E. W. McCALLISTER.

POWER DEVELOPING APPARATUS.

APPLICATION FILED AUG 8, 1919. RENEWED JUNE 18, 1921.

1,402,875. Patented Jan. 10, 1922.

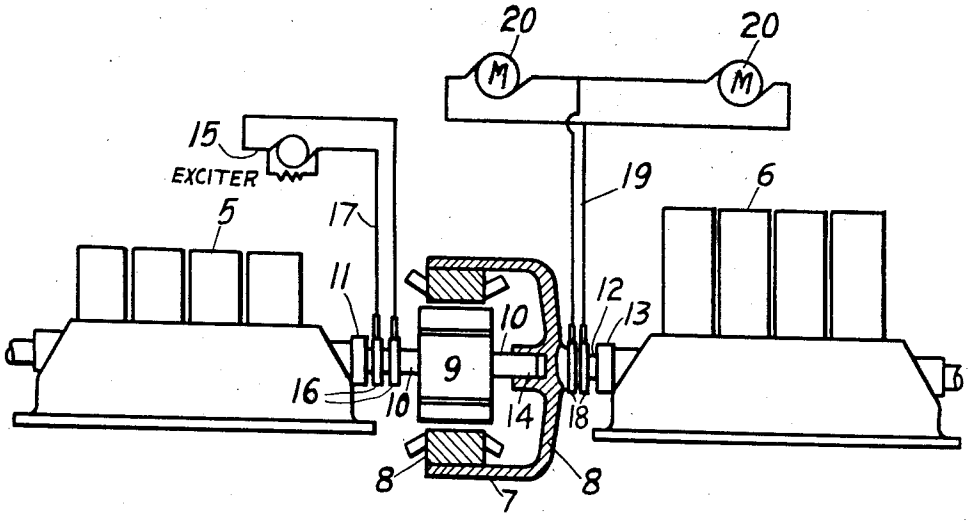


Fig. 1

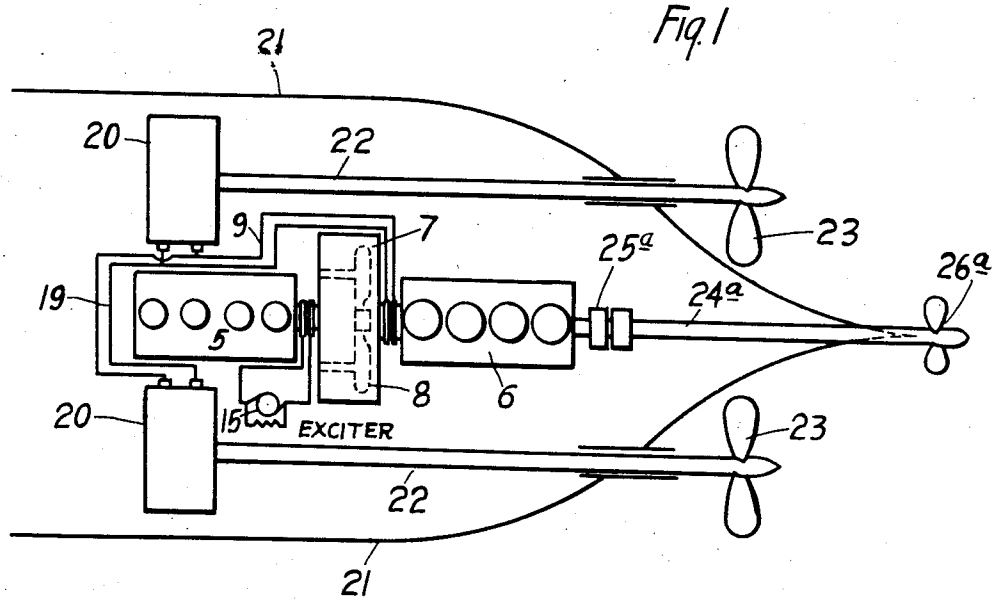


Fig. 2

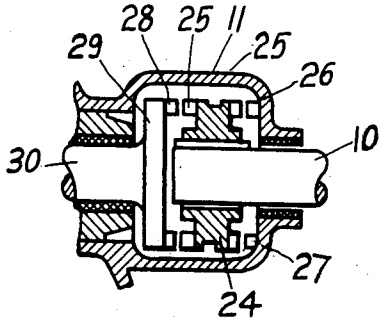


Fig. 3

INVENTOR.

E. W. McCallister

UNITED STATES PATENT OFFICE.

EDGAR W. McCALLISTER, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING CO., A CORPORATION OF PENNSYLVANIA.

POWER-DEVELOPING APPARATUS.

1,402,875. Specification of Letters Patent. Patented Jan. 10, 1922.

Application filed August 8, 1919, Serial No. 316,242. Renewed June 18, 1921. Serial No. 478,721.

To all whom it may concern:

Be it known that I, EDGAR W. McCALLISTER, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have made a new and useful invention in Power-Developing Apparatus, of which the following is a specification.

This invention relates in general to Diesel engine installations and particularly to a new and improved marine power developing apparatus.

Diesel engines operate most efficiently at a certain predetermined speed and load. If either of these is varied, to any considerable extent, a decrease in efficiency usually results. In marine installations the engines are ordinarily either geared or directly connected to the propeller shafts and consequently the speed of the ship can only be varied by varying the speed of the engines. For example, at cruising speed the engines operate under a relatively light load and at a relatively slow speed, consequently if they are designed to be most efficient under full speed conditions the loss in efficiency due to the operation at cruising speed is objectionable.

An object of my invention is to produce a ship propulsion apparatus in which means are employed for driving the ship at three different speeds under normal load and speed conditions of the operating prime mover.

