United States Patent [19]

Noly

[11] **3,886,255**

[45] **May 27, 1975**

[54] **DEVICE INCLUDING A PULLEY, A CLUTCH, A RETARDER, AND A BRAKE, IN PARTICULAR FOR HOISTING GEARS**

[75] Inventor: **Jean Noly,** La Clayette, France

[73] Assignee: **Potain,** Chevilly, Larue (Val de Marne), France

[22] Filed: **Apr. 20, 1973**

[21] Appl. No.: **353,175**

[30] **Foreign Application Priority Data**

Apr. 21, 1972 France 14944/72

[52] **U.S. Cl.** **310/94;** 310/105; 310/77

[51] **Int. Cl.** **H02k 49/02**

[58] **Field of Search** ..... 310/92–101, 310/76, 77, 105, 103; 192/12 D

[56] **References Cited**

UNITED STATES PATENTS

2,233,060	2/1941	Parvin	310/96
2,289,330	7/1942	Fischer et al.	310/105 X
2,630,467	3/1953	Winther	310/105 X
2,636,138	4/1953	Few et al.	310/94 X
2,806,967	9/1957	Eck et al.	310/94 X
2,809,312	10/1957	Eck et al.	310/94

Primary Examiner—Donovan F. Duggan

Attorney, Agent, or Firm—Sughrue, Rothwell, Mion, Zinn & Macpeak

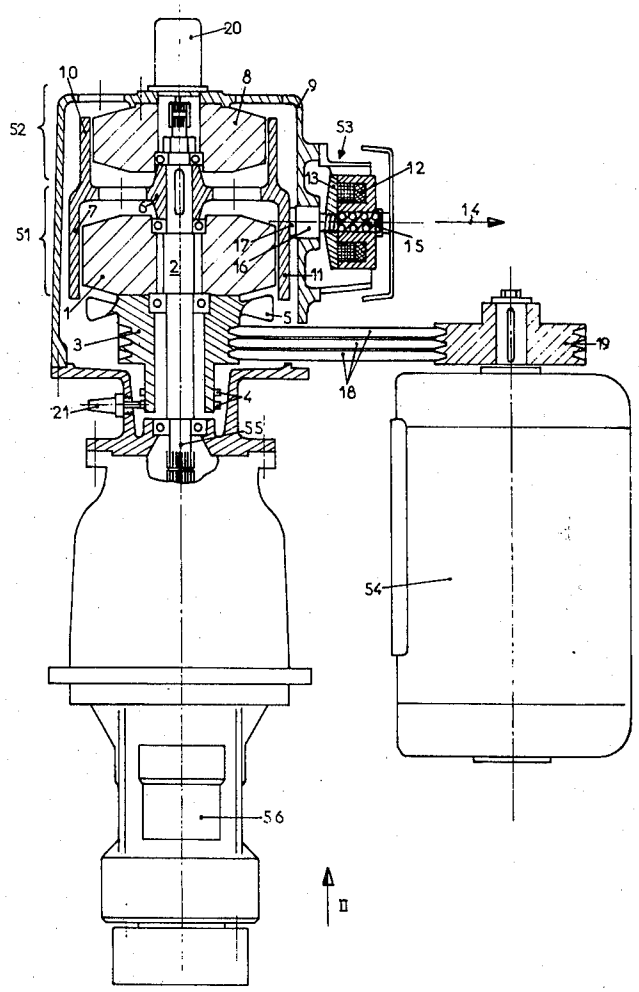
[57] **ABSTRACT**

The invention relates to an adjustable speed driving device.

The motor 54 drives directly the inductor **1** of an eddy current clutch **51.** The double bell **7–10** is keyed to the adjustable speed output shaft **2.** The skirt **10** rotates round the stationary inductor **8** of the eddy current brake. A safety brake **53** is locked by the spring **15** when the electromagnet **12** is off.

Application: one-piece device for handling a load on a crane or a travelling crane.

