US012084321B2

(12) **United States Patent**
Parks et al.

(10) **Patent No.: US 12,084,321 B2**
(45) **Date of Patent: Sep. 10, 2024**

(54) **STAGE HOIST MOTOR ASSEMBLY**

(71) Applicant: **IWEISS**, Fairview, NJ (US)

(72) Inventors: **Richard Wiley Parks**, Park Ridge, NJ (US); **Ben William Marson**, Turlock, CA (US); **Ree Seminole**, Portland, OR (US); **Geoffrey Michael Stock**, Manlius, NY (US)

(73) Assignee: **IWEISS**, Fairview, NJ (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **17/885,010**

(22) Filed: **Aug. 10, 2022**

(65) **Prior Publication Data**

US 2023/0052797 A1 Feb. 16, 2023

Related U.S. Application Data

(60) Provisional application No. 63/231,431, filed on Aug. 10, 2021.

(51) **Int. Cl.**
B66D 1/12 (2006.01)
A63J 1/02 (2006.01)
B66D 1/20 (2006.01)

(52) **U.S. Cl.**
CPC ***B66D 1/12*** (2013.01); ***A63J 1/028*** (2013.01); ***B66D 1/20*** (2013.01)

(58) **Field of Classification Search**
CPC ... B66D 1/20; B66D 1/02; B66D 1/12; B66D 1/14; B66D 1/28; A63J 1/028
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,738,614	A *	6/1973	Peterson	B66D 1/20 254/365
2016/0257234	A1 *	9/2016	Gomes	B60N 3/103
2018/0291716	A1 *	10/2018	Su	B66D 1/20
2021/0316972	A1 *	10/2021	Huang	B66D 1/28

FOREIGN PATENT DOCUMENTS

CN	111099511	A *	5/2020	B66D 1/12
DE	10117466	A1 *	10/2002	B66D 1/12
DE	202013005539	U1 *	8/2013	B66D 1/20

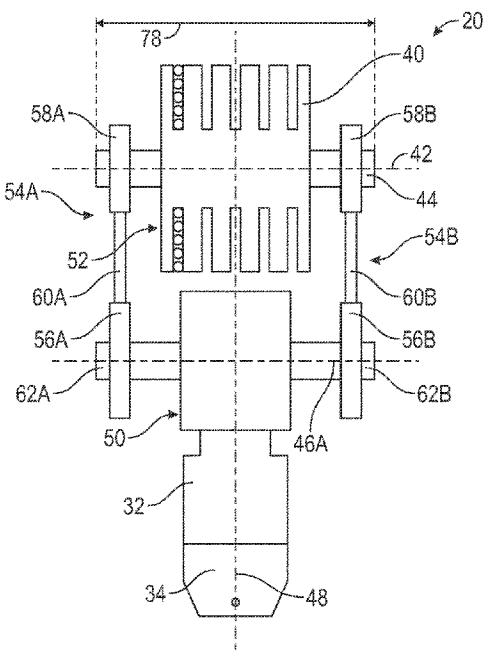
* cited by examiner

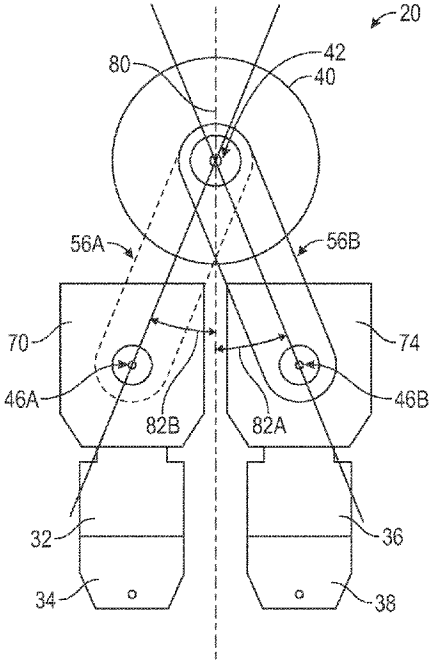
Primary Examiner — Sang K Kim
Assistant Examiner — Nathaniel L Adams
(74) *Attorney, Agent, or Firm* — Carlson, Gaskey & Olds, P.C.

(57) **ABSTRACT**

A stage hoist motor assembly includes a first electric motor including a first brake and a second electric motor including a second brake. The first electric motor and the second electric motor are stacked one atop the other within a common plane. A cable winch is rotatable about a winch axis and includes a cable winch shaft that is driven by the first and second electric motors through respective ones of a first drive coupling and a second drive coupling. A width of the motors is less than a width of the winch. Moreover, the motors are stacked one atop the other within a common plane to provide a compact foot print that is favorable to use in performance venue environments.

