Oct. 21, 1941. J. H. DORAN 2,260,010

MARINE TURBINE CONDENSER AND SUPPORTING ARRANGEMENT

Filed Jan. 5, 1939

Fig. 1.

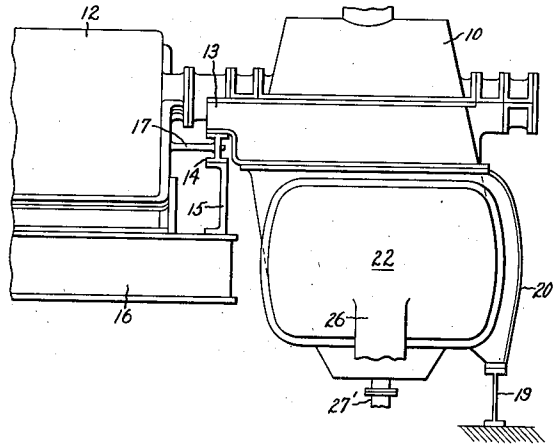
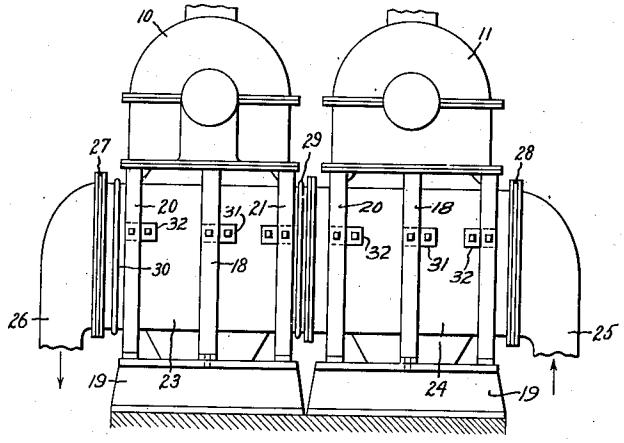


Fig. 2.



Inventor:
John H. Doran,
by Harry E. Dunham
His Attorney.

Patented Oct. 21, 1941 2,260,010

UNITED STATES PATENT OFFICE

2,260,010

MARINE TURBINE CONDENSER AND SUPPORTING ARRANGEMENT

John H. Doran, Scotia, N. Y., assignor to General Electric Company, a corporation of New York

Application January 5, 1939, Serial No. 249,468

3 Claims. (Cl. 60—95)

This invention relates to a condenser and supporting arrangement for elastic fluid turbines and, although it is not necessarily limited thereto, it is particularly applicable for use with a pair of adjacently located low pressure turbine units of a multi-turbine marine drive installation.

In the arrangement of apparatus in the power plant compartment of ships and particularly of naval vessels, it is of prime importance that the available space be used economically. In order that the size of the driving turbines may be kept down to a minimum, it is feasible to divide the turbine into a plurality of relatively small, individual, high speed units. Thus, the low pressure portion of the turbine may be divided into two substantially identical units which may be arranged side by side and connected to a common drive gear and which may also exhaust into a common condenser arranged beneath the turbine units. In order that the expansion movements of the turbine units may take place without disturbing the predetermined alignment of the gearing connections special supporting means must be provided so that the turbine units may shift in the axial direction independently of each other. The condenser which is secured to the exhaust casings of the two turbine units must also be so arranged as to allow for its own expansion movements independently of both turbines and in such a manner as not to affect the expansion movements of the two turbine units.

It is an object of this invention to provide a new and improved arrangement for supporting a pair of condensing turbine units with a common condenser fastened to the two units.

It is a further object of this invention to provide a new and improved arrangement for supporting a pair of condensing turbine units and a common condenser connected to the two units so that expansion movements of the two turbines and of the condenser may take place independently of each other.

It is a still further object of this invention to provide a new and improved condenser arrangement for receiving the exhaust fluid from a pair of superposed condensing turbine units which condenser may expand transversely of the axes of the turbine units without affecting a predetermined axial alignment of the turbine units with respect to other apparatus connected thereto.

In the illustrated embodiment of my invention, two condensing turbine units are rigidly secured at the end adjacent the gear unit to which they are connected, the opposite ends of the turbine units being individually and flexibly mounted so that they are free to move in the longitudinal or axial direction in accordance with temperature variations. A common condenser is transversely arranged beneath said turbines, the drum thereof being rigidly secured to the exhaust casing of said two turbine units, and provided with means whereby expansion movements thereof may take place without unduly stressing the supporting structure of either of the turbine units.

For a consideration of what I believe to be novel and my invention, attention is directed to the following description and the claims appended thereto taken in connection with the accompanying drawing.

In the drawing Fig. 1 is a side elevation of a turbine and condenser arrangement embodying my invention and Fig. 2 is an end view of the arrangement shown in Fig. 1.

Referring to the drawing, a pair of low pressure condensing turbine units 10 and 11 are shown, which are arranged side by side axially parallel with each other and connected to a drive gear arranged in the speed reduction unit indicated at 12. The ends of the turbine units adjacent the gear casing are substantially rigidly fixed with respect to the gear casing in any suitable manner so as to preclude relative movements therebetween which may disturb the predetermined alignment of the turbine shafts with respect to the gearing of the unit 12. For example, the ends 13 of the turbine exhaust casings may be supported upon a transversely extending beam 14 to which the turbine units may be further keyed vertically beneath the axes thereof. The beam 14 may in turn be supported by the standards 15 upon the base 16 of the gear casing. A tie member 17 may be provided between the gear casing 12 and the beam 14 for increasing the rigidity of this end of the turbine units with respect to the gear casing.

