

Aug. 3, 1965

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3,198,162

ENGINE

Filed Dec. 9, 1963

2 Sheets-Sheet 1

FIG. 1.

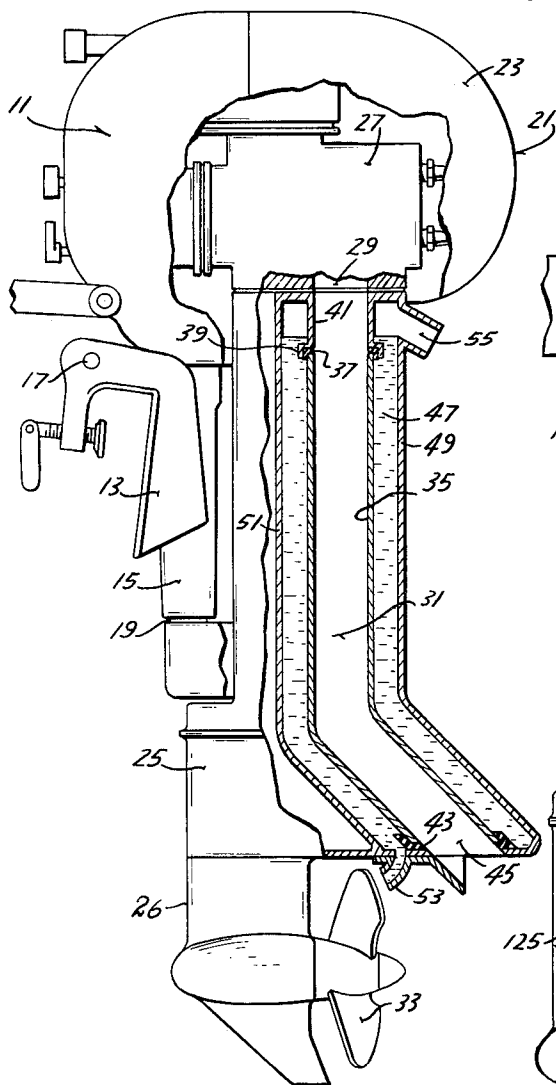
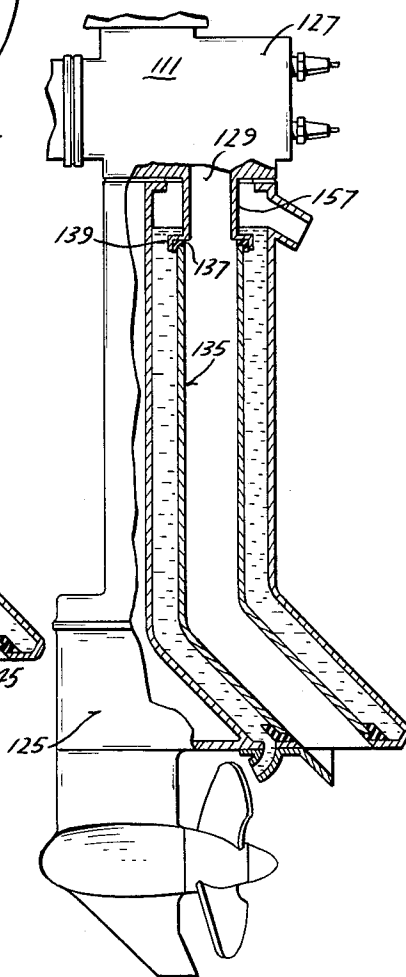


FIG. 2.



