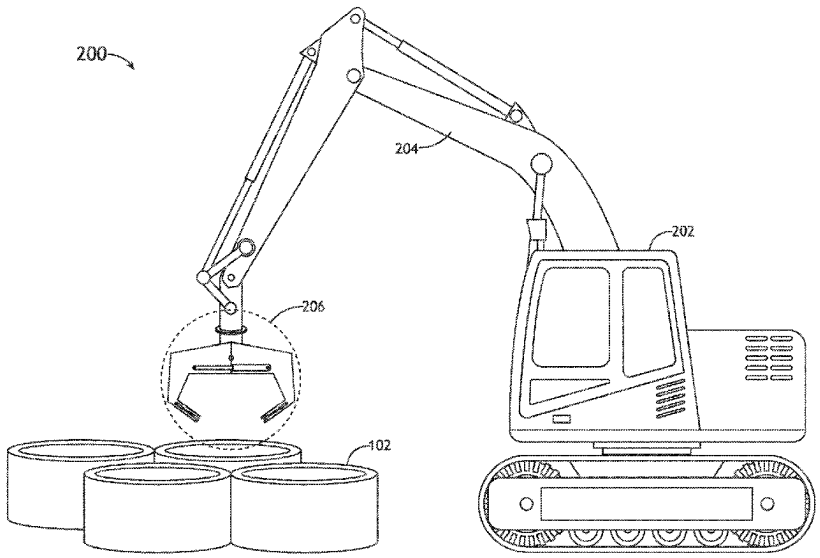
Primary Examiner — Daniel Jeremy Leeds

(57) **ABSTRACT**

A system for producing and positioning multi-tire structural features is disclosed. The system includes a construction vehicle, an actuatable arm extending from the construction vehicle, and a grasper coupled to a distal end of the actuatable arm. The gasper includes a first moving member and a second moving member that are configured to be actuated toward one another when the first moving member is disposed within a first tire and the second moving member is disposed within a second tire. The first moving member comprises a staple driver that is configured to release and force a staple through tire walls of the first and second tires, and the second moving member comprises a staple fastener that is configured to at least partially close the staple after the staple penetrates the tire walls of the first and second tires in order to fasten the first and second tires together.