19 Claims, 9 Drawing Sheets





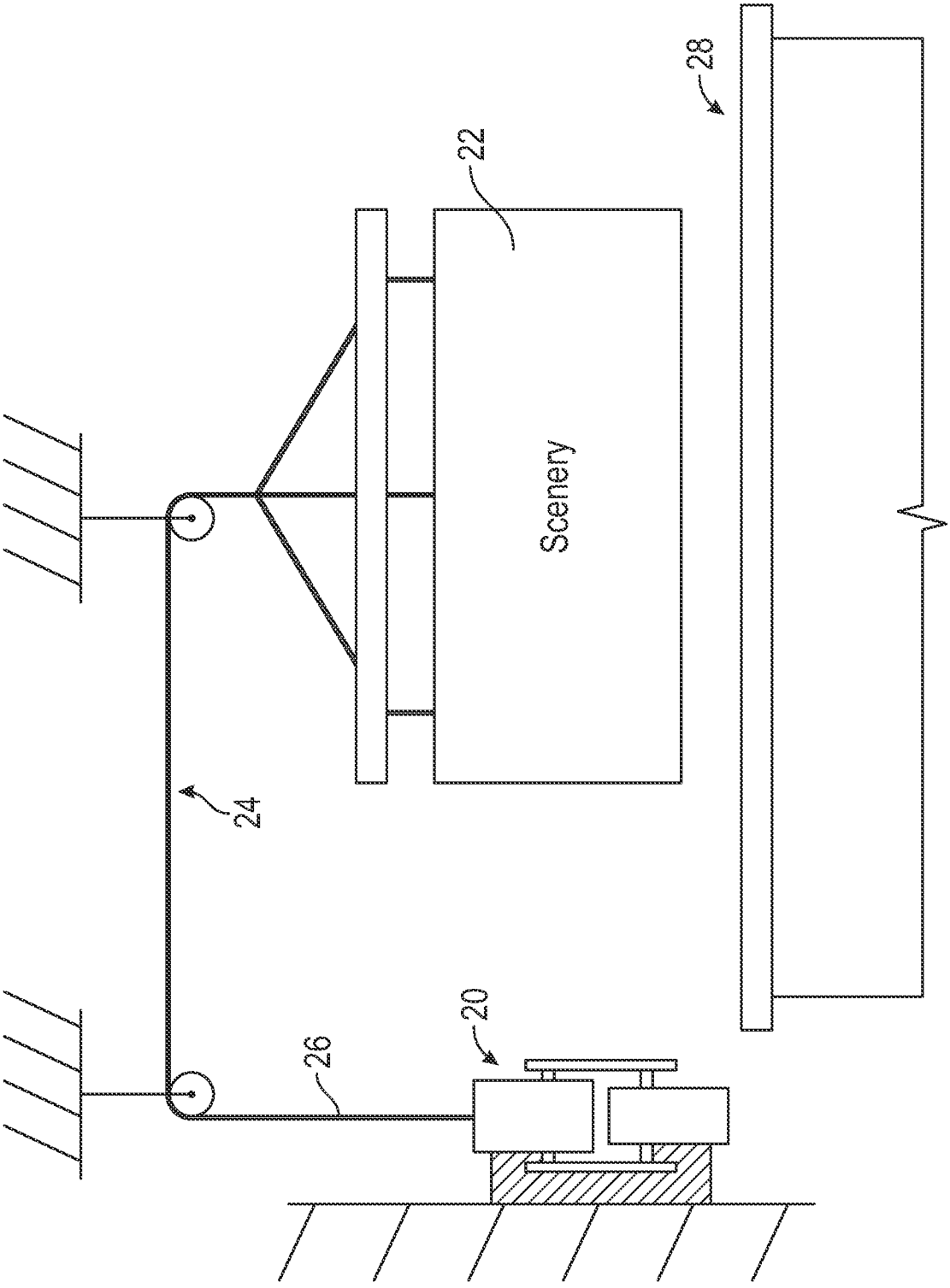


FIG. 1

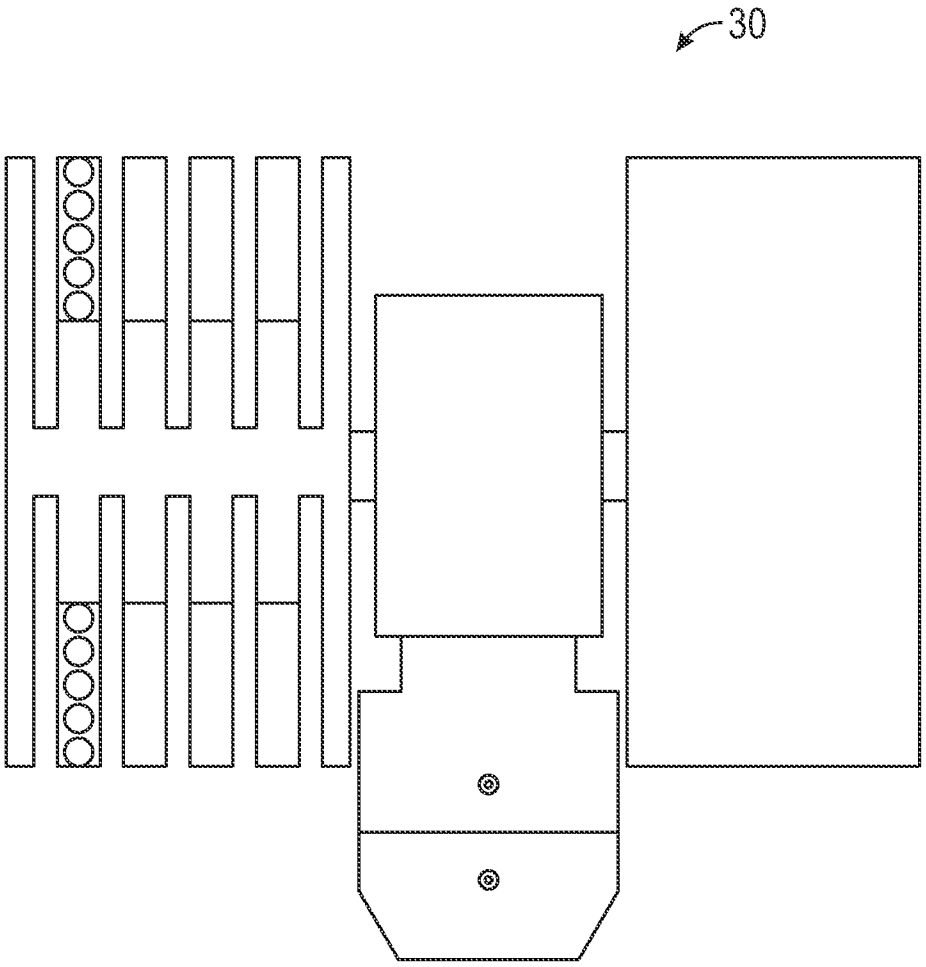


FIG. 2
(Prior Art)