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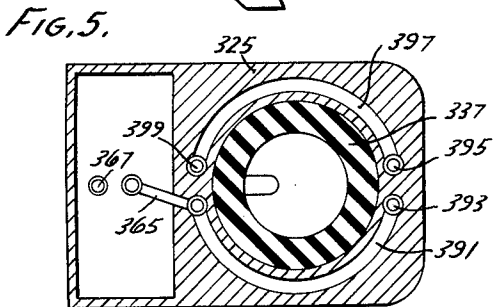
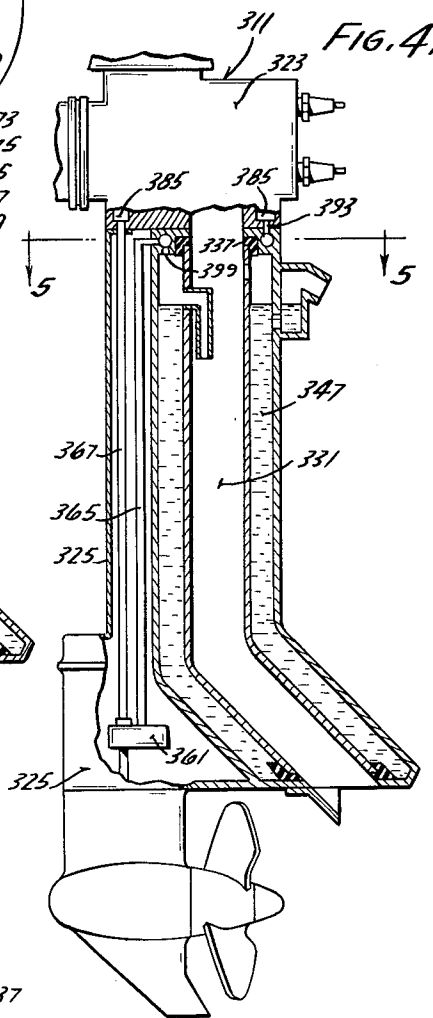
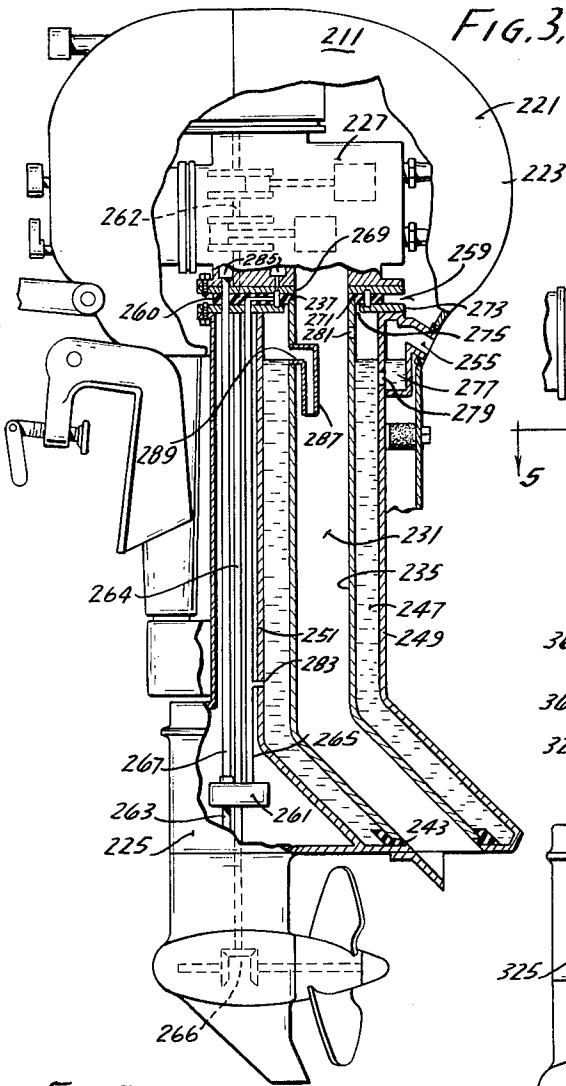
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2 Sheets-Sheet 2



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42 Claims. (Cl. 115-17)

The invention relates to exhaust gas discharge arrange-
ments for marine propulsion devices such as outboard
motors and stern drive units which are powered by an in-
ternal combustion engine.

The invention provides a lower unit including an ex-
haust gas tube which communicates with the exhaust gas
discharge port of the engine and with a lower unit ex-
haust gas outlet and which is isolated by resilient mount-
ings from both the lower unit and the power unit. In
addition, in the preferred embodiment, the exhaust gas
tube is jacketed with a water chamber. The invention
provides various arrangements for supplying water to the
jacket and for discharging water from the jacket, which
arrangements include provision for cooling the resilient
cushions supporting the exhaust gas tube.

The provision of both a water jacket surrounding the
exhaust gas tube, together with the resilient mounting
thereof, serves to isolate the engine exhaust excitations
from the sound radiating surfaces of the lower unit,
thereby providing vibrational and sound isolation between
the exhaust gas tube and the lower unit and producing a
quieter operating device. In addition, the use of a jacketed
exhaust tube serves to reduce the temperature of the
gases flowing through the exhaust gas tube.

Other objects of the invention will become known by
reference to the following description and accompanying
drawings in which

FIG. 1 is a side elevational view, partially broken away
and in section, of an outboard motor embodying various
of the features of the invention;

FIG. 2 is a fragmentary side elevational view, partial-
ly broken away in section, of a second embodiment of an
outboard motor in accordance with the invention;

FIG. 3 is a side elevational view, partially broken away
in section, of another embodiment of an outboard motor
incorporating various of the features of the invention;

FIG. 4 is a fragmentary side elevational view, partial-
ly broken away and in section, of a fourth embodiment
of an outboard motor in accordance with the invention;
and

FIG. 5 is an enlarged sectional view taken along line
5-5 of FIG. 4.

The outboard motor 11 shown in FIG. 1 is representa-
tive of various marine propulsion devices, such as out-
board motors and stern drive units, in which various of
the features of the invention can be embodied. The out-
board motor 11 conventionally includes a transom
bracket 13 to which a swivel bracket 15 is connected for
vertical swinging movement about a horizontal pintle 17.
Carried from the swivel bracket 15 for horizontal or
dirigible swinging movement, by pivot means including a
vertical kingpin 19, is a propulsion unit 21 including a
power head 23 and a lower unit 25. Included in the power
head 23 is an internal combustion engine 27 including
an exhaust gas discharge port 29.