12 Claims, 6 Drawing Sheets



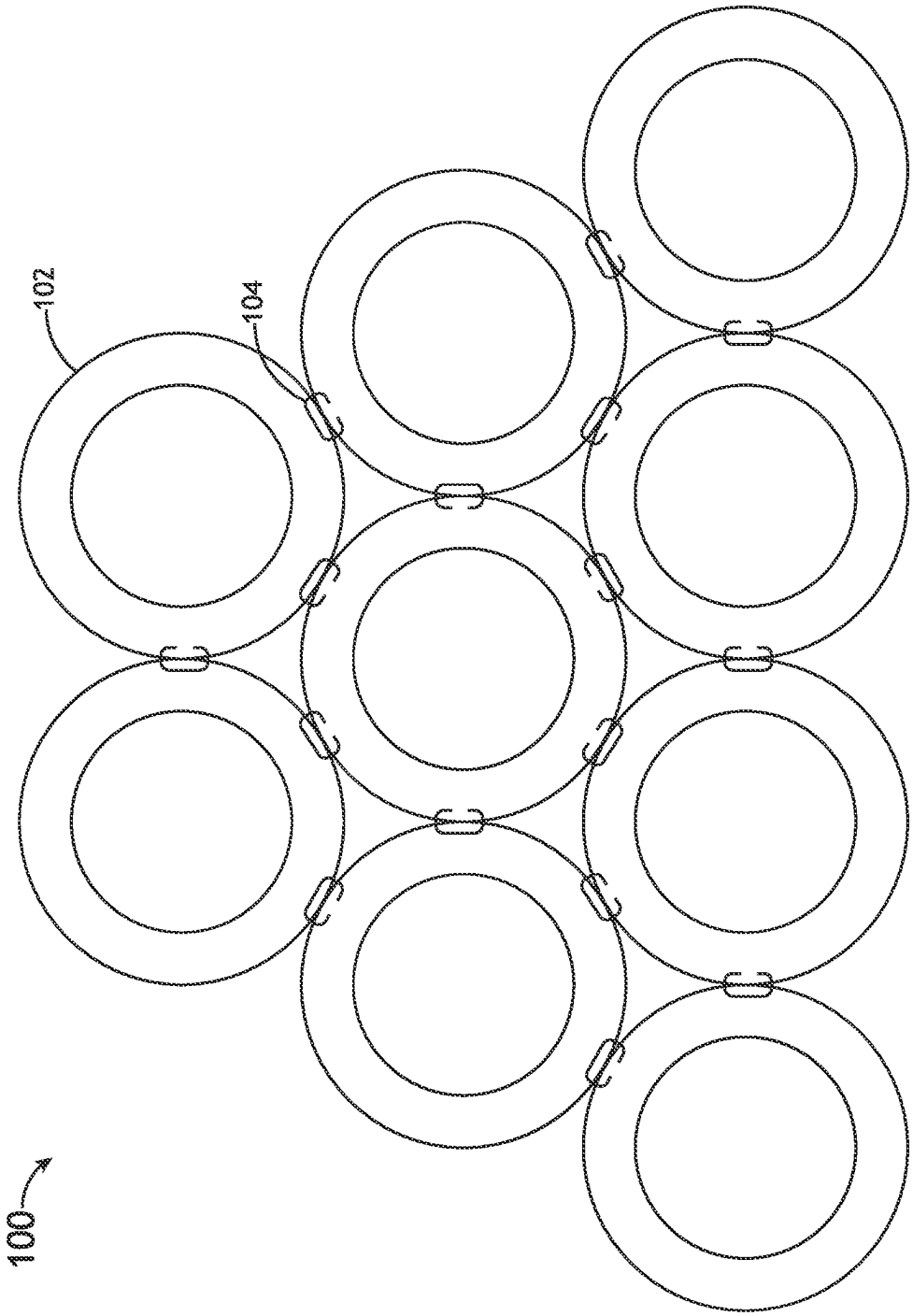


FIG. 1

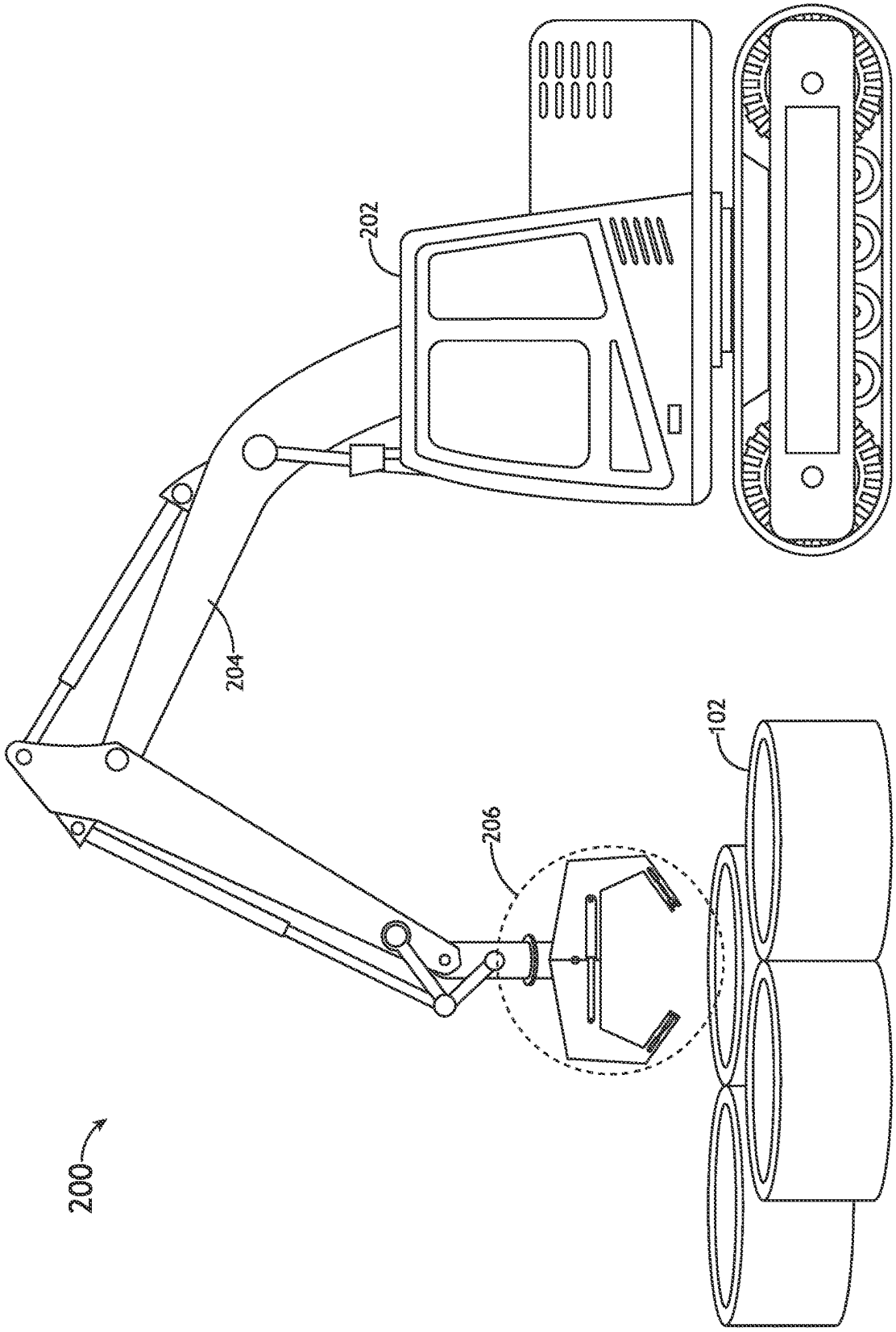


FIG. 2

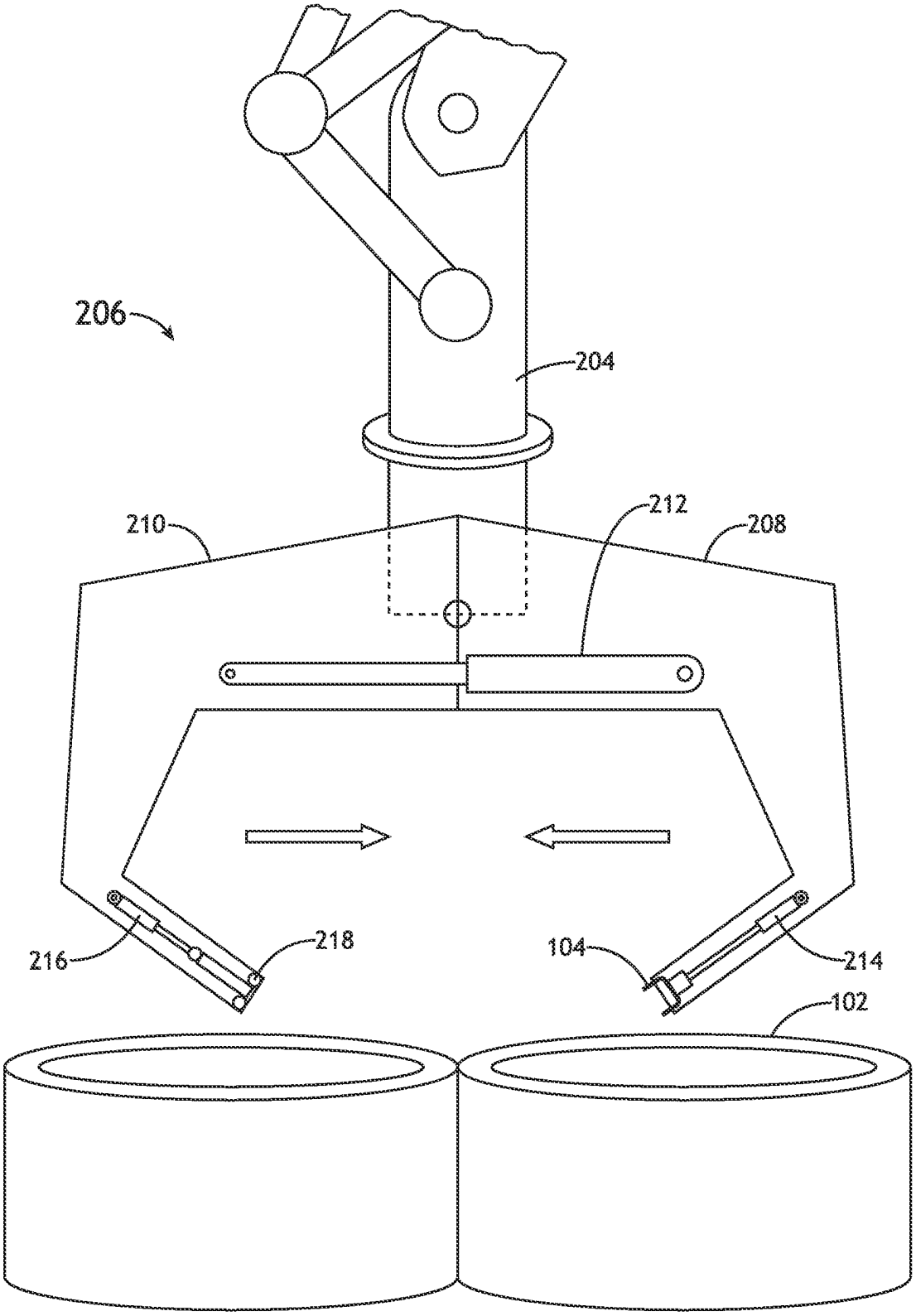


FIG. 3

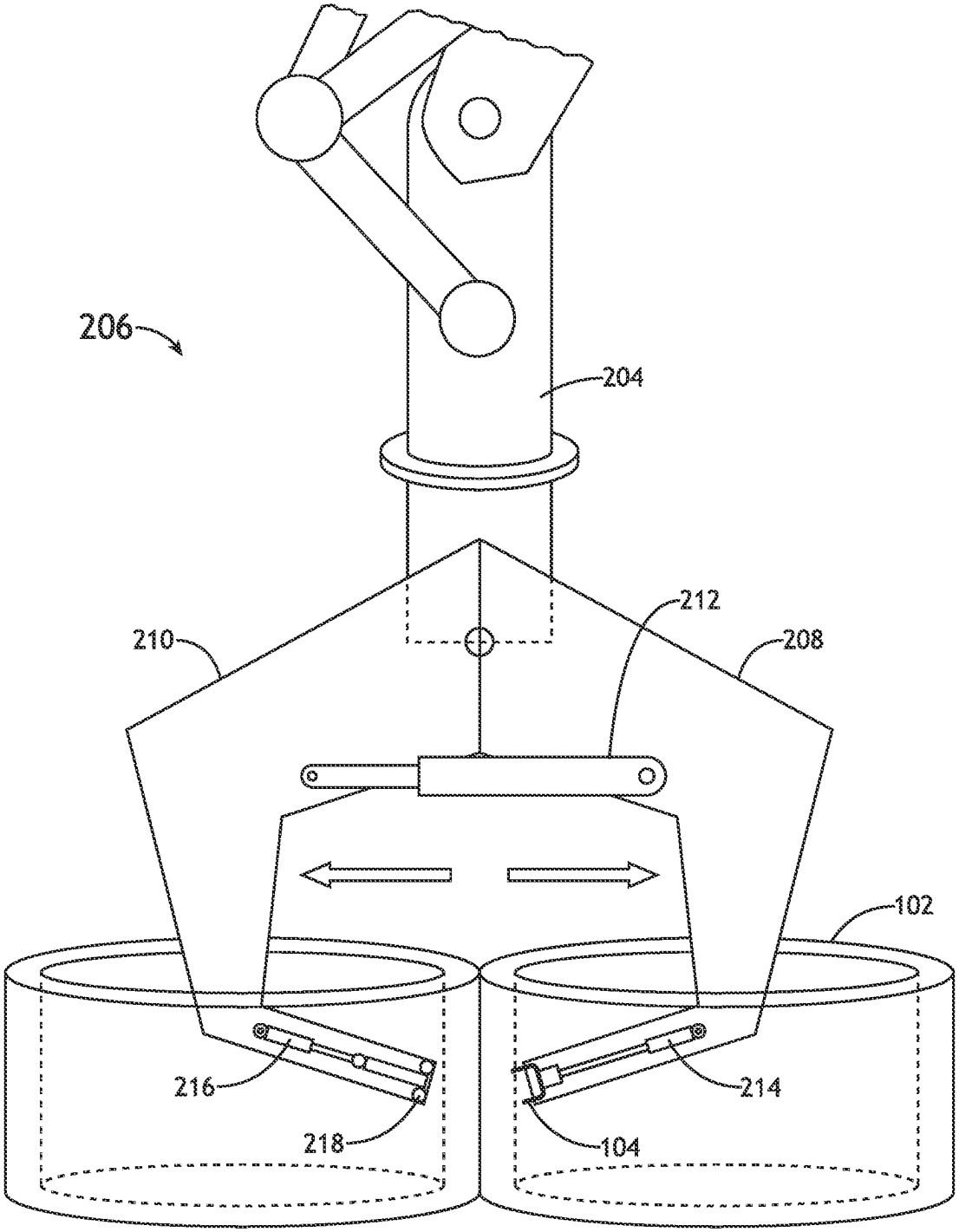


FIG.4

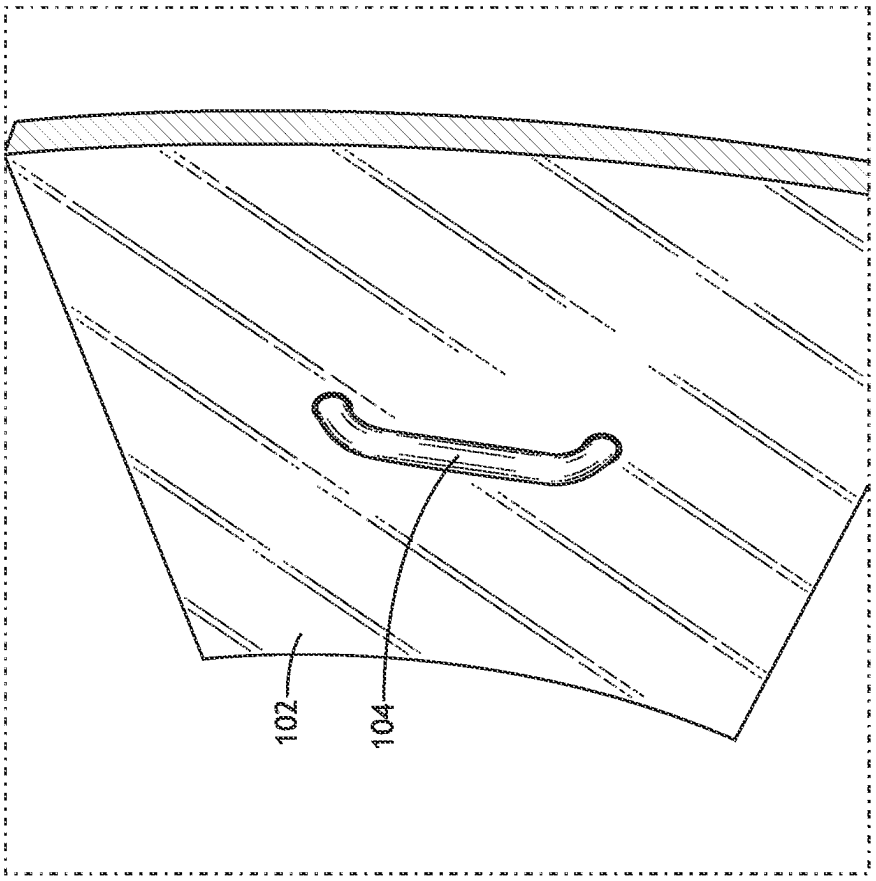


FIG. 5

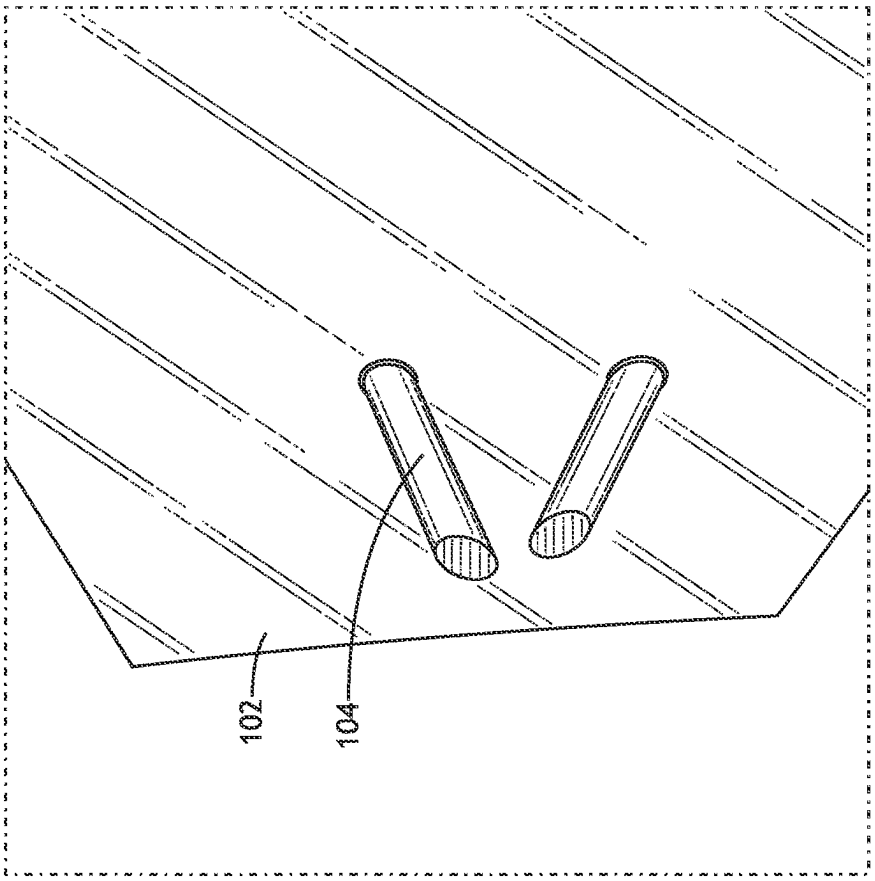


FIG.6

APPARATUS, SYSTEM, AND METHOD FOR PRODUCING AND POSITIONING MULTI-TIRE STRUCTURAL FEATURES

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application claims the benefit under 35 U.S.C. § 119(e) of U.S. Provisional Application No. 63/171,794, filed Apr. 7, 2021, and titled "APPARATUS, SYSTEM, AND METHOD FOR PRODUCING AND POSITIONING MULTI-TIRE STRUCTURAL FEATURES," which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

The present disclosure relates to construction tools, and more particularly, to a construction tool for fastening two or more tires together to produce structural features.