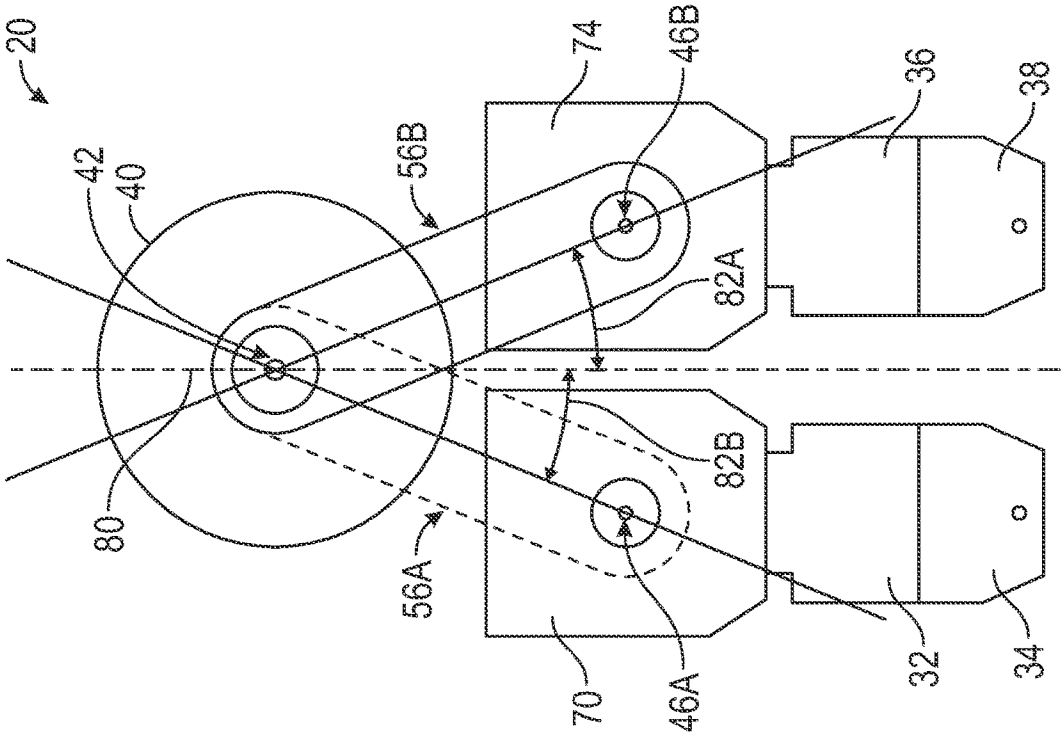

20
42
40
56B
74
46B
36
38
82A
80
82B
56A
70
46A
32
34

FIG. 4

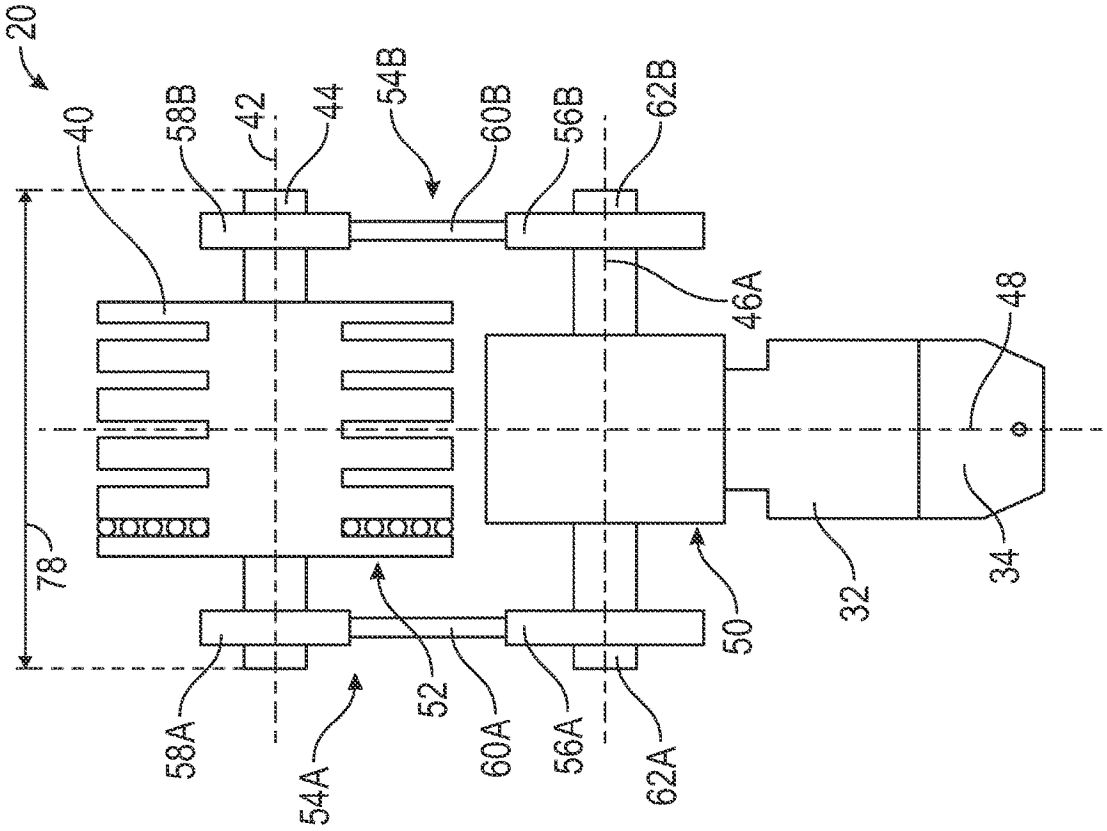

20
40
58B
42
44
54B
60B
56B
62B
46A
48
78
58A
54A
52
60A
56A
62A
50
32
34

FIG. 3