Included in the lower unit 25 is an exhaust gas passage
means in the form of a passage 31 and a part 26 which is
normally submerged in water during operation and which
includes means (not shown) for supporting a propeller 33
and for driving the propeller from the engine 27.

The propulsion unit 21 can be vibrationally isolated
from the swivel bracket 15 in various ways, such as the
arrangements disclosed in the Irgens Patent No. 2,740,368
and in the Watkins Patent No. 3,002,489.

In accordance with the invention, the exhaust gas pas-
sage 31 is formed in part by a sleeve member or tube 35
which is resiliently supported by cushion mounts from the
remainder of the lower unit 25, thereby isolating the lower
unit 25 from any vibration which may be imparted to
the sleeve or tube 35 by the exhaust gas flow. Thus, in
the construction shown in FIG. 1, a cushion 37 is inter-
posed between the upper end of the sleeve 35 and a
flanged ring 39 at the lower end of a tubular portion 41
of the lower unit, which portion communicates with the
engine exhaust gas discharge port 29. As its lower end,
the sleeve 35 is carried by cushion 43 mounted adjacent
to the lower unit exhaust gas outlet 45.

Also provided in the lower unit around the exhaust
gas passage 31 is a water jacket 47 which serves to cool
the passage 31 and to deaden transmission to the lower
unit 25 of the vibration or sound excitations which are
associated with engine exhaust gases. The water jacket is
formed through the cooperation of an outer wall 49 of
the lower unit 25 and a partition 51.

Means are provided for supplying water to the jacket
47 and for discharging water from the jacket. In the
embodiment shown in FIG. 1, such means is in the form
of an opening or scoop 53 communicating with the jacket
47, depending from the lower unit 25 and including an
inlet rearwardly of the propeller 33, whereby propeller
rotation serves to introduce water into the jacket 47
through the scoop 53.

At its upper end, above the cushion 37, the outer wall
49 of the lower unit is provided with means for discharg-
ing or overflowing water from the jacket. In the embodi-
ment shown in FIGURE 1, such means comprises a port
55 from which water supplied to the jacket 47 is dis-
charged. This arrangement has the advantage of provid-
ing coolant convection flow around the exhaust gas pas-
sage 31 and of affording coolant flow into the vicinity of
the cushions 37 and 43 so as to avoid deterioration
thereof.

In the outboard motor 111 shown in FIG. 2, the en-
gine 127 includes an exhaust gas port 129 with an exten-
sion 157 which projects into the lower unit 125 clear of
any contact with the lower unit. At its lower end, the ex-
tension 157 is provided with a flanged ring 139 which car-
ries an upper cushion 137 in which the upper end of a
sleeve 135 is supported. The use of an extension 157
projecting into the lower unit clear of contact therewith
serves to avoid the possibility of transmitting vibration
and sound to the lower unit portion 41 shown in FIG. 1.
In other respects, the construction of the outboard motor
127 is the same as the outboard motor 27 shown in
FIG. 1.

In the outboard motor 211 shown in FIG. 3, the pro-
pulsion unit 221 includes a lower unit 225 and a power
head 223 which are jointed together by a sound and vibra-
tional barrier 259, including a resilient member or pad
260, as disclosed in my copending application entitled
"Engine," Serial No. 328,813. Included in the power head
223 is a crankshaft 262. Also included in the lower
unit 225 are portions of an engine cooling system in-
cluding a conventional water pump 261 driven by a drive-
shaft 264 which is connected to the crankshaft 262 and
to a clutch mechanism 266. The water pump 261 sup-
plies coolant to the engine 227 and communicates with an
inlet line 263, a discharge line 265 and a recirculating
line 267. The driveshaft 262, discharge line 265, and
recirculating line 267 are passed through the barrier 259,
including the resilient member or pad 260, in accordance
with the disclosure of said copending application.

As in the other embodiments, the lower unit 225 in-
cludes an exhaust gas passage 231 including a sleeve 235
which is resiliently supported on its upper and lower ends
by respective cushions 237 and 243. The cushion 243

is mounted in the lower unit 225 in the same manner as the cushion 43 incorporated in the outboard motor 11. However, the cushion 237 constitutes a part of the resilient pad 260 incorporated in the barrier 259. In this regard, the resilient pad includes a gas discharge aperture 269 and, at the lower end thereof, a counterbore 271 which provides a seat for the upper end of the sleeve 235. The pad 260 in the vicinity of the aperture 269 can be cooled by various arrangements, for instance, as by the arrangements disclosed in my said copending application.

The lower mounting plate 273 of the barrier 259 includes an aperture 275 of such size so that there is no contact between the plate 273 and the sleeve 235.