This and other objects which will be made apparent throughout the further description of my invention are attained by means of apparatus embodying the features herein described and illustrated in the drawings accompanying and forming a part hereof.

In the drawings: Fig. 1 is a diagrammatic sectional view of a Diesel engine installation embodying my invention, a part of the apparatus being shown in section.

Fig. 2 is a diagrammatic plan view of a marine power developing installation embodying the features of my invention.

Fig. 3 is a diagrammatic sectional view of a part of the apparatus illustrated in Fig. 1.

In Fig. 1, I have diagrammatically illustrated two axially aligned Diesel engines 5 and 6, the engine 6 being larger than the engine 5. I have shown an electric generator between the two engines. The generator includes a rotatable armature 8 and a rotatable field structure 9. As shown, the field structure 9 is operatively coupled to the engine 5 by means of the shaft 10 and a clutch 11, and the armature 8 is illustrated as coupled to the engine 6 by means of a shaft 12 and a clutch 13. As shown, the outer end of the shaft 10 of the field structure, is mounted in a bearing 14 formed within the armature structure 8.

As illustrated in Fig. 1, the field structure 9 is electrically connected to the exciter 15 by means of suitable slip rings 16 and wiring 17. The current generated in the armature structure 8 is adapted to be transmitted through suitable slip rings 18 and wiring 19 to motors 20 which may be connected, for example, to propeller shafts, as illustrated in Fig. 2.

In Fig. 2, I have shown such an installation as applied to a ship 21; the same reference numerals are applied to like parts in the two views. As illustrated, each motor 20 is operatively connected to a propeller shaft 22 which drives the propellers 23. I have shown a third propeller shaft 24^a which is adapted to be coupled to the engine 6, by means of a detachable coupling 25^a.

In Fig. 3, I have shown a detailed view of the clutch 11 diagrammatically illustrated in Fig. 1. In the construction shown, a slidable clutch member 24 is feathered on the field structure shaft 10 and is provided with lugs 25 on both sides. At one extremity of the travel of the member 24, the lugs 25 are adapted to engage lugs 26 on the stationary casing 27 of the engine 5, and to thereby hold stationary the shaft 10 and hence the field structure 9. At the other extremity of its travel the lugs 25 on the opposite side of the member 24 are adapted to engage lugs 28 on a flange 29 which, as shown, is integrally formed with the crank shaft 30 of the engine 5. It will, of course, be understood that the clutch 13 between the engine 6 and the armature structure 8 may be of similar construction, so that the armature 8 may also be either locked in place or operatively connected to the crank shaft of the engine.

When operating under normal full load conditions the engines 5 and 6 are driven in opposite directions and are connected respectively to the armature 8 and the field structure 9 by means of the clutches 11 and 13. The exciter 15 delivers current to the

field structure 9 by means of the wiring 17 and the slip rings 16. The current generated by the relative motion of the armature structure 8 and the field structure 9 is delivered through the slip rings 18 and the wiring 19 to the motors 20 which, of course, operate in synchronism with the generator 7. Variations in speed of the motors 20 for the purpose of manoeuvering may be accomplished either by varying the speed of one or both of the engines 5 and 6, or by means of suitable electrical controls.

The engine 6 is designed so that it is capable of developing about twice the power of the engine 5. The fact that these engines are coupled to the same generator makes it necessary for the torque developed by one engine to be substantially equal to that developed by the other, consequently the normal speed of the engine 6 must be approximately twice that of the engine 5 to accomplish the desired result.

At cruising speed the engine 6 may be stopped and the clutch 13 shifted so as to lock the armature structure 8 in place. The engine 5 may then be operated at normal speed and normal load, but as the relative motion of the armature structure 8 and the field structure 9 is greatly reduced, the frequency and hence the normal speed of the motors 20 will be correspondingly reduced.

For intermediate speeds, between cruising and full speed the engine 5 is disconnected from the field structure 9, the field structure being locked stationary, and the engine 6 is coupled to drive the armature structure 8. With this arrangement three speeds are obtained with high efficiency since the prime movers operate under normal conditions of load and speed when in operation.

If desired, the generator 7 and the motors 20 may be of the direct current type, although the drawings illustrate a simple and effective alternating current arrangement. A plurality of engine and generator sets such as that illustrated may be provided, in which case greater flexibility may be obtained for the installation, that is, the number of engines in operation may be more accurately proportioned to the load on the system so as to maintain the highest efficiency in the engines in actual operation.

While I have described and illustrated but one embodiment of my invention, it will be apparent to those skilled in the art that various changes, modifications, additions and omissions may be made in the apparatus described and illustrated without departing from the spirit and scope of the invention as set forth by the appended claims.

What I claim is:

1. In combination in propulsion apparatus, two oppositely rotating prime movers, one adapted to operate at a substantially different speed from the other, a double rotation generator, means for detachably connecting one prime mover to the field and the other to the armature of the generator, means for locking the field or armature stationary, a motor receiving current from said generator, and a propulsion element driven by said motor.

2. In combination in ship propulsion apparatus, two oppositely rotating internal combustion engines, one adapted to operate at a substantially different speed from the other, a double rotation electric generator, means for detachably connecting one engine to the field and the other to the armature of the generator, means for locking the field stationary and means for locking the armature stationary, a motor receiving current from said generator and a propeller driven by said motor.

3. In combination in ship propulsion apparatus, a double rotation generator, an internal combustion engine detachably coupled to one of the relatively rotatable elements of said generator, a second engine of materially greater power detachably coupled to the oppositely rotating element of the generator, a motor electrically connected to the generator, a propeller shaft driven by the motor and means for holding one or the other of the oppositely rotating elements of the generator stationary.

In testimony whereof I have hereunto subscribed my name this 29th day of July, 1919.

EDGAR W. McCALLISTER.