BACKGROUND

Used tires are often used to construct retaining walls and other structural barriers. Sometimes, the tires may be fastened together to produce multi-tire structural features that are able to withstand strong forces without coming apart. For example, the tires may be tied with rope, chained, or bolted together. The process of fastening the tires together and then positioning the multi-tire structural features is labor intensive and time consuming. Consequently, there is a need for improvements that expedite and simplify the processes of producing and positioning multi-tire structural features.

SUMMARY

A system for producing and positioning multi-tire structural features is disclosed. In embodiments, the system includes a construction vehicle, an actuatable arm extending from the construction vehicle, and a grasper coupled to a distal end of the actuatable arm. The gasper includes a first moving member and a second moving member that are configured to be actuated toward one another when the first moving member is disposed within a first tire and the second moving member is disposed within a second tire. The first moving member comprises a staple driver that is configured to release and force a staple through tire walls of the first and second tires, and the second moving member comprises a staple fastener that is configured to at least partially close the staple after the staple penetrates the tire walls of the first and second tires in order to fasten the first and second tires together.

This Summary is provided solely as an introduction to subject matter that is fully described in the Detailed Description and Drawings. The Summary should not be considered to describe essential features nor be used to determine the scope of the Claims. Moreover, it is to be understood that both the foregoing Summary and the following Detailed Description are example and explanatory only and are not necessarily restrictive of the subject matter claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