As in the other embodiments, the exhaust gas passage 231 is provided with a water jacket 247 formed by part of the outer wall 249 of the lower unit 225 and a partition 251. However, in the embodiment shown in FIG. 3, an idle relief exhaust arrangement is provided. Specifically, the lower unit is provided with an auxiliary chamber 277 which includes an exhaust port 255 and which, at a point below the bottom of the upper end of the exhaust port, communicates with the water jacket 247 through an aperture 279 in the wall 249 of the lower unit 225. At a point above the normal level of the water in the jacket 247, the sleeve 235 is provided with a port 281 permitting flow of exhaust gas, under idling conditions, into the jacket 247 for flow through the aperture 279 into the auxiliary chamber 277 and out of the exhaust port 255.

As also in the other embodiments, means are provided for supplying water to and discharging water from the jacket. In the embodiment shown in FIG. 3, water is supplied by a branch line 283 which communicates between the water pump discharge line 265 and the water jacket 247 and which is of relatively small cross section as compared to the size of the water pump discharge line 265. Dimensioning of the branch line 283 with a relatively small cross sectional size affords flow to the exhaust gas water jacket 247 while also assuring water flow to the engine cooling jacket 285.

Additional muffling advantages are provided by discharging the water flow from the jacket 247 into the exhaust gas passage 231. Specifically an inverted L-shaped pipe 287 is mounted on the sleeve 235 and communicates between the water jacket 247 and the interior of the passage 231. The leg 289 of the pipe is located so as to establish a normal water level in the water jacket 247 below the bottom of the upper end of the port 255 and slightly above the aperture 279, thereby normally providing for a small depth of water through which the engine exhaust passes under idling conditions. In the event that the pipe 287 becomes blocked, the disclosed construction permits discharge from the water jacket 247 through the aperture 279, chamber 277 and the port 255.

While the outboard motor 211 is shown in FIG. 3 with a recirculating type of engine cooling system, the advantages of the invention can also be obtained when using either of the so-called bypass or restriction types and when using other coolant passage arrangements in the vicinity of the aperture 269, as disclosed for instance, in said copending application.

In the outboard motor 311 shown in FIG. 4, the lower unit 325 is directly connected to the power head 323 and the upper cushion 337 is located in the lower unit 325 immediately below this connection. Cooling of the cushion 337 is provided by coolant flow to and from the engine water jacket 385 through water passages in the lower unit 325 generally surrounding the upper cushion 337. Specifically, the discharge line 365 from the water pump 361 communicates with a first arcuate passage 391 which, in turn, communicates with another bore or passage 393 extending through the connection between the lower unit 325 and the power head 323 for communication with the engine water jacket 385.

Water discharge from the engine water jacket 385 for recirculation returns to the pump through the recirculating line 367. Water discharged from the engine water jacket 385 for discharge from the motor 311 travels through a discharge port in communication with a bore or passage 395 (see FIG. 5) which passes through the connection between the lower unit 325 and the power head 323 and which communicates with a second arcuate passage 397 around the cushion 337. In turn, the arcuate passage 397 communicates with a port or passage 399 which drains the discharge from the engine water jacket 385 into the water jacket 347 surrounding the exhaust gas passage 331. Thus, in the embodiment shown in FIG. 4, water for the jacket 347 surrounding the exhaust gas passage 331 is provided by the discharge flow from the engine water jacket 385. This flow also serves to assist in cooling the cushion 337. Water is drained from the jacket 347 in the same manner as in the outboard motor 211 shown in FIG. 3. Other arrangements such as, for example, the passages disclosed in my said copending application, can be employed to cool the upper cushion 337.

Various of the features of the invention are set forth in the following claims.

What is claimed is:

1. In a marine propulsion device, an engine having an exhaust gas discharge port, and a lower unit including exhaust gas passage means communicating with said exhaust gas discharge port of said engine, said gas passage means including an exhaust gas tube, and resilient means interposed between said tube and said exhaust gas discharge port, whereby said gas tube is free of rigid connection with said engine.

2. In a marine propulsion device comprising an engine having a water discharge port, a lower unit including an exhaust gas passage means including an outlet opening and an exhaust gas tube communicating with said outlet opening and with said exhaust discharge port of said engine, resilient means supporting said tube interposed between said tube and said exhaust gas discharge port, means defining a water jacket surrounding said tube, water inlet means communicating with said water jacket, and water discharge means communicating with said water jacket.

3. In an outboard motor, the combination of a power head including an internal combustion engine having an exhaust gas discharge port, a lower unit, means resiliently connecting said lower unit and said power head, exhaust gas passage means in said lower unit communicating with said exhaust gas discharge port and including an outlet below said power head, and an exhaust gas tube communicating with said discharge port and said outlet, and resilient means supporting said tube in said lower unit and interposed between said exhaust gas discharge port and said tube.

4. An outboard motor in accordance with claim 3 wherein said resilient means supporting said tube and interposed between said exhaust gas discharge port and said tube includes a part of said means resiliently connecting said lower unit and said power head.