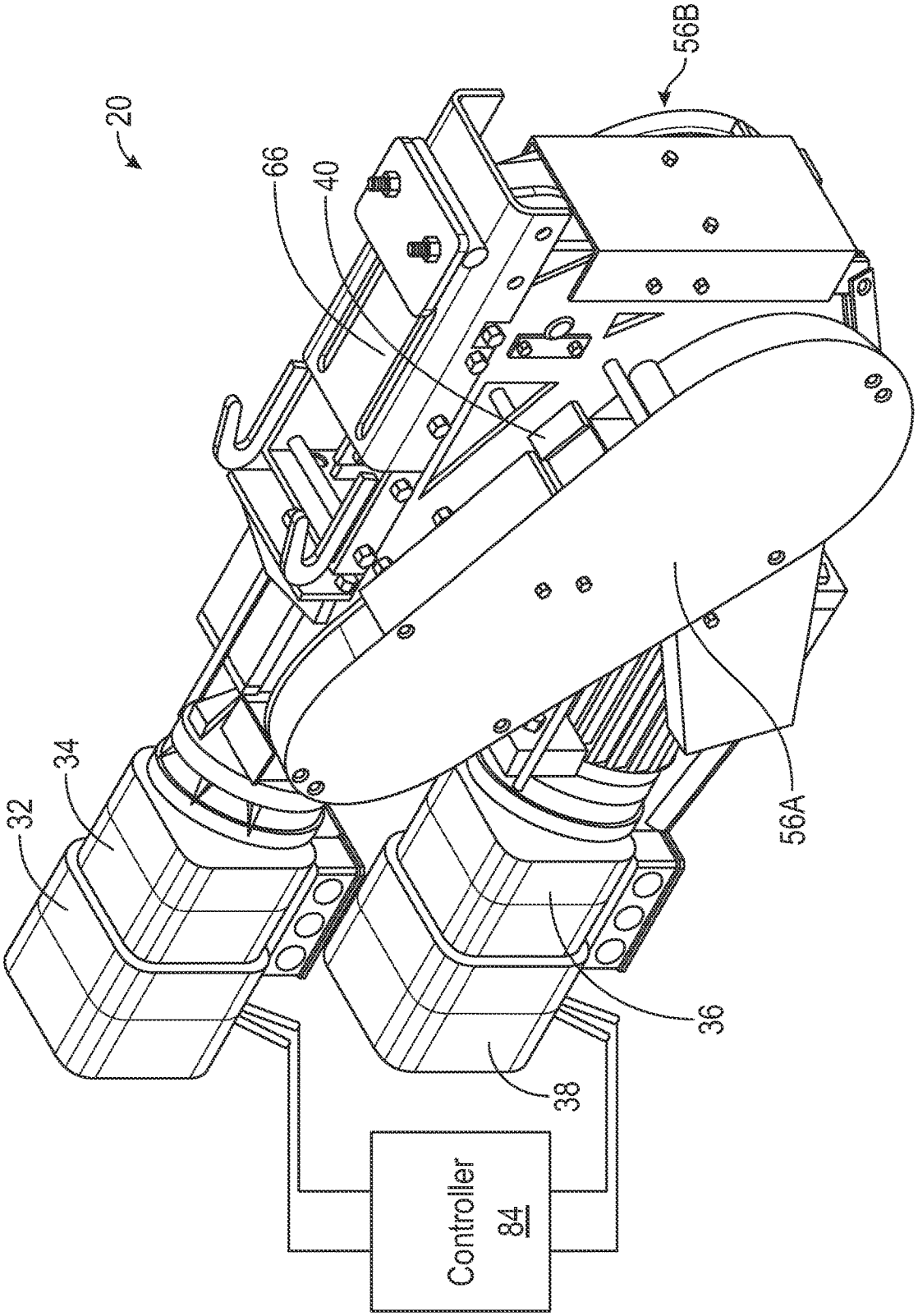


FIG. 5

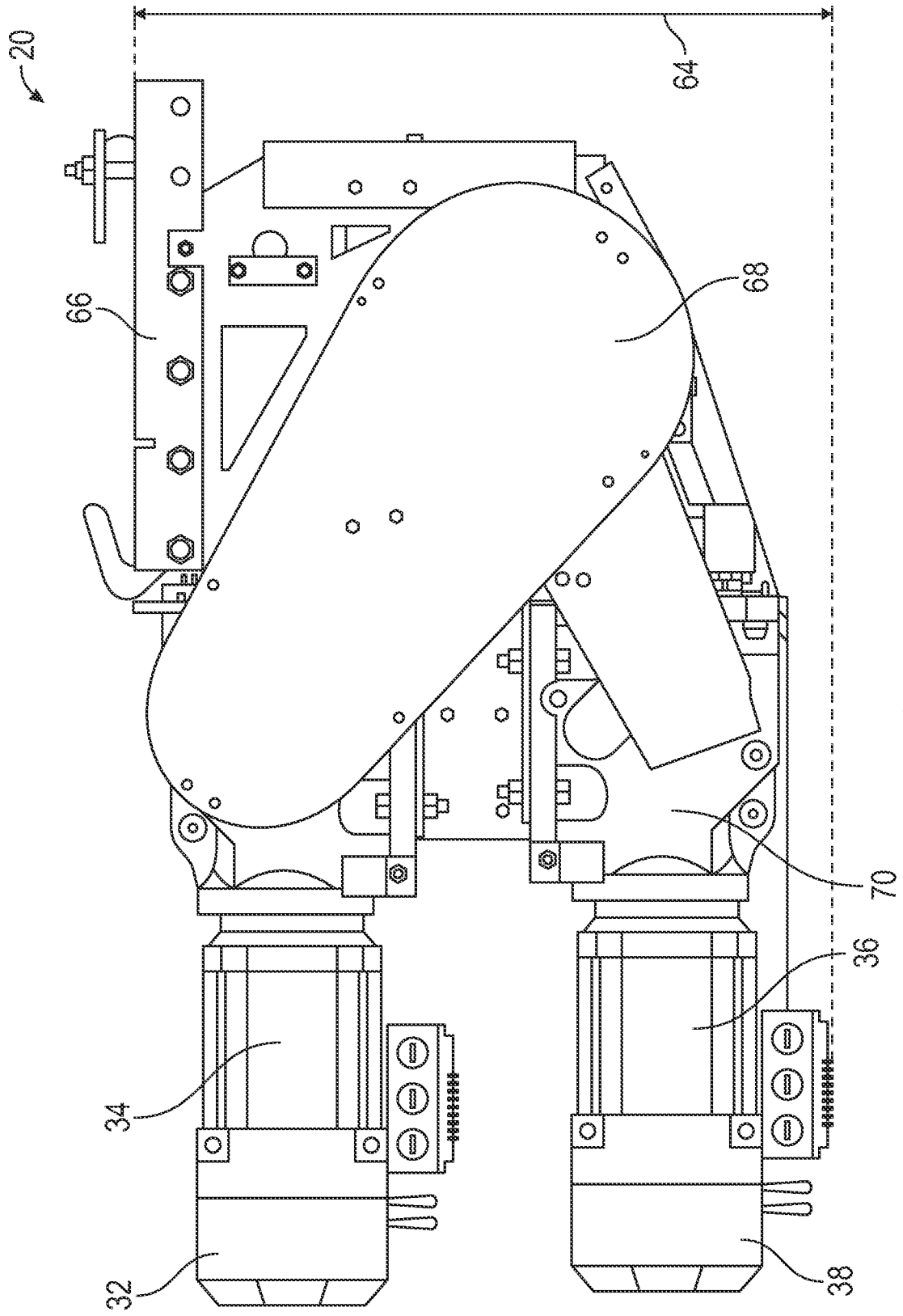


FIG. 6

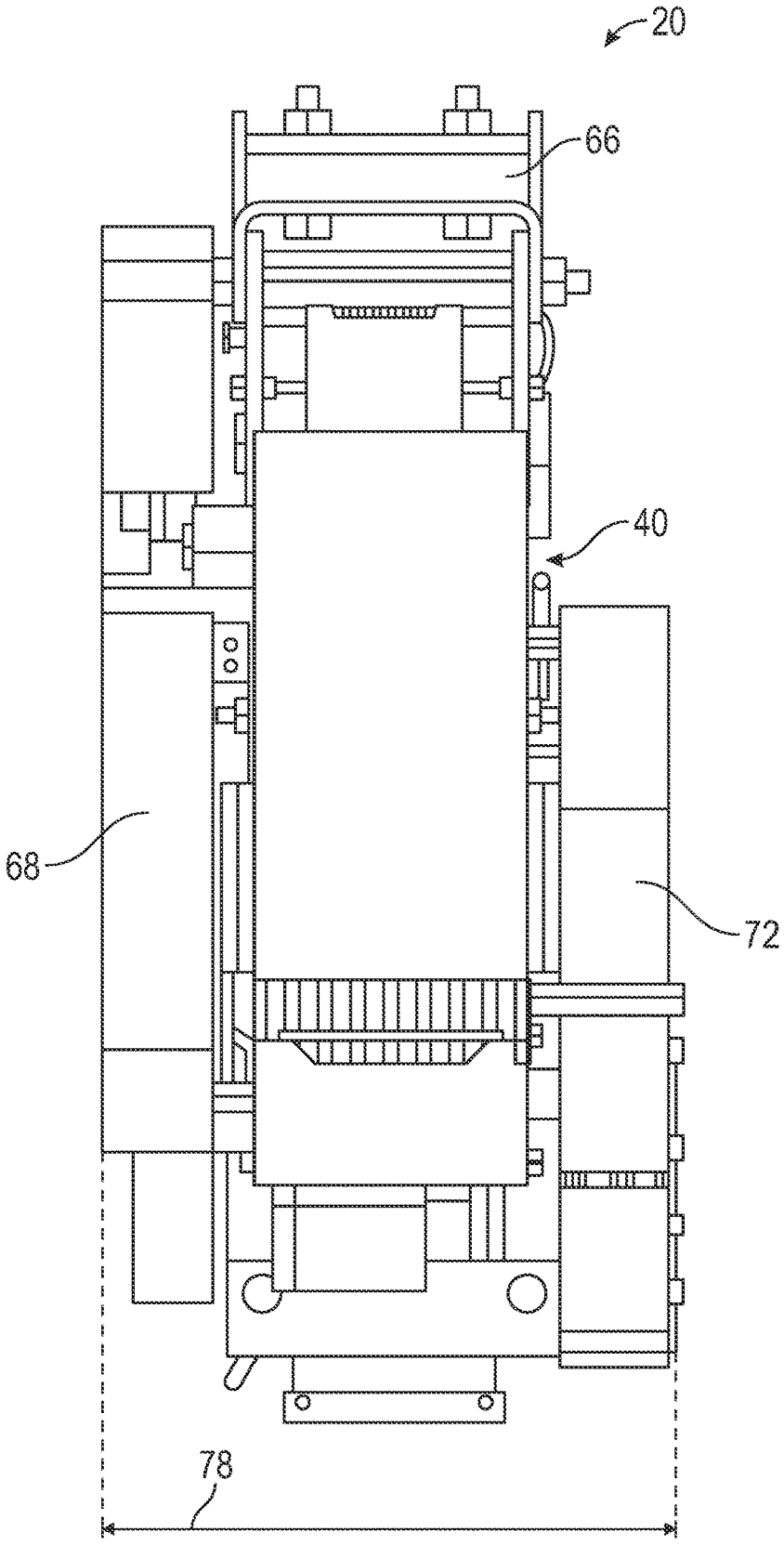


FIG. 7

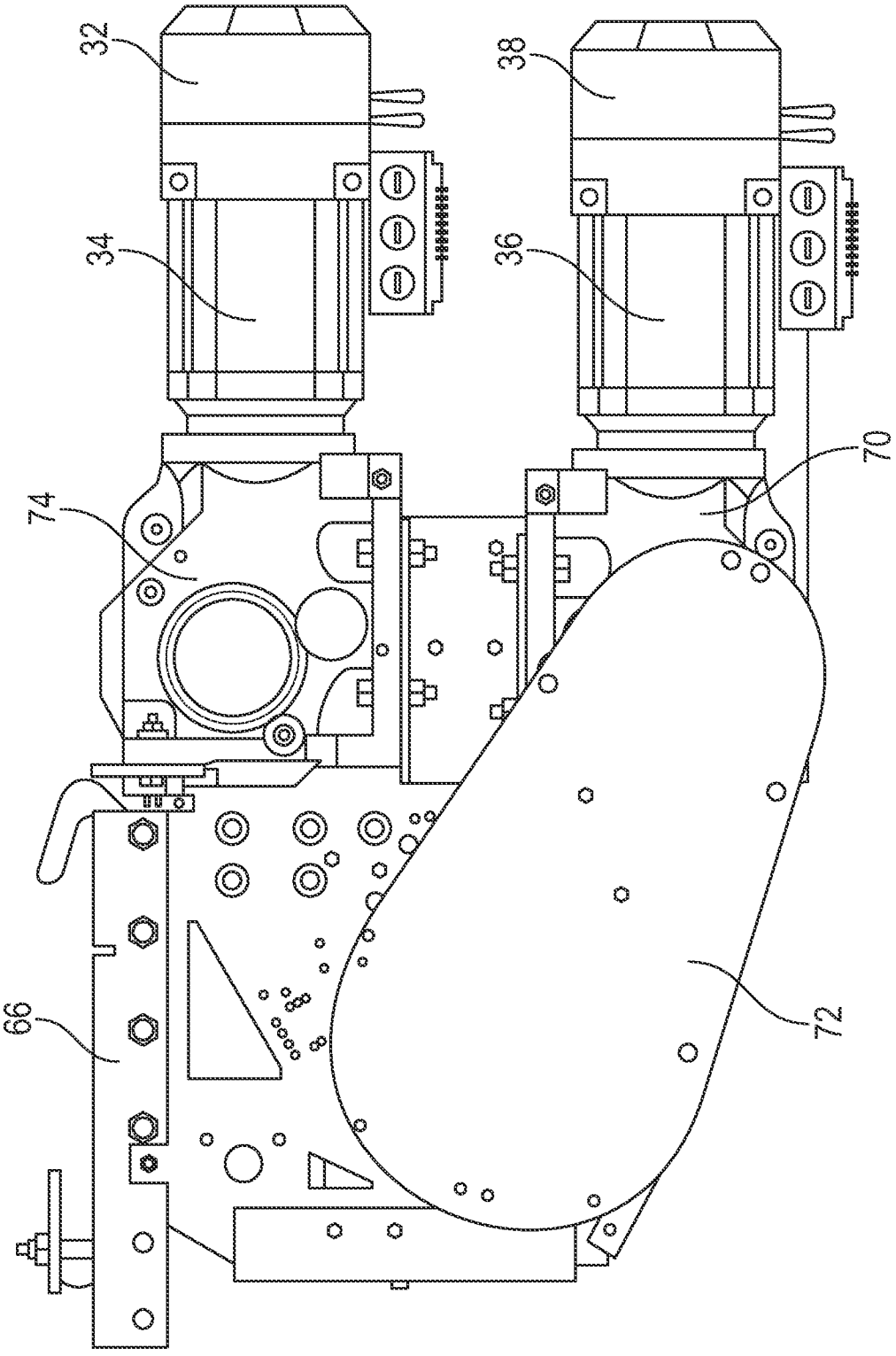


FIG. 8

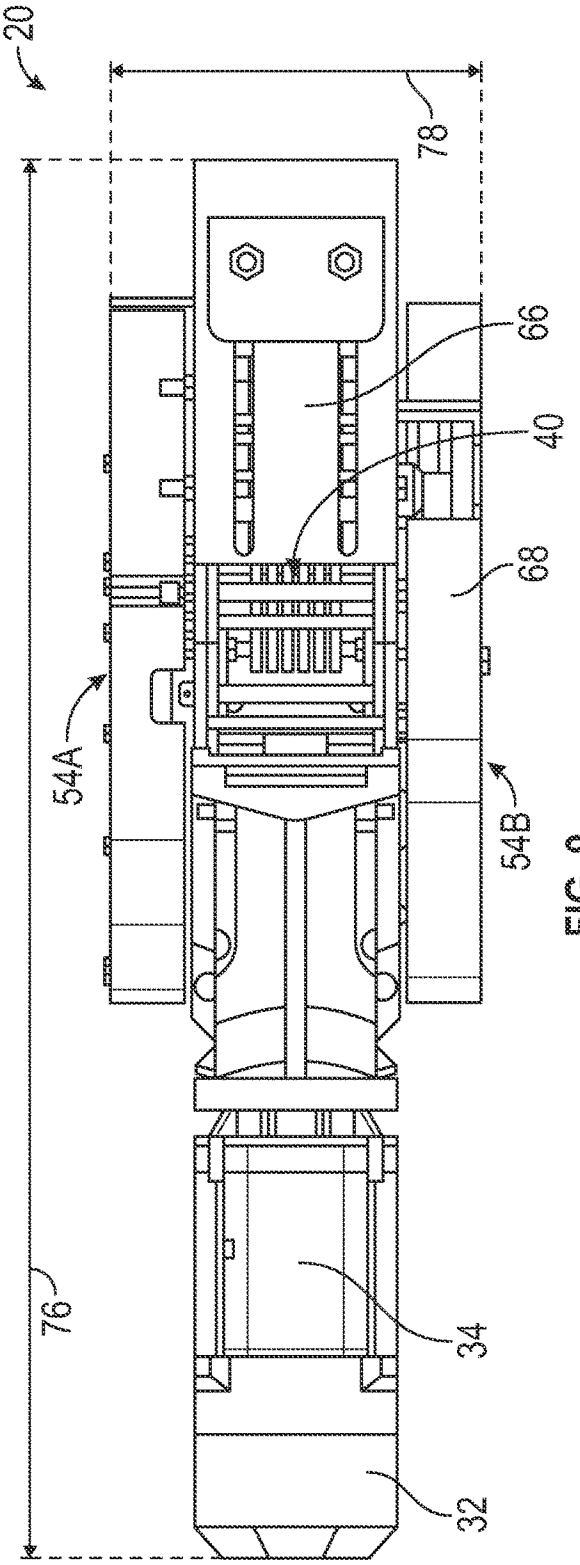