The ends of the turbine units remote from the gear unit 12 may be supported by means including members 18 which are vertically arranged and centered with respect to the axis of each turbine unit. The upper end of each of the members 18 is rigidly secured to the exhaust casing of the corresponding turbine unit, the lower end thereof being doweled or otherwise rigidly secured to an I-beam section 19. It is understood that the I-beam sections are arranged at right angles with respect to the axes of the turbine units, the webs thereof being relatively flexible so as to allow relative longitudinal expansion movements of the respective turbine units. The

turbine units are further supported by the members 20 and 21 which are laterally disposed on opposite sides of the central members 18 and while the upper ends of these members are rigidly secured to the exhaust casing of the turbine units, the lower ends are adapted to rest upon the upper flange of the I-beam sections 19 without being rigidly connected thereto. Therefore lateral expansion movements of the turbine casings will be accompanied by a spreading of the feet of the members 20 and 21 while the predetermined alignments of the turbine axes are maintained by the central stationary supports 18.

The common condenser 22 is arranged transversely beneath the two turbine units, the shell thereof being rigidly secured to the exhaust casing of the two turbine units. In the preferred embodiment, the shell is divided into two sections 23 and 24 which may be flanged together between the turbine units and to the headers at the opposite ends thereof. Cooling fluid may be passed into the condenser through the intake 25 and discharged through the outlet 26. In so far as the interior of the condenser is concerned, any suitable arrangement of tubing may be used, the ends of which tubes may be fastened in the tube sheets 27 and 28 clamped between the flanges of the headers and the ends of the adjacent shell sections. Condensate is withdrawn from the condenser through suitable connections such as 27'. The shell of the condenser is provided with an axially flexible expansion absorbing section 29 which extends circumferentially thereof between the two turbine units. By this arrangement expansion movements acting longitudinally of the condenser shell may take place which movements will be absorbed by the section 29 without affecting the predetermined alignment of the turbine units. A second similar expansion absorbing section 30 is provided circumferentially of the condenser shell between the turbine unit 10 and the tube sheet 27 for absorbing expansion movements of the tube bank relative to the shell. The expansible sections may both be formed in the same shell section as indicated which is a simple, yet efficient arrangement.

For increasing the rigidity of the condenser arrangement, the shell sections 23 and 24 may be rigidly fastened in any suitable manner to the central supporting members 18, such as by brackets 31. If desired, the supports 20 and 21 may likewise be suitably fastened, such as by brackets 32, to the condenser shell for assisting in supporting the weight thereof. Since the longitudinal movements of the condenser shell sections will be substantially identical with the transverse expansions of the turbine exhaust casings, the supports 20 and 21 will be spread without their parallel relationship being appreciably disturbed. As the adjacent side supports for the two turbine units move towards each other, the flexible section 29 will collapse by a corresponding amount, the predetermined alignment of the turbine units being unaffected by such shifting movements.

Having described the principle of operation of my invention together with the apparatus which I now consider to represent the best embodiment thereof, I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. The combination comprising a plurality of condensing turbine units, said turbine units being connected to a common gearing, the ends of said turbine units adjacent said gearing being rigidly supported with respect to said gearing in a predetermined axial relation therewith, a foundation, members secured to the foundation in perpendicular alignment with the axes of said turbine units and flexible in axial direction of the units, and means securing the members to the units for supporting a central portion of each of the other ends of said turbine units remote from said gearing so as to allow axial expansion movements of said turbine units independently of each other and for maintaining the axial relation between the units and the gearing, a common condenser for said turbine units including a shell transversely arranged beneath said turbine units, the shell of said condenser being rigidly connected to the exhaust casings of said turbine units, means arranged in said condenser shell whereby the exhaust casings of said turbine units may expand transversely with respect to the axes of said turbine units, and means loosely engaging said members and laterally disposed with respect to the axes of said turbine units for supporting corresponding portions of said units, said last mentioned means being laterally movable in accordance with lateral expansion movements of said turbine exhaust casings without affecting said predetermined axial alignment of said turbine units.

2. Turbine arrangement comprising a turbine casing, a condenser attached to and partly supported on the casing, means rigidly supporting one end of the turbine casing and other means yieldingly supporting the other end of the casing, said other means comprising an I-beam extending transverse to the axis of the turbine, a supporting member securing a central portion of said other casing end to the I-beam, and other supporting members loosely connecting side portions of said other end and said beam to support the casing on the beam and to permit lateral expansion of the casing relative to the beam, at least one of the supporting members being secured to and acting as a support for the condenser.

3. Turbine arrangement comprising two parallel arranged condensing turbines having separate casings and parallel shafts, a single condenser having a shell with two portions and means flexibly connecting said portions, each portion being connected to the exhaust end of one of the casings, means rigidly supporting one end of each casing, and separate means yieldably supporting the other ends of the casings and maintaining the shafts parallel, each of the last-named means comprising a beam extending transverse to the axis of the casing, a member secured to a central end portion of the casing and the beam, and other members engaging opposite side portions of the casing and the beam and permitting relative lateral expansion between the casing and the beam, and means securing each member to the corresponding portion of the shell to act as a direct support for the condenser.

JOHN H. DORAN.