5. An outboard motor in accordance with claim 3 in further combination with means in said lower unit defining a water jacket surrounding said tube, water inlet means in said lower unit communicating with said water jacket, and water discharge means in said lower unit communicating with said water jacket.

6. In an outboard motor, the combination of a power head including an internal combustion engine having an exhaust gas discharge port with an extension, a lower unit connected to said power head with said extension projecting into said lower unit, free of contact therewith, said lower unit including exhaust gas passage means comprising an outlet opening below said power head, and an exhaust gas tube communicating with said extension and said outlet, resilient support means connecting the upper

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end of said tube and said extension, and resilient support means connecting the lower end of said tube and said outlet.

7. An outboard motor in accordance with claim 6 in further combination with means defining a water jacket surrounding said tube and said support means, water inlet means communicating with said water jacket, and water discharge means communicating with said water jacket.

8. In a marine propulsion device, an engine having an exhaust discharge port, and a lower unit including exhaust gas passage means communicating with said exhaust gas discharge port, said exhaust gas passage means including an exhaust gas tube, resilient means interposed between said tube whereby said gas tube is free of rigid connection with said engine, and said exhaust gas discharge port, and coolant passage means in adjacent location to said resilient means.

9. In a marine propulsion device, an engine having an exhaust gas discharge port and a lower unit including exhaust gas passage means communicating with said exhaust gas discharge port, said gas passage means including an exhaust gas tube, resilient means interposed between said tube and said exhaust gas discharge port, whereby said gas tube is free of rigid connection with said engine, and means defining a water jacket in said lower unit in surrounding relation to said tube.

10. A marine propulsion device comprising an engine having an exhaust gas discharge port, a lower unit including an exhaust gas passage means including an outlet opening and an exhaust gas tube communicating with said outlet opening and with said exhaust gas discharge port, resilient means interposed between said tube and said exhaust gas discharge port, whereby said gas tube is free of rigid connection with said engine, means defining a water jacket surrounding said tube, water inlet means communicating with said water jacket, and water discharge means communicating through said tube between said water jacket and said exhaust gas passage means.

11. A marine propulsion device comprising an engine having an exhaust gas discharge port, a lower unit including an exhaust gas passage means including an outlet opening, and an exhaust gas tube communicating with said opening and with said exhaust gas discharge port, resilient means interposed between said tube and said exhaust gas discharge port, means defining a water jacket surrounding said tube, water inlet means communicating with said water jacket, water discharge means communicating with said water jacket, and a port communicating with the atmosphere and with said water jacket, said port including means above said water discharge means to allow drainage from said water jacket in the event of blockage of said water discharge means.

12. In an outboard motor, the combination of a power head including an integral combustion engine having a water jacket and an exhaust gas discharge port, a lower unit connected to said power head, exhaust gas passage means in said lower unit communicating with said exhaust gas discharge port and including an outlet below said power head, and an exhaust gas tube communicating with said discharge port and said outlet, resilient means interposed between said tube and said exhaust gas discharge port, a water jacket surrounding said exhaust gas tube, and a water pump carried by said lower unit and communicating separately with said engine water jacket and said water jacket surrounding said exhaust gas tube.

13. An outboard motor in accordance with claim 12 wherein water discharge means communicates through said exhaust gas tube for discharge of coolant through said exhaust passage means.

14. In an outboard motor, the combination of a power head including an internal combustion engine having an exhaust gas discharge port, a lower unit connected to said power head, exhaust gas passage means in said lower unit

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communicating with said exhaust gas discharge port and including an outlet below said power head, and an exhaust gas tube communicating with said discharge port and said outlet, and resilient means interposed between said tube and said exhaust gas discharge port, a water jacket surrounding said tube, water inlet means in said lower unit communicating with said water jacket, and water discharge means in said lower unit communicating with said water jacket and located above said water inlet means.

15. In a marine propulsion device, the combination of an engine including an exhaust gas discharge port, and a lower unit including exhaust gas passage means, said exhaust gas passage means including an outlet, an exhaust gas tube, and means mounting said tube in said lower unit free of rigid connection with said engine and in communication with said outlet and said engine exhaust gas discharge port, and means defining a water jacket surrounding said exhaust gas tube.

16. In a marine propulsion device, the combination of an engine including an exhaust gas discharge port and a water jacket, said water jacket having a discharge port, and a lower unit including exhaust gas passage means, said exhaust gas passage means including an outlet, an exhaust gas tube, and means mounting said tube in said lower unit free of rigid connection with said engine and in communication with said outlet and said engine exhaust gas discharge port, and means defining a water jacket surrounding said exhaust gas tube and communicating with said water jacket discharge port, said means defining a water jacket including means affording discharge of water from said jacket at a point spaced substantially above the bottom of said jacket.