FIG. 9

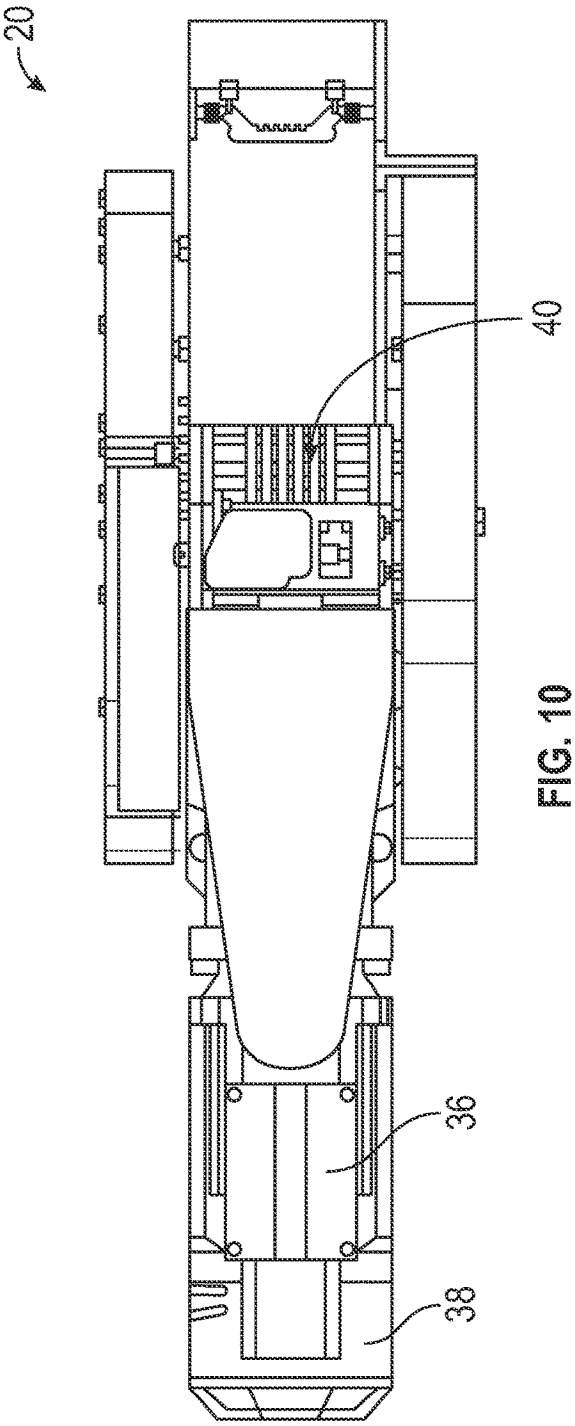


FIG. 10

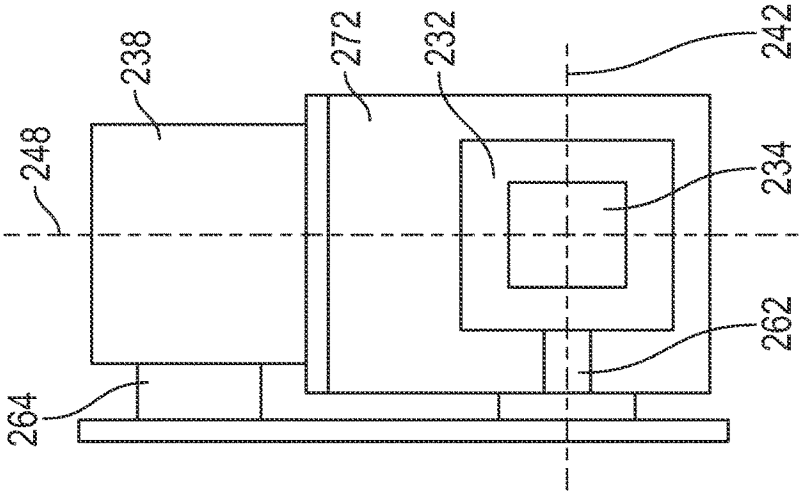

200
238
272
232
242
248
234
262
264

FIG. 12

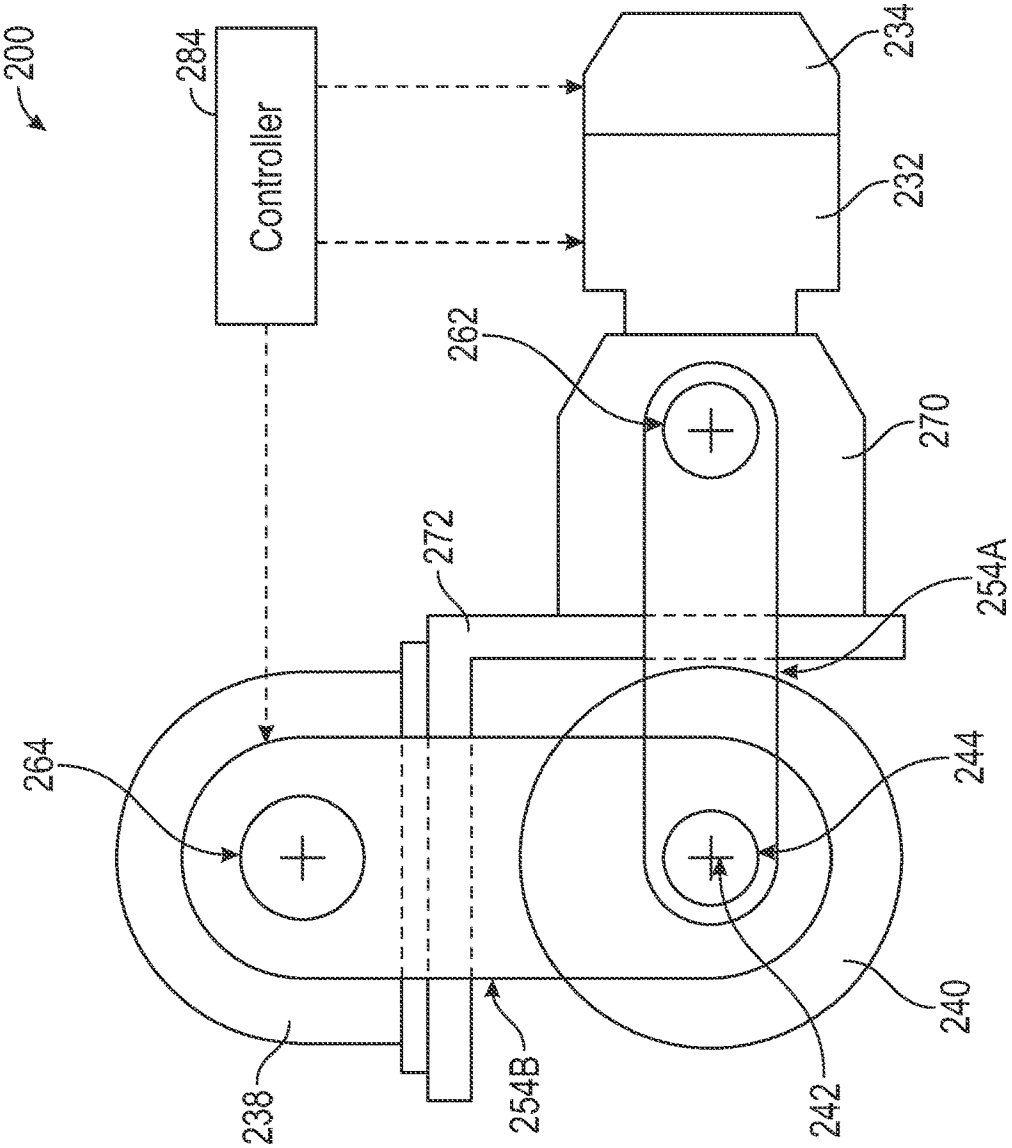

200
284
Controller
234
232
262
270
272
254A
264
244
240
238
254B
242

FIG. 11

STAGE HOIST MOTOR ASSEMBLY

CROSS REFERENCE TO RELATED APPLICATION

This application claims priority to U.S. Provisional Application No. 63/231,431 filed on Aug. 10, 2021.