The detailed description is described with reference to the accompanying figures. The use of the same reference numbers in different instances in the description and the figures may indicate similar or identical items. Various embodiments or examples ("examples") of the present disclosure

are disclosed in the following detailed description and the accompanying drawings. The drawings are not necessarily to scale. In general, operations of disclosed processes may be performed in an arbitrary order, unless otherwise provided in the claims.

FIG. **1** is a schematic illustration of a multi-tire structural feature, in accordance with an example embodiment of this disclosure.

FIG. **2** is a schematic illustration of a system for producing and positioning multi-tire structural features, in accordance with an example embodiment of this disclosure.

FIG. **3** is a schematic illustration of a grasper of the system for producing and positioning multi-tire structural features, wherein the grasper is in an open configuration, in accordance with an example embodiment of this disclosure.

FIG. **4** is another schematic illustration of the grasper of the system for producing and positioning multi-tire structural features, wherein the grasper is in a closed configuration, in accordance with an example embodiment of this disclosure.

FIG. **5** depicts tire walls of two tires fastened together by the system for producing and positioning multi-tire structural features, in accordance with an example embodiment of this disclosure.

FIG. **6** further depicts the tire walls of the two tires fastened together by the system for producing and positioning multi-tire structural features, in accordance with an example embodiment of this disclosure.