17. An outboard motor comprising a transom bracket, a swivel bracket connected to said transom bracket for pivotal movement about a horizontal axis, and a propulsion unit connected to said swivel bracket for pivotal movement about a generally upright axis, said propulsion unit comprising an engine and a lower unit, said engine including an exhaust gas discharge port, said lower unit including exhaust gas passage means, said exhaust gas passage means including an outlet, an exhaust gas tube, and means mounting said tube in said lower unit in communication with said outlet and said exhaust gas discharge port, and means defining a water jacket surrounding said exhaust gas tube and extending within said lower unit from below to above the lower end of said swivel bracket.

18. An outboard motor comprising a transom bracket, a swivel bracket connected to said transom bracket for pivotal movement about a horizontal axis, and a propulsion unit connected to said swivel bracket for pivotal movement about a generally upright axis, said propulsion unit comprising an engine and a lower unit, said engine including an exhaust gas discharge port, said lower unit including exhaust gas passage means, said exhaust gas passage means including an outlet, an exhaust gas tube, and means mounting said tube in said lower unit in communication with said outlet and said exhaust gas discharge port, means defining a water jacket surrounding said exhaust gas tube and extending within said lower unit, and means affording overflow of water from said jacket at a point spaced substantially above the bottom of said jacket.

19. An outboard motor comprising a transom bracket, a swivel bracket connected to said transom bracket for pivotal movement about a horizontal axis, and a propulsion unit connected to said swivel bracket for pivotal movement about a generally upright axis, said propulsion unit comprising an engine and a lower unit, said engine including an exhaust gas discharge port, said lower unit including exhaust gas passage means, said exhaust gas passage means including an outlet, an exhaust gas tube, and means mounting said tube in said lower unit in communication with said outlet and said exhaust gas dis-

charge port, and means defining a water jacket surrounding said exhaust gas tube and extending within said lower unit from below to above the lower end of said swivel bracket, said means defining a water jacket including means affording discharge of water from said jacket at a point spaced substantially above the lower end of said swivel bracket.

20. An outboard motor comprising a transom bracket, a swivel bracket connected to said transom bracket for pivotal movement about a horizontal axis, and a propulsion unit connected to said swivel bracket for pivotal movement about a generally upright axis, said propulsion unit comprising an engine and a lower unit, said engine including an exhaust gas discharge port, said lower unit including exhaust gas passage means, said exhaust gas passage means including an outlet, an exhaust gas tube, and means mounting said tube in said lower unit free of rigid connection with said engine and in communication with said outlet and said exhaust gas discharge port, and means defining a water jacket surrounding said exhaust gas tube and extending within said lower unit from below to above the lower end of said swivel bracket, said means defining water jacket including means affording discharge of water from said jacket at a point spaced substantially above the bottom of said jacket.

21. An outboard motor comprising a transom bracket, a swivel bracket connected to said transom bracket for pivotal movement about a horizontal axis, and a propulsion unit connected to said swivel bracket for pivotal movement about a generally upright axis, said propulsion unit comprising an engine and a lower unit, said engine including an exhaust gas discharge port and a water jacket, said water jacket having a discharge port, said lower unit including exhaust gas passage means, said exhaust gas passage means including an outlet, an exhaust gas tube, and means mounting said tube in said lower unit in communication with said outlet and said exhaust gas discharge port, and means defining a water jacket surrounding said exhaust gas tube and extending within said lower unit from below to above the lower end of said swivel bracket, said means defining a water jacket including means affording communication with said engine water jacket discharge port, and means affording discharge of water from said jacket at a point spaced substantially above the bottom of said jacket.

22. An outboard motor comprising a transom bracket, a swivel bracket connected to said transom bracket for pivotal movement about a horizontal axis, and a propulsion unit connected to said swivel bracket for pivotal movement about a generally upright axis, said propulsion unit comprising an engine and a lower unit, said engine including an exhaust gas discharge port and a water jacket, said water jacket having a discharge port, said lower unit including exhaust gas passage means, said exhaust gas passage means including an outlet, an exhaust gas tube, and means mounting said tube in said lower unit free of rigid connection with said engine and in communication with said outlet and said exhaust gas discharge port, and means defining a water jacket surrounding said exhaust gas tube and extending within said lower unit from below to above the lower end of said swivel bracket, said means defining a water jacket including means affording communication with said engine water jacket discharge port, and means affording discharge of water from said jacket at a point spaced substantially above the bottom of said jacket.

23. In a marine propulsion device, the combination of an engine including a crank shaft and an exhaust gas discharge port, and a lower unit including a vertically extending drive shaft connected to said crank shaft, and exhaust gas passage means, said exhaust gas passage means including an outlet, an exhaust gas tube, and means mounting said tube in said lower unit free of rigid connection with said engine and in communication with said outlet and said engine exhaust gas discharge port, and

means defining a water jacket surrounding said exhaust gas tube and located in spaced relation to said drive shaft.

24. In a marine propulsion device, the combination of an engine including an exhaust gas discharge port, and a lower unit including exhaust gas passage means, said exhaust gas passage means including an outlet, an exhaust gas tube communicating with said outlet and said engine exhaust gas discharge port, and means defining a water jacket surrounding said exhaust gas tube and including water discharge means located in an upper part of said jacket.