1 Claim, 3 Drawing Figures



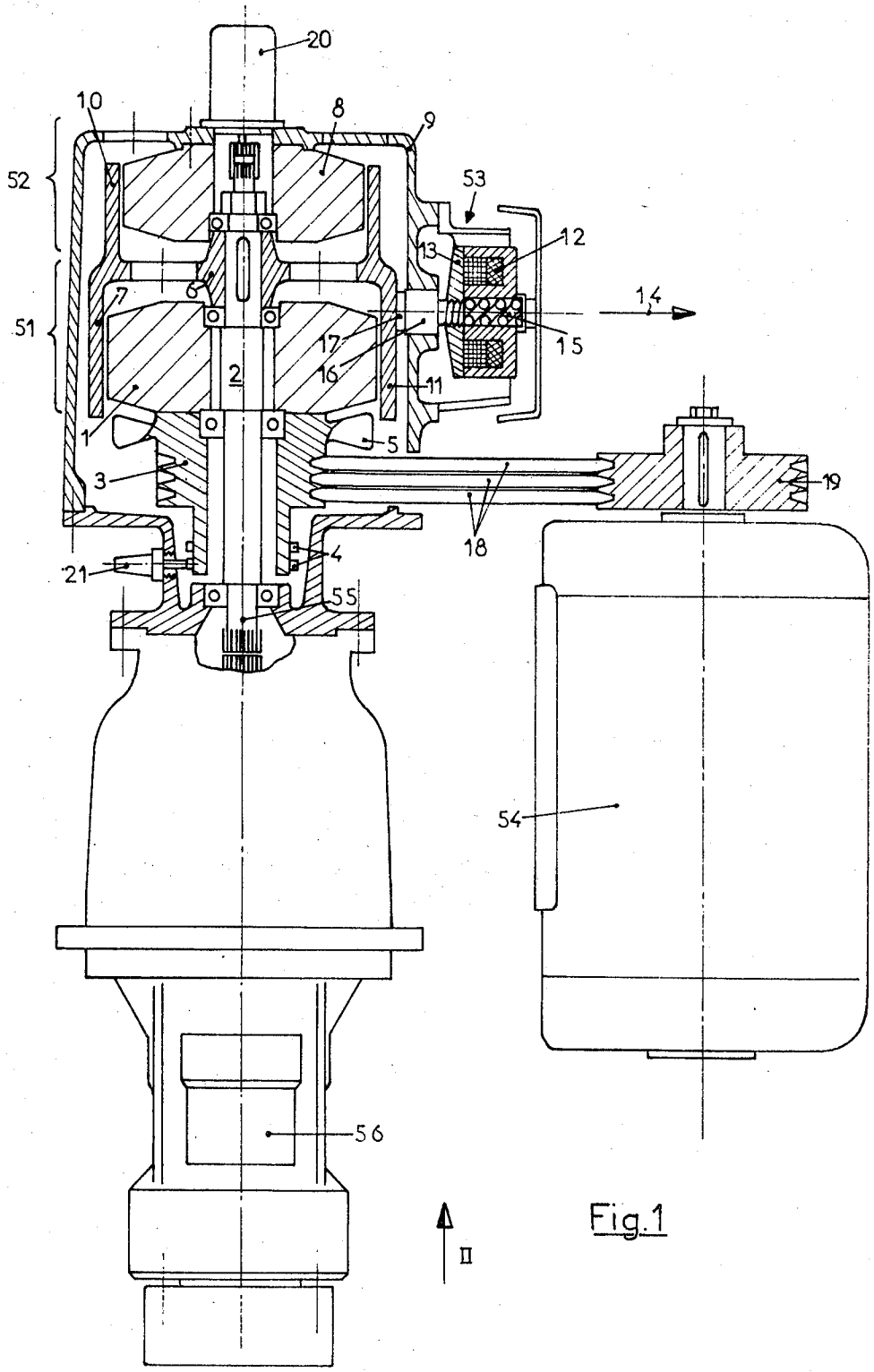


Fig.1

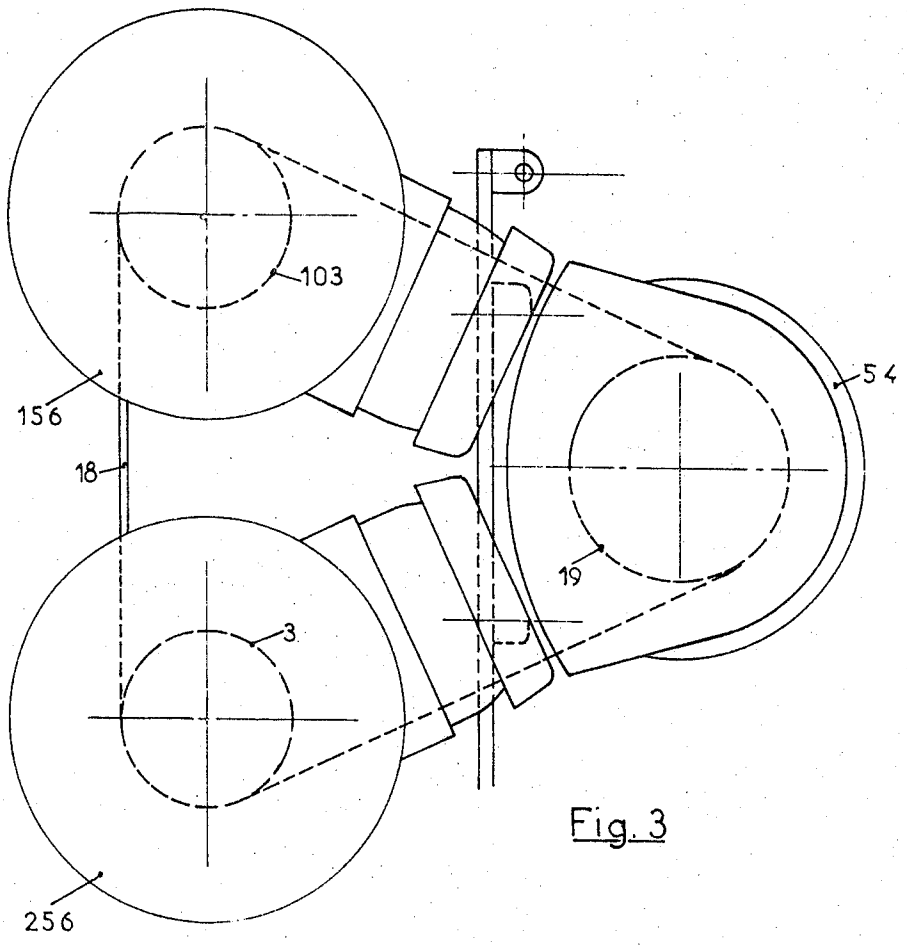


Fig. 3

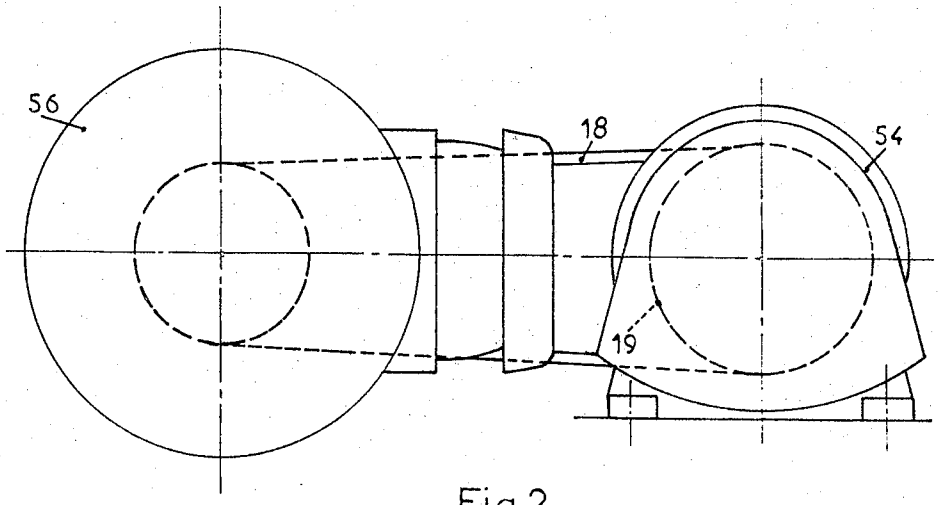


Fig. 2

DEVICE INCLUDING A PULLEY, A CLUTCH, A RETARDER, AND A BRAKE, IN PARTICULAR FOR HOISTING GEARS

The invention relates to a device of a new type, comprising a pulley, a clutch, a retarder, and a brake, and intended to be fitted to a hoisting gear, such as a crane, a travelling crane, or an elevator.

It is known that a crane or a travelling crane must be provided with one or more winches for controlling lifting or handling cables, and one or more driving gears for angular settings. To this end, it is known to use motor units provided with coupling, braking, or speed varying devices. Such devices are used separately, and mounting them on a crane or a travelling crane requires the provision of assembling and synchronizing systems. Furthermore, the whole assembly is subject to failures, and the maintenance thereof is difficult.

The object of the present invention is to obviate such inconveniences.

A driving device according to the invention is characterized in that it appears as a one-piece variable speed unit comprising the combination of an eddy current clutch, an eddy current retarder, and a safety brake.

The attached drawing, given by way of non-limiting example, will enable the features of the invention to be better understood.

FIG. 1 is a partly sectional general view of a variable speed driving device according to the invention.

FIG. 2 is a front view of same, when looking in the direction of the arrow II in FIG. 1.

FIG. 3 is a similar view of a modified embodiment, wherein a single electric motor drives two variable speed systems.

The driving gear shown in FIGS. 1 and 2 includes three main members, to wit:

an eddy current clutch **51**;

an eddy current retarder **52**;

a safety brake **53**.

The assembly is driven by an electric motor **54**.

Said motor **54** runs at constant speed (such as, for instance, 1500 rpm). From the motor **54** the mechanism **51–52–53** according to the invention enables the output shaft **55** to be rotated at a variable speed, said shaft driving a system **56**.