DETAILED DESCRIPTION

Reference will now be made in detail to the subject matter disclosed, which is illustrated in the accompanying drawings.

As shown in FIG. **1**, a structural feature **100**, such as a wall or boundary, can formed by stacking a plurality of tires **102** upon one another. To enhance the structural performance of the multi-tire structural feature **100**, the tires **102** can be attached by fasteners **104** driven through tire walls (e.g., tread walls) of adjacent tires **102**.

Referring generally to FIGS. **2** through **6**, a system **200** for producing and positioning multi-tire structural features **100** is disclosed.

An example embodiment of the system **200** is illustrated in FIG. **2**. The system **200** may include a construction vehicle **202**, an actuatable arm **204** extending from the construction vehicle **200**, and a grasper **206** coupled to a distal end of the actuatable arm **204**. In some embodiments, the grasper **206** is coupled to the distal end of the actuatable arm **204** by a multi-axis pivot that allows for roll, pitch, and/or yaw rotations of the gasper **206** relative to the actuatable arm **204**.

As shown in FIGS. **3** and **4**, the gasper **206** includes a first moving member **208** and a second moving member **210** that are configured to be actuated toward one another when the first moving member **208** is disposed within a first tire **102** and the second moving member **210** is disposed within a second tire **102**. In embodiments, the gasper **206** includes an actuator **212** (e.g., a hydraulic, pneumatic, or electromechanical linear or rotary actuator) that is configured to move the first moving member **208** and the second moving member **210** toward or away from one another (e.g., to gasp or release tires **102** or other objects). In a preferred embodiment, the actuator **212** may be or may include a hydraulic cylinder.

The first moving member **208** includes a staple driver **214** that is configured to release and force a staple **104** through

tire walls of the first and second tires **102**. In embodiments, the staple driver **214** may be or may include an actuator (e.g., a hydraulic, pneumatic, or electromechanical linear actuator) that is configured to drive the staple **104** through a distal end of the first moving member **208**. In a preferred embodiment, the actuator may be or may include a hydraulic cylinder. The first moving member **208** and/or staple driver **214** may further include a staple holder or cartridge configured to hold one or more staples (e.g., an individual staple or a plurality of staples in a cartridge, magazine, or strip).

The second moving member **210** includes a staple fastener **218** that is configured to at least partially close the staple **104** after the staple **104** penetrates the tire walls of the first and second tires **102** in order to fasten the first and second tires **102** together. In some embodiments, the staple fastener **218** includes at least two rollers located at a distal end of the second moving member **210**, wherein the staple **104** is bent by the rollers after the staple **104** penetrates the tire walls of the first and second tires **102** in order to fasten the first and second tires **102** together. This results when the distal ends of the moving members **208** and **210** are disposed within the tires **102** and actuated toward one another so that the distal ends of the moving members **208** and **210** are each brought into contact (or near contact) with an inner tire wall of a respective one of the tires **102**. At this point the staple driver **214** of the first moving member **208** drives a staple **104** through the tire walls to fasten the tires **102** together, and the staple fastener **218** of the second moving member **210** bends the penetrating prongs of the staple **104** from the other side to secure the staple **104** so that it no longer be removed from the tires **102** (without unbending).

In some embodiments, the second moving member **210** further includes an actuator **216** (e.g., a hydraulic, pneumatic, or electromechanical linear actuator) configured to apply additional force to help close the staple **104** while the staple **104** is being bent by the staple fastener **218** (e.g., rollers) after the staple **104** penetrates the tire walls of the first and second tires **102** in order to fasten the first and second tires **102** together. In a preferred embodiment, the actuator **216** may be or may include a hydraulic cylinder. The actuator **216** may be configured to apply additional force by ramming the staple prongs in between the rollers as the staple **104** is being closed by the staple fastener **218** in order to assist with bending the staple prongs inwardly.

FIGS. **5** and **6** show an example of tire walls of adjacent tires **102** that have been secured by a staple **104** in the manner described herein.

After the tires **102** are fastened together, the grasper **206** and actuatable arm **204** may be further configured to pick up the connected tires **102** and move them to a desired location in order to construct a structure made up of one or more multi-tire tire structural features. The grasper **206** can also be used to fasten one multi-tire structural feature to another multi-tire structural feature and so on.

The grasper **206** and actuatable arm **204** can also be used to move the tires to desired location beforehand (i.e., before the tires **102** are fastened together). In this manner, tires **102** can continually be added to a large structural feature made up of any number of tires **102**.

It is further contemplated that the system **200** may be used to fasten and position other building materials or structures (e.g., walls, planks, sheets, arches, etc.).

Although the technology has been described with reference to the embodiments illustrated in the attached drawing figures, equivalents may be employed, and substitutions may be made herein without departing from the scope of the technology as recited in the claims. Components illustrated and described herein are examples of devices and components that may be used to implement the embodiments of the present invention and may be replaced with other devices and components without departing from the scope of the invention. Furthermore, any dimensions, degrees, and/or numerical ranges provided herein are to be understood as non-limiting examples unless otherwise specified in the claims.

What is claimed is:

1. A system for producing and positioning multi-tire structural features, comprising:

a construction vehicle;

an actuatable arm extending from the construction vehicle;

a grasper coupled to a distal end of the actuatable arm, the gasper including a first moving member and a second moving member that are configured to be actuated toward one another when the first moving member is disposed within a first tire and the second moving member is disposed within a second tire, wherein the first moving member comprises a staple driver that is configured to release and force a staple through tire walls of the first and second tires, and wherein the second moving member comprises a staple fastener that is configured to at least partially close the staple after the staple penetrates the tire walls of the first and second tires in order to fasten the first and second tires together.

2. The system of claim **1**, wherein the staple driver comprises a linear actuator configured to drive the staple through a distal end of the first moving member.

3. The system of claim **1**, wherein the staple fastener comprises rollers located at a distal end of the second moving member, wherein the staple is bent by the rollers after the staple penetrates the tire walls of the first and second tires in order to fasten the first and second tires together.

4. The system of claim **3**, wherein the second moving member further includes a linear actuator configured to apply additional force to help close the staple while the staple is being bent by the rollers after the staple penetrates the tire walls of the first and second tires in order to fasten the first and second tires together.

5. An apparatus for producing and positioning multi-tire structural features, comprising:

a grasper configured to be coupled to a distal end of an actuatable arm, the gasper including a first moving member and a second moving member that are configured to be actuated toward one another when the first moving member is disposed within a first tire and the second moving member is disposed within a second tire, wherein the first moving member comprises a staple driver that is configured to release and force a staple through tire walls of the first and second tires, and wherein the second moving member comprises a staple fastener that is configured to at least partially close the staple after the staple penetrates the tire walls of the first and second tires in order to fasten the first and second tires together.

6. The apparatus of claim **5**, wherein the staple driver comprises a linear actuator configured to drive the staple through a distal end of the first moving member.

7. The apparatus of claim **5**, wherein the staple fastener comprises rollers located at a distal end of the second moving member, wherein the staple is bent by the rollers

after the staple penetrates the tire walls of the first and second tires in order to fasten the first and second tires together.

8. The apparatus of claim **7**, wherein the second moving member further includes a linear actuator configured to apply additional force to help close the staple while the staple is being bent by the rollers after the staple penetrates the tire walls of the first and second tires in order to fasten the first and second tires together.

9. A method of producing and positioning multi-tire structural features, comprising:

engaging a first tire and a second tire with a grasper coupled to a distal end of an actuatable arm extending from a construction vehicle, the gasper including a first moving member and a second moving member;

actuating the first moving member and the second moving member toward one another when the first moving member is disposed within the first tire and the second moving member is disposed within the second tire, wherein the first moving member comprises a staple driver, and the second moving member comprises a staple fastener;

releasing and forcing a staple through tire walls of the first and second tires with the staple driver of the first moving member;

closing the staple after the staple penetrates the tire walls of the first and second tires with the staple fastener of the second moving member in order to fasten the first and second tires together; and

picking up and relocating the fastened first and second tires using the grasper and the actuatable arm.

10. The method of claim **9**, wherein the staple driver comprises a linear actuator configured to drive the staple through a distal end of the first moving member.

11. The method of claim **9**, wherein the staple fastener comprises rollers located at a distal end of the second moving member, wherein the staple is bent by the rollers after the staple penetrates the tire walls of the first and second tires in order to fasten the first and second tires together.

12. The method of claim **11**, wherein the second moving member further includes a linear actuator configured to apply additional force to help close the staple while the staple is being bent by the rollers after the staple penetrates the tire walls of the first and second tires in order to fasten the first and second tires together.

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