TECHNICAL FIELD

The present disclosure relates to hoist assembly utilized in performance venues for lifting and moving items such as scenery items, curtains lighting and any other structures utilized as part of a performance venue.

BACKGROUND

Hoists are utilized in performance venues are sometimes referred to as a pile-on winch due to the cable stacking on itself as it is wound around a rotating drum. Most hoists are large to be adaptable to many different uses. The space required by such a hoist is amplified by the need for several hoists for different scenery items. Moreover, each hoist requires redundant safety brakes that can add to the cost, size and complexity of the hoist.

The background description provided herein is for the purpose of generally presenting a context of this disclosure. Work of the presently named inventors, to the extent it is described in this background section, as well as aspects of the description that may not otherwise qualify as prior art at the time of filing, are neither expressly nor impliedly admitted as prior art against the present disclosure.

SUMMARY

A stage hoist motor assembly according to a disclosed example embodiment includes a first electric motor including a first brake and a second electric motor including a second brake. The first electric motor and the second electric motor are stacked one atop the other within a common plane. A cable winch is rotatable about a winch axis. The cable winch includes a cable winch shaft that is driven by the first and second electric motors through respective ones of a first drive coupling and a second drive coupling. The integration of the motors and brakes provides for a smaller overall width. In one disclosed embodiment, a width of the motors is less than a width of the winch. Moreover, the motors are stacked one atop the other within a common plane to provide a compact foot print that is favorable to use in performance venue environments.

Although the different examples have the specific components shown in the illustrations, embodiments of this disclosure are not limited to those particular combinations. It is possible to use some of the components or features from one of the examples in combination with features or components from another one of the examples.

These and other features disclosed herein can be best understood from the following specification and drawings, the following of which is a brief description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic view of a performance venue including an example hoist motor assembly embodiment for moving scenery.

FIG. **2** is a partial sectional view of a prior at hoist motor assembly.

FIG. **3** is a schematic view of an example hoist motor assembly embodiment.

FIG. **4** is a side view of the example hoist motor assembly.

FIG. **5** is a perspective view of the example hoist motor assembly.

FIG. **6** is a front view of the example hoist motor assembly.

FIG. **7** is a side view of the example hoist motor assembly.

FIG. **8** is a back view of the example hoist motor assembly.

FIG. **9** is a top view of the example hoist motor assembly.

FIG. **10** is a bottom view of the example hoist motor assembly.

FIG. **11** is a schematic front view of another example hoist motor assembly embodiment.

FIG. **12** is a schematic side view of the example hoist motor assembly of FIG. **11**.

DETAILED DESCRIPTION

Referring to FIG. **1**, a performance venue is schematically shown and includes a hoist motor assembly **20** for moving scenery **22**. The hoist motor assembly **20** actuates a cable **26** of rigging **24** to move the scenery **22** relative to a stage **28**. The hoist motor assembly **20** is mounted to a fixed static surface of the venue and is operable to move different scenery items through the rigging **24**. It is typically not desirable to have the motor hoist assembly **20** viewable by an audience and therefore it is usually located back stage. The back stage area of a performance venue may be very small and therefore space for performers and equipment is a priority.

Referring to FIG. **2**, an example prior art hoist assembly **30** is schematically shown and includes a winch motor and brake all disposed along a common shaft. The total width of the hoist assembly **30** is therefore a combination of the width of each of these components. Moreover, although the motor includes a brake, a redundant secondary brake is provided as a backup. The additional features all contribute to the overall size of the hoist assembly **30**.

Referring to FIGS. **3**, **4** and **5** an example hoist motor assembly **20** according to a disclosed example embodiment includes two electric motors that each include an integrated brake that is coupled to drive a cable winch **40**. The cable winch **40** is supported by a winch shaft **44** for rotation about a winch axis **42**. A first electric motor **32** and a second electric motor **36** are disposed within a common plane **48** that is transverse to the winch axis **42**. The first electric motor **32** drives a first shaft **62**A about a first drive axis **46**A through a first gear box **70** and the second electric motor **36** drives a second shaft **62**B about a second drive axis **46**B through a second gear box **74**. The first drive axis **46**A and the second drive axis **46**B are parallel to each other and transverse to a common plane **48**.

The first electric motor **32** includes a first brake **34** and the second electric motor includes a second brake **38**. The first brake **34** is also referred to and operates as a primary brake and the second brake **38** is referred to and operates as a secondary brake **38**. Although in this disclosed example, the first brake **34** is a primary brake and the second brake **38** is a secondary brake, the roles and operation could be reversed within the contemplation and scope of this disclosure.

The integration of the motors **32**, **36** and brakes **34**, **38** provides for a smaller overall width. In this disclosed embodiment, a width **50** of the motors **32**, **36** is less than a width **52** of the winch **40**. The motors **32**, **36** are stacked one

atop the other within the plane **48** to provide the compact foot print that is favorable to use in performance venue environments.

The first motor **32** is coupled to the winch shaft **44** through a first coupling **54**A. The second motor **36** is coupled to the winch shaft **44** through a second coupling **54**B. The first coupling **54**A is on one end of the winch shaft **44** and the second coupling **54**B is on a second end of the winch shaft **44**. The first and second couplings **54**A, **54**B each include a corresponding one of a drive sprocket **56**A-B, a driven sprocket **58**A-B and a drive chain **60**A-B. A first cover **68** and a second cover **72** are provided to cover the respective drive chains **60**A-B. Each of the motors **32**, **36** are independently coupled to the winch shaft **44**. The motors **32**, **36** are both operated concurrently to drive the winch **40**. Each of the motors **32**, **36** remains coupled to the shaft **44** such that both brakes **34**, **38** are always coupled to the winch shaft **44** and thereby able to apply braking force as needed. Both motors **32**, **36** work together to provide power to actuate the winch **40**.

A controller **84** (FIG. **5**) is provided to control operation of each of the motors **32**, **36**. The controller **84** is programmed to operate each of the electric motors **32**, **36** in unison. The controller **84** is further programmed to operate each of the primary brake **34** and the secondary brake **36** as needed to control operation of the winch **40**. Moreover, the controller **84** may be programmed to operate the motors **32**, **36** independently and continue to operate the primary brake **34** and secondary brake **38** to control operation of the winch **40**.

Because the motors **32**, **36** are disposed in the common plane **48** that is transverse to the winch **40**, the couplings **54**A-B are disposed at respective angles **82**A-B relative to a longitudinal plane **80** shown in FIG. **4**. In one disclosed embodiment, the angles **82**A-B are the same and are each less than about 45 degrees. In another disclosed example embodiment, the angles **82**A-B are both between 30 degrees and 40 degrees. In another example embodiment, the angles **82**A-B are both 35 degrees. However, other angles could be utilized and are within the contemplation of this disclosure. Additionally, although the angles **82**A-B are the same in this disclosed example, it is within the scope and contemplation of this disclosure that the angles **82**A-B may be different to tailor the assembly **20** to application specific space limitations.