25. In a marine propulsion device, the combination of an engine including an exhaust gas discharge port and a lower unit including exhaust gas passage means, said exhaust gas passage means including an outlet, an exhaust gas tube communicating with said outlet and said engine exhaust gas discharge port, and means defining a water jacket surrounding said exhaust gas tube and including water overflow means establishing a normal level of water in said jacket.

26. In a marine propulsion device, the combination of an engine including an exhaust gas discharge port and a lower unit including exhaust gas passage means including an outlet, and an exhaust gas passage means, said exhaust gas tube communicating with said outlet and said engine exhaust gas discharge port, means defining a water jacket surrounding said exhaust gas tube and including water overflow means establishing the normal level of water in said jacket, and an idle exhaust gas relief means including a wall portion in said lower unit having therein means defining an aperture communicating with said water jacket below said normal water level.

27. In a marine propulsion device, the combination of an engine including an exhaust gas discharge port, and a lower unit including exhaust gas passage means, said exhaust gas passage means including an outlet, an exhaust gas tube communicating with said outlet and said engine exhaust gas discharge port, and means resiliently mounting the lower end of said tube in said lower unit, and means defining a water jacket surrounding said exhaust gas tube.

28. In a marine propulsion device, the combination of an engine including an exhaust gas discharge port and a lower unit including exhaust gas passage means, said exhaust gas passage means including an outlet, an exhaust gas tube communicating with said outlet and said engine exhaust gas discharge port, and means resiliently mounting the lower end of said tube in said lower unit, and means defining a water jacket surrounding said exhaust gas tube and including an aperture adjacent the lower end of said jacket.

29. In a marine propulsion device, the combination of an engine including an exhaust gas discharge port, and a lower unit including exhaust gas passage means, said exhaust gas passage means including an outlet, an exhaust gas tube communicating with said outlet and said engine exhaust gas discharge port, and means resiliently mounting the upper end of said tube, and means defining a water jacket surrounding said exhaust gas tube.

30. In a marine propulsion device, the combination of an engine including an exhaust gas discharge port, and a lower unit including a part normally submerged in water during normal operation, exhaust gas passage means including an outlet located in said part, and an exhaust gas tube communicating with said outlet and said engine exhaust gas discharge port, and means defining a water jacket surrounding said exhaust gas tube and extending upwardly from adjacent to said part normally submerged in water.

31. In a marine propulsion device, the combination of an engine including an exhaust gas discharge port, and a lower unit including a part normally submerged in water during normal operation, and exhaust gas passage means, said exhaust gas passage means including and an

outlet located in said part, an exhaust gas tube communicating with said outlet and said engine exhaust gas discharge port, and means defining a water jacket surrounding said exhaust gas tube and extending upwardly from adjacent to said part normally submerged in water, said water jacket including an opening adjacent the lower end thereof.

32. In a marine propulsion device, the combination of an engine including an exhaust gas discharge port and a lower unit including a part normally submerged in water, and an exhaust gas passage means, said exhaust gas passage means including an outlet, and a free standing exhaust gas tube in communication with said outlet and said engine exhaust gas discharge port, said tube extending upwardly in said lower unit from adjacent to said normally submerged part, and means defining a water jacket surrounding said exhaust gas tube.

33. In a marine propulsion device, the combination of an engine including an exhaust gas discharge port, and a lower unit including exhaust gas passage means, said exhaust gas passage means including an outlet, an exhaust gas tube, and means resiliently mounting said tube in said lower unit and in communication with said outlet and said engine exhaust gas discharge port, means defining a water jacket surrounding said exhaust gas tube, and means defining an aperture in said tube communicating with said water jacket.

34. An outboard motor comprising a transom bracket, a swivel bracket connected to said transom bracket for pivotal movement about a horizontal axis, and a propulsion unit connected to said swivel bracket for pivotal movement about a generally upright axis, said propulsion unit comprising an engine and a lower unit, said engine including an exhaust gas discharge port and a crank shaft, said lower unit including a drive shaft connected to said crank shaft, exhaust gas passage means including an outlet, an exhaust gas tube, and means mounting said tube in said lower unit in communication with said outlet and said exhaust gas discharge port, and means defining a water jacket surrounding said exhaust gas tube and extending upwardly within said lower unit from below the lower end of said swivel bracket and in spaced relation to said drive shaft.

35. An outboard motor comprising a transom bracket, a swivel bracket connected to said transom bracket for pivotal movement about a horizontal axis, and a propulsion unit connected to said swivel bracket for pivotal movement about a generally upright axis, said propulsion unit comprising an engine and a lower unit, said engine including an exhaust gas discharge port, said lower unit including exhaust gas passage means, said exhaust gas passage means including an outlet, an exhaust gas tube, and means mounting said tube in said lower unit and in communication with said outlet and said exhaust gas discharge port, and means defining a water jacket surrounding said exhaust gas tube and extending upwardly within said lower unit from below the lower end of said swivel bracket, said means defining a water jacket including means defining an opening adjacent to the bottom of said jacket.