The eddy current clutch **51** includes:

a rotary inductor **1**, adapted to rotate freely on a shaft **2**, and integral with a driving pulley **3**;

two rings **4** for the supply of electric current to the inductor **1**;

a fan **5** for cooling the assembly;

a double bell, the hub **6** of which is keyed to the shaft **2**,

while one of its skirts, that indicated at **7**, surrounds the inductor **1**, around which it defines a gap.

The eddy current retarder includes:

a stationary inductor **8**, integral with the casing **9** of the unit (said inductor **8** is power supplied);

a skirt **10** of the double bell; said skirt **10** surrounds the stationary inductor **8**, around which it defines a gap.

The safety brake includes:

a cylindrical friction surface **11** defined on the outer wall of the skirt **7** of the double bell;

a coiled electromagnet **12**, fixedly mounted on the casing **9**;

a movable armature **13**, capable of being attracted in the direction of the arrow **14** when the coil **12** is alive, or of being repelled in the opposite direction by a return spring **15** when the coil **12** is off;

a braking shoe **16** integral with the movable armature **13**; said shoe **16** is provided with a friction lining **17** adapted to come and bear upon the surface **11** of the double bell **6–7–10**.

Endless belts **18** connect the multi-groove pulley **3** of the unit to the pulley **19** of the driving motor **54**.

The end **55** of the shaft **2** drives the driven system **56**.

A tachymetric dynamo **20** is mounted on the opposite end of the shaft **2**, that is, that end which corresponds to the stationary inductor **8**, whereby the speed of rotation of said shaft **2** can be controlled.

The operation is as follows:

The pulley **19** of the motor **54** rotates at constant speed. It drives the inductor **1** of the clutch **51**, at constant speed as well. The rings **4** are supplied with electric current through the brushes **21**, and the electric field thus produced rotates the skirt **7** of the double bell, which transmits the motion to the system **56** through the shaft **2**.

When the speed selected has been reached, the current in the inductor **1** is reduced till the torque produced balances the resisting torque: the speed of the output shaft **55** is then stable.

It is possible to modify said speed at will:

either by reducing or increasing the current in the inductor **1** of the clutch **51**,

or by feeding the eddy current brake or retarder **52** at a suitable value.

Upon slowing down, the current is interrupted in the inductor **1** of the clutch, and set at a suitable value in the inductor **8** of the retarder. This arrangement is used, for instance, when the assembly is used for slowing down the fall of a load coming down under its own weight, or for slowing down the jib of a rotating crane.

Reversing the direction of rotation of the shaft **2** is obtained by reversing the motor **54**.

The speed can be regulated either manually or automatically.

Said regulation is manual when acting on a double potentiometer, one branch of which supplies the inductor **1** of the clutch **51**, while the other branch supplies the inductor **8** of the retarder **52**. The electric connections are made in a way such that the current in the inductor **1** of the clutch **51** increases when the current in the inductor **8** of the retarder **52** decreases.

The regulation is automatic if the correction of the currents in the inductors **1** and **8** is ensured, under electronic control, from the difference between the theoretical speed selected for the shaft **2** and the speed indication actually measured by the techymetric dynamo **20**.

During all the operation steps just described, the electromagnet **12** is kept alive, that is, the brake **53** is released (lining **17** spaced from the friction surface **11**).

On the other hand, when it is wanted to stop the system **56**, it is only necessary to cut off the supply to the electromagnet **12**: the spring then automatically ensures the locking of the skirt **7** by the friction lining **17**.

The motor **54** may be used for driving a single operative system **56**, as shown in FIGS. **1** and **2**. It may be used as well for driving with adjustable speed two systems **156** and **256**, as shown in FIG. **3**. To this end, it is only necessary to make the endless belts **18** run along

a triangular path between the pulleys **19** and **3**, and the pulley **103** corresponding to the system **156**.

In every case, the safety brake **53** is clamped automatically in the event of a lack of electric current.

I claim:

1. An eddy current coupling device, comprising:

a. a rigid, generally cylindrical housing,

b. a central shaft journaled for rotation in the housing,

c. a double bell rigidly secured to the shaft and having a central web and cylindrical, coaxial, first and second bell skirts integral at their one ends with the web and axially aligned with the shaft,

d. a retarder inductor coil rigidly secured to the housing, surrounding the shaft, and substantially completely disposed within the first bell skirt and defining an air gap therebetween,

e. a driven member rotatably mounted to the shaft,

f. a constant speed drive motor having an output shaft,

g. means drivably coupling the output shaft to the driven member,

h. a driver inductor coil rigidly secured to the driven member, rotatably secured to and surrounding the shaft, and substantially completely disposed within the second bell skirt and defining an air gap therebetween,

i. slip ring means surrounding the shaft and rotatable with the driver inductor coil for delivering electrical energy thereto, and

j. an electromechanical safety brake mounted to the housing and including a brake shoe adapted to bear against one of the bell skirts upon actuation.

* * * * *