Referring to FIGS. **6-10** with continued reference to FIG. **5**, the disclosed hoist motor assembly **20** includes a height **64** (FIG. **6**), an overall length **76** and an overall width **78**. The overall length **76** is greater than the overall width **78**. The height is greater than the width **78**. In one disclosed example embodiment, the height **64** is approximately twice the width **78** and the length **76** is approximately four times the width **78**. In another disclosed embodiment, the height **78** is between 1¾ and 2¼ times greater than the width **78** and the length **76** is between 3¾ and 4¼ times greater than the width **78**. The relative dimension provides a compact assembly with a flatter profile provides for incorporation within many different rigging configurations.

The winch **40** is disposed within a housing **66**. The housing **66** provides for support of the winch **40** and is attached to a first gearbox **70** and a second gearbox **74**. The motors **32**, **36** are mounted to the respective ones of the first and second gearboxes **70**, **74**. The first and second gearboxes **70**, **74** include gearing to transfer rotational torque produced by the corresponding electric motors **32**, **36** transversely into shafts **62**A-B (FIG. **3**) to drive the respective couplings **54**A-B.

The gearboxes **70**, **74** may include reduction gearing to provide an output speed of each of the shafts **62**A-B that is a predefined ratio of the input rotational speed of each of the electric motors **32**, **36**. In one disclosed example embodiment, both the first and second gearboxes **70**, **74** include the same gear reduction ratio. In another disclosed example embodiment, the first and second electric motors **30**, **32** are of a different size and the first and second gearboxes **70**, **74** include different gear reduction ratios.

Although the couplings **54**A-B are disclosed as a chain and sprocket drive system, other couplings such as a belt drive, shaft drive, gear coupling or any other mechanical drive coupling could also be utilized and is within the contemplation of this disclosure.

Referring to FIGS. **11** and **12**, another example hoist motor assembly embodiment is schematically shown and indicated at **200**. The hoist motor assembly **200** includes an electric motor **232** with a first brake **234**. The electric motor **232** is configured to drive a gearbox **270** that is mounted to a bracket **272**. The bracket **272** is substantially "L" shaped and provides for the mounting of a second brake **238**. A winch **240** includes a winch shaft **244** disposed along a winch axis **242**. The electric motor **232**, first brake **234** and the second brake **238** are disposed within a common plan **248** that is transverse to the winch axis **242**. The relative orientation between the winch **240**, electric motor **232**, first brake **234** and the second brake **238** provide a compact assembly that expands mounting options to provide for adaptation to any venue configuration.

In this disclosed example, the electric motor drives a shaft **262** through the gear box **270**. The shaft **262** is coupled to the winch shaft **244** through a first drive link **254**A. The second brake **238** is coupled to a brake shaft **264**. The brake shat **264** is coupled to the winch shaft **244** through a second drive link **254**B. The electric motor **232**, first brake **234** and the second brake **238** are in communication with a controller **284**. The controller **284** is programmed to control operation of the winch **240** by controlling the electric motor **232**, the first brake **234** and the second brake **238**. The first brake **234** is configured to operate as the primary brake and the second brake is configured to operate as a secondary brake. Additional features of the hoist motor assembly **20** discussed above are applicable and may be incorporated into the example hoist motor assembly **200**.

Accordingly, the example hoist motor assemblies **20**, **200** provide a compact device that provides additional mounting and placement options while also improving operational functionality

Although an example embodiment has been disclosed, a worker of ordinary skill in this art would recognize that certain modifications would come within the scope of this disclosure. For that reason, the following claims should be studied to determine the scope and content of this disclosure.

What is claimed is:

1. A stage hoist motor assembly comprising:

a first electric motor including a first brake;

a second brake;

a cable winch that is rotatable about a winch axis;

a first drive coupling between the first electric motor and the cable winch; and

a second drive coupling between the second brake and the cable winch, wherein the first electric motor and the second brake are both centered along a common plane disposed transverse to the winch axis, wherein the assembly is of a longitudinal length that is between 3¾ and 4¼ times a greatest width of the assembly in a direction parallel to the winch axis.

2. The stage hoist motor assembly as recited in claim 1, including a second electric motor and the second brake is coupled to the cable winch through the second electric motor.

3. The stage hoist motor assembly as recited in claim 2, wherein the cable winch includes a winch shaft disposed along the winch axis, the winch shaft including a first end coupled to the first drive coupling and a second end coupled to the second drive coupling.

4. The stage hoist motor assembly as recited in claim 2, wherein the first drive coupling and the second drive coupling are disposed at an angle relative to the winch axis.

5. The stage hoist motor assembly as recited in claim 4, wherein the first drive coupling and the second drive coupling each comprise a drive chain coupling a drive sprocket to a driven sprocket.

6. The stage hoist motor assembly as recited in claim 5, including a first gearbox coupled to be driven by the first electric motor and a second gearbox coupled to be driven by the second electric motor and both the first gearbox and the second gearbox are centered along the common plane.

7. The stage hoist motor assembly as recited in claim 2, wherein the first electric motor and the second electric motor include a width in a direction parallel to the winch axis that is less than the cable winch.

8. The stage hoist motor assembly as recited in claim 2, including a controller programmed to govern operation of the first electric motor, the first brake, the second electric motor and the second brake.

9. The stage hoist motor assembly as recited in claim 8, wherein both the first electric motor and the second electric motor are operated at the same time to drive the winch.

10. The stage hoist motor assembly as recited in claim 1, wherein the assembly is of a height that is between 1¾ and 2¼ the greatest width.

11. The stage hoist motor assembly as recited in claim 1, wherein the first brake operates as a primary brake and the second brake operates as a secondary brake to control operation of the winch.

12. A stage hoist motor assembly comprising:

a first electric motor including a first brake;

a second electric motor including a second brake, wherein the first electric motor and the second electric motor are stacked one atop the other within a common plane;

a cable winch that is rotatable about a winch axis;

a first drive coupling between the first electric motor and the cable winch; and

a second drive coupling between the second electric motor and the cable winch, wherein the cable winch includes a winch shaft disposed along the winch axis, the winch shaft including a first end coupled to the first drive coupling and a second end coupled to the second drive coupling and a longitudinal length of the assembly including both the first electric motor, the second electric motor and the cable winch is between 3¾ and 4¼ times a greatest width of the assembly in a direction parallel to the winch axis.

13. The stage hoist motor assembly as recited in claim 12, wherein the assembly is of a height that is between 1¾ and 2¼ the greatest width.

14. The stage hoist motor assembly as recited in claim 13, wherein the height is twice the greatest width and the length is four times the greatest width.

15. The stage hoist motor assembly as recited in claim 13, wherein the first brake operates as a primary brake and the second brake operates as a secondary brake to control operation of the winch.

16. The stage hoist motor assembly as recited in claim 14, wherein the first drive coupling and the second drive coupling are disposed at an angle relative to the winch axis.

17. The stage hoist motor assembly as recited in claim 16, including a first gearbox driven by the first electric motor and coupled to the first drive coupling and a second gearbox driven by the second electric motor and coupled to the second drive coupling.

18. The stage hoist motor assembly as recited in claim 17, wherein each of the first gearbox and the second gearbox include the same gear reduction gear ratio.

19. The stage hoist motor assembly as recited in claim 12, including a controller programmed to govern operation of the first electric motor, the second electric motor, the first brake and the second brake.

* * * * *