36. In an outboard motor, the combination of a power head including an internal combustion engine having an exhaust gas discharge port, and a lower unit having therein exhaust gas passage means communicating with said exhaust gas discharge port and including an outlet below said power head and an exhaust gas tube communicating with said discharge port and said outlet, said lower unit also having therein means resiliently supporting said tube.

37. A marine propulsion device comprising an engine having an exhaust gas discharge port, a lower unit including exhaust gas passage means including an outlet opening, and an exhaust gas tube communicating with said opening and with said exhaust gas discharge port, resilient means interposed between said tube and said exhaust gas discharge port, means defining a water jacket surround-

ing said tube, water inlet means communicating with said water jacket, water discharge means communicating with said water jacket, a port communicating with the atmosphere and with said water jacket, said port including means above said water discharge means to allow drainage from said water jacket in the event of blockage of said water discharge means, an auxiliary chamber communicating with said port and with said water jacket at a point below the normal water level in said water jacket as defined by said water discharge means, and means communicating between said exhaust gas passage means and said water jacket above said normal water level.

38. In an outboard motor, the combination of a propulsion unit, and means adapted to be connected to a boat transom and connected to said propulsion unit for affording dirigible movement of said propulsion unit, said means for affording dirigible propulsion unit movement including pivot means extending generally vertically when said propulsion unit is in normal operating position, said propulsion unit comprising a power head including an internal combustion engine having an exhaust gas discharge port, and a lower unit connected to said power head and including exhaust gas passage means communicating with said exhaust gas discharge port and comprising an outlet below said power head, and a resiliently mounted exhaust gas tube communicating with said discharge port and said outlet and extending in said lower unit from adjacent to the lower end of said pivot means, and means defining a water jacket surrounding said exhaust gas tube.

39. An outboard motor comprising a propulsion unit, means adapted to be connected to a boat transom and connected to said propulsion unit for affording dirigible movement of said propulsion unit, said means affording dirigible propulsion unit movement including pivot means extending generally vertically when said propulsion unit is in normal operating position, said propulsion unit comprising an engine and a lower unit, said engine including an exhaust gas discharge port, said lower unit comprising exhaust gas passage means including an outlet, an exhaust gas tube, and means mounting said tube in said lower unit in communication with said outlet and said exhaust gas discharge port, and means defining a water jacket surrounding said exhaust gas tube and extending within said lower unit from below to above the lower end of said pivot means.

40. In a marine propulsion device, the combination of an engine including an exhaust gas discharge port and a lower unit including exhaust gas passage means, said exhaust gas passage means including an outlet and an exhaust gas tube communicating with said outlet and with said engine exhaust gas discharge port, means defining a water jacket surrounding said exhaust gas tube and including means establishing a normal level of water in said jacket, and an aperture located below said normal water level and communicating with said exhaust gas tube for exhaust gas flow through said water jacket and through said aperture.

41. In a marine propulsion device, the combination of an engine including an exhaust gas discharge port and a lower unit including exhaust gas passage means, said exhaust gas passage means including an outlet and an exhaust gas tube communicating with said outlet and with said engine exhaust gas discharge port, means defining a water jacket surrounding said exhaust gas tube and including water overflow means establishing a normal level of water in said jacket, and an idle exhaust gas relief means including means defining an aperture located below said normal water level and communicating with the interior of said exhaust gas tube.

42. In a marine propulsion device, the combination of an engine including an exhaust gas discharge port, and a lower unit including exhaust gas passage means, said exhaust gas passage means including an outlet, and exhaust gas tube communicating with said outlet and said engine

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exhaust gas discharge port, and means in said lower unit resiliently mounting said tube, and means defining a water jacket surrounding said exhaust gas tube.

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R. DAVID BLAKESLEE, *Examiner.*

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,198,162

August 3, 1965

Robert T. Larsen

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 11, for "As" read -- At --; column 4, line 35, for "a water" read -- an exhaust --; column 5, line 10, after "exhaust", first occurrence, insert -- gas --; lines 14 and 15, strike out "said tube whereby said gas tube is free of rigid connection with said engine, and said exhaust gas discharge port," and insert instead -- said tube and said exhaust gas discharge port, whereby said gas tube is free of rigid connection with said engine, --; line 55, for "integral" read -- internal --; column 7, lines 50 and 51, strike out "unit comprising an engine and a lower unit, said engine movement about a generally upright axis, said propulsion" and insert instead -- movement about a generally upright axis, said propulsion unit comprising an engine and a lower unit, said engine --; column 8, line 7, strike out "and" and insert the same before "an", second occurrence, same line 7; line 16, strike out "and" and insert the same before "an", second occurrence, same line 16; line 24, after "means" insert -- , said exhaust gas passage means --; line 25, strike out "exhaust gas passage means, said".

Signed and sealed this 22nd day of February 1966.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents