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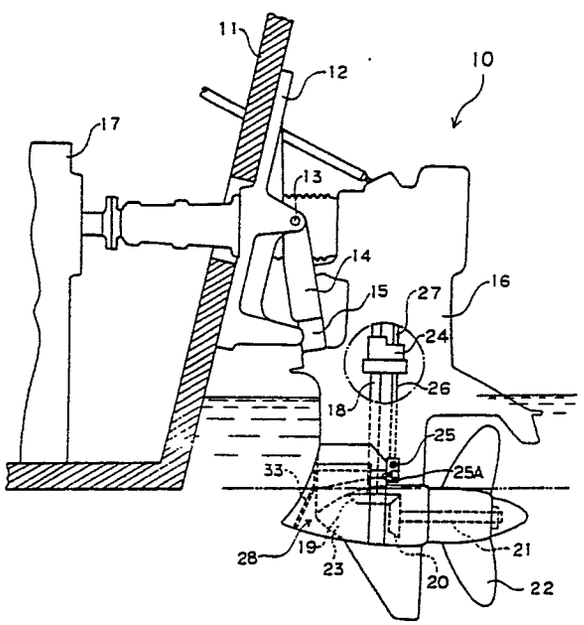
## (54) Water-intake construction for marine propulsion unit.

(57) The present invention provides a water-intake construction for a marine propulsion unit, including a propulsion casing (16) having a portion which is inflated sidewards and in which a propeller shaft (18) is accomodated, suction inlet ports (25a) provided on both sides of said propulsion casing and each communicated with a water pump (24), and a nose cone (28) mounted on the front surface of said propulsion casing for regularizing water flows in the periphery of said propeller shaft accommodating portion, said marine propulsion unit being characterized in that a water intake passage having an inlet and outlets is provided in said nose cone in such an arrangement that the inlet (34) thereof is positioned at a level lower than that of said suction inlet ports and that the outlets thereof are positioned to face said suction inlet ports.

FIG. 1

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# Water-Intake Construction For Marine Propulsion Unit

Detailed Description of the Invention:

[Industrially Applicable Field]

This invention relates to a water-intake construction for a marine propulsion unit.

[Prior Art]

There is a known marine propulsion unit for inboard/outboard drive units, outboard drive units and the like units which includes a propulsion casing having a portion which is inflated sidewards and in which a propeller shaft is accomodated, suction inlet ports provided on both sides of said propulsion casing and each communicated with a water pump, and a nose cone mounted on the front surface of said propulsion casing for regularizing water flows in the periphery of said propeller shaft accommodating portion.

The above-described water pump is operated to feed water sucked through the suction inlet ports to the engine under a pressure for the purpose of cooling the engine with the water.

[Problems To Be Solved By the Invention]

In the above-described conventional marine propulsion unit, however, when the ship runs at a high speed, there encounters a difficulty in maintaining the suction inlet ports, provided on the side surface of the propulsion casing and leading to the water pump, in submerged state in a stable manner, because the water level relative to the propulsion casing becomes lowered in such a high speed running condition. When the suction inlet ports emerge out of the water, the water fed to the water pump from the suction inlet ports is entrained with a large amount of air so that it becomes impossible to feed a required amount of cooling water to the engine. This gives rise to troubles of the operation of the engine and breakage of rubber impellers of the water pump due to the generation of heat.

The present invention is aimed at the provision of a water-intake construction of a simple structure which always enables to feed water in a stable manner to suction inlet ports leading to a water pump and provided on the side surface of a propulsion casing irrespective of whether the ship is in a low speed running state or in a high speed running state.

[Means For Solveing the Problems]

In accordance with the present invention there is provided a water-intake construction for a marine propulsion unit, including a propulsion casing having a proportion which is inflated sidewards and in which a propeller shaft is accomodated, suction inlet ports provided on both sides of said propulsion casing and each communicated with a water pump, and a nose cone mounted on the front surface of said propulsion casing for regularizing water flows in the periphery of said propeller shaft accommodating portion, said marine propulsion unit being characterized in that a water intake passage having an inlet and outlets is provided in said nose cone in such an arrangement that the inlet thereof is positioned at a level lower than that of said suction inlet ports and that the outlets thereof are positioned to face said suction inlet ports.

[Functions]

In the present invention, a water intake passage is formed in the noze cone mounted on the propulsion casing. Therefore, as compared with a construction in which a water intake passage is formed in a propulsion casing, the present invention can form the water intake passage with a simpler construction. Further, since the inlet of the water intake passage is positioned at a lower level than the suction inlet ports provided in the propulsion casing, even when the suction inlet ports emerge out of the water due to the lowering of of the water level relative to the propulsion casing during a high speed running, the inlet of the water intake passage can be maintained still below the water level, so that water can be fed to the suction inlet ports.

Namely, according to the present invention, the water intake passage is formed with a simple structure and can introduce water from its inlet always positioned below the surface of the water throughout any running conditions inclusive of low and high speed running and can feed the introduced water to the suction inlet ports leading to the water pump.

[Embodiments]

Fig. 1 is a fragmentary side view showing the main structure of an inboard/outboard drive unit to which a first embodiment according to the present invention is applied, Fig. 2 is a side view showing

the essential part of Fig. 1, Fig. 3 is a cross-sectional view taken on the line III-III of Fig. 2, Fig. 4 is a cross-section view showing the nose cone of Fig. 1, Fig. 5 is a cross-sectional view showing the nose cone of Fig. 4, and Figs. (6(A)-6(D) cross-sectional view cut away in half and taken on the lines A-A through D-D of Fig. 4, respectively.

As shown in Fig. 1, the inboard/outboard drive unit has a transom bracket 12 fixedly secured to a hull 11. The transom bracket 12 has a tilt shaft 13 to which a swivel bracket 14 is incliningly supported. The swivel bracket 14 is provided with a cylindrical portion 15 to which a propulsion casing 16 is steerably supported via steering shaft (not shown).

Provided inside of the hull 11 is an engine 17 whose output is transmitted through a speed change gear (not shown), a propulsion shaft 18, gears 19 and 20 and a propeller shaft 21 accommodated in the casing 16 to a propeller 22.

The casing 16 of the drive unit 10 has, at its lower portion, a propeller shaft accommodating portion 23 (of a torpede shape) which is inflated sidewards and in which the propeller shaft 21 and gears 19 and 20 are accommodated.

As shown in Figs. 2 and 3, the casing 16 is provided with water intake members 25 for the introduction of water into a water pump 24 at upper side surfaces of the propeller shaft accommodating portion 23. Each of the water intake members 25 has a mounting planar portion 101 to be mounted to the casing 16 and a standing wall portion 102 raised from the planar portion 101 to form a suction inlet port 25A. The water pump 24 is in fluid communication with the suction inlet port 25A of each water intake member 25 through a suction-side passage 26 and with a water jacket (not shown) of the engine 17 through a water feeding passage 27 and is adapted to feed, under a pressure, the water introduced from the suction inlet ports 25A to the engine 17 for cooling same. The reference numeral 25B designates a mounting screw.

As shown in Figs. 2 and 3, the inboard/outboard drive unit 10 according to the present invention is provided with a nose cone secuted to the front surface of the casing 16 by means of an adhesive. The nose cone serves to regularize the flow of water in the periphery of the propeller shaft accommodating portion 23 so as to ensure proper thrust force by preventing the blow out of the water flow from the sides of the casing and to improve the stability in straight running.

As shown in Fig. 3, the nose cone 28 has a symmetrical structure. For the purpose of simple explanation, the following description will be made only for one side of the nose cone though the similar arrangement is also provided in the other side.

In the embodiment shown, a pad 29 formed of a synthetic resin is provided on the casing 16 at the back of the rear end 28A of the nose cone 16 for the purpose of providing smooth joint between the rear end 28A of the nose cone 16 and the side surface of the casing 16. In the similar manner, a pad 30 of a synthetic resin is provided on the side of the casing 16 above the upper end 28B of the nose cone 16 for the purpose of ensuring smooth joint between the upper end 28 B of the nose cone and the side face of the casing 16.

As shown in Figs. 4 through 6, the nose cone 28 is provided at its front end portion with a bore 31 extending from the under side of the front edge to the inside surface of the front end portion of the nose cone 28. The nose cone 28 is also provided with a groove 32 extending from the inside surface of the front end portion, at which the bore 31 opens, to the inside surface of the rear end portion of the nose cone 28. As a result of the above construction, when the nose cone 28 is mounted on the casing 16, there is formed a water intake passage 33 by the bore 31 and the hollow cavity defined between the side face of the casing 16 and the groove 32.

The open end of the bore 31 which opens at the lower face of the front edge of the nose cone 28 and which is located at a lower level than the suction inlet port 25A serves to function as an inlet 34 of the water-ntake passage 33, while the open end of the groove 32 which opens at the rear end surface of the nose cone 28 and which is located to face the suction inlet port 25A serves to function as an outlet 35 of the water-intake passage 33.

Between the outlet 35 of the water-intake passage 33 and the suction inlet port 25A is formed a water-guide passage 36 in the form of a groove defined between the above-described pads 29 and 30. As shown in Fig. 2, the outlet 35 has a size W1 which is greater than the size W2 of the suction inlet port 25A so that the water discharged from the outlet 35 can be introduced into the suction inlet port 25A without entraining air.

The function of the water-intake construction according to the first embodiment of the present invention will be described below.

In the above-described first embodiment, a water intake passage 33 is formed in the noze cone 28 mounted on the propulsion casing 16. Therefore, as compared with a construction in which a water intake passage is formed in a propulsion casing 16, the present invention can form the water

intake passage 33 with a simpler construction. Further, since the inlet 34 of the water intake passage 33 is positioned at a lower level than the suction inlet port 25A provided in the propulsion casing 16, even when the suction inlet port 25A emerges out of the water due to the lowering of of the water level relative to the propulsion casing 16 from the state as shown by the solid line in Fig. 1 to the state as shown by the two-dotted line in Fig. 1 during a high speed running, the inlet 34 of the water intake passage 33 can be maintained still below the water level, so that water can be fed to the suction inlet port 25A.

As shown in Fig. 1, the suction inlet port 25A is generally provided at a location above the propeller shaft accommodating portion 23 of the sideward portion of the casing 16, since it is difficult to provide the suction-side passage 26 within the propeller shaft accommodating portion 23 accommodating the propeller shaft 21 and the like component parts. In this case, in order both to form a water-intake passage for feeding water to the suction inlet port 25A in the casing 16 and to provide the inlet of the water-intake passage at a level lower than that of the suction inlet port 25A, it is necessary to provide the water-intake passage within the propeller shaft accommodating portion 23 of the casing 16 having complicated curved structures. This is, however, extremely difficult. On the other hand, according to the above-described first embodiment of the present invention, the nose cone 28 to be mounted on the peripheral surface of the propeller shaft accommodating portion 23 is utilized for the formation of the water-intake passage 33.

Therefore, the water intake passage 33 is formed with a simple structure and can introduce water from its inlet 34 always positioned below the surface of the water throughout any running conditions inclusive of low and high speed running and can feed the introduced water to the suction inlet port 25A positioned opposite to the outlet 35 of the water-intake passage 33 and leading to the water pump 24.

Further, in the first embodiment, since the inlet 34 of the water-intake passage 33 opens at the lower face of the front edge of the nose cone 28, water is smoothly introduced into the inlet 34 with the aid of the dynamic water pressure caused upon the running of the ship, thereby ensuring the introduction of the water into the suction inlet port 25A.

Fig. 7 is a side view showing the essential part of a second embodiment according to the present invention and Fig. 8 is a cross-sectional view taken along the line VIII-VIII of Fig. 7.

The second embodiment differs from the above-described first embodiment in that the second embodiment uses a nose cone 40 which is deformed from the nose cone 28 of the first embodiment. The nose cone 40, too, has a bore 41 and a groove 42 which correspond to the bore 31 and the groove 32 of the nose cone 28, respectively, and which form in combination a water-intake passage 43 when the nose cone 40 is mounted on the casing 16. Similar to the nose cone 28, the water-intake passage 43 has an inlet 44 which opens at the lower face of the front edge of the nose cone 40 and which is located at a level lower than that of the suction inlet port 25A. The nose cone 40 extends and is abutted to the water intake member 25 and the rear end of the groove 42 also extends to the water intake member 25 so that the outlet 45 of the water-intake passage 43, which is the open end of the groove 42, is directly connected to the suction inlet port 25A.

As a result of the above-construction, the water discharged from the outlet 45 of the water-intake passage 43 is directly fed to the suction inlet port 25A without being exposed to the atmosphere so that air can be prevented from entering the suction inlet port 25A with certainty.

[Effect of the Invention]

As having been described in the foregoing, the present invention provides a water-intake construction for a marine propulsion unit, including a propulsion casing having a portion which is inflated sidewards and in which a propeller shaft is accomodated, suction inlet ports provided on both sides of said propulsion casing and each communicated with a water pump, and a nose cone mounted on the front surface of said propulsion casing for regularizing water flows in the periphery of said propeller shaft accommodating portion, said marine propulsion unit being characterized in that a water intake passage having an inlet and outlets is provided in said nose cone in such an arrangement that the inlet thereof is positioned at a level lower than that of said suction inlet ports and that the outlets thereof are positioned to face said suction inlet ports.

Thus, in the present invention, a water intake passage is formed in the noze cone mounted on the propulsion casing. Therefore, as compared with a construction in which a water intake passage is formed in a propulsion casing, the present invention can form the water intake passage with a simpler construction. Further, since the inlet of the water intake passage is positioned at a lower level than the suction inlet ports provided in the propulsion casing, even when the suction inlet ports

emerge out of the water due to the lowering of of the water level relative to the propulsion casing during a high speed running, the inlet of the water intake passage can be maintained still below the water level, so that water can be fed to the suction inlet ports.

Namely, according to the present invention, the water intake passage is formed with a simple structure and can introduce water from its inlet always positioned below the surface of the water throughout any running conditions inclusive of low and high speed running and can feed the introduced water to the suction inlet ports leading to the water pump.

Brief Description of the Drawings:

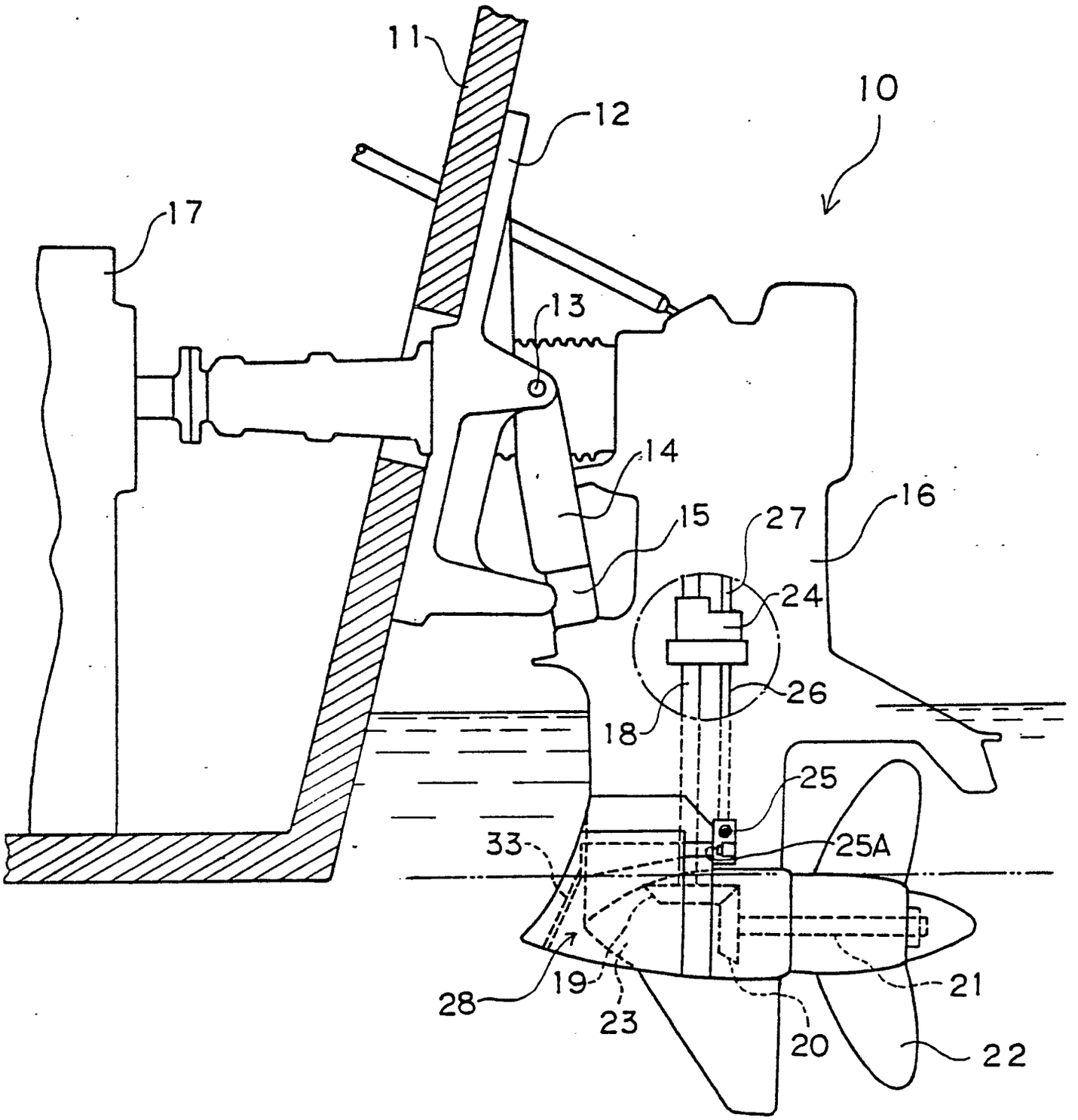
Fig. 1 is a fragmentary side view showing the main structure of an inboard/outboard drive unit to which a first embodiment according to the present invention is applied; Fig. 2 is a side view showing the essential part of Fig. 1; Fig. 3 is a cross-sectional view taken on the line III-III of Fig. 2; Fig. 4 is a cross-sectional view showing the nose cone of Fig. 1; Fig. 5 is a cross-sectional view showing the nose cone of Fig. 4; Figs. 6(A)-6(D) cross-sectional view cut away in half and taken on lines A-A through D-D of Fig. 4, respectively; Fig. 7 is a side view showing the essential part of a second embodiment according to the present invention; and Fig. 8 is a cross-sectional view taken along the line VIII-VIII of Fig. 7. 10... inboard/outboard drive unit, 16... propulsion casing, 21... propeller shaft, 23... propeller shaft accommodating portion, 24... water pump, 25A... suction inlet port, 28... nose cone, 33... water intake passage, 34... inlet, 35... outlet, 40... nose cone, 43... water intake passage, 44... inlet, 45... outlet

## Claims

(1) A water-intake construction for a marine propulsion unit, including a propulsion casing having a portion which is inflated sidewards and in which a propeller shaft is accomodated, suction inlet ports provided on both sides of said propulsion casing and each communicated with a water pump, and a nose cone mounted on the front surface of said propulsion casing for regularizing water flows in the periphery of said propeller shaft accommodating portion, said marine propulsion unit being characterized in that a water intake passage having an inlet and outlets is provided in said nose cone in such an arrangement that the inlet thereof is positioned at a level lower than that of said suction inlet ports and that the outlets thereof are positioned to face said suction inlet ports.

(2) A water-intake construction for a marine propulsion unit according to claim 1, wherein at least a portion of said water intake passage is defined between said nose cone and the side surface of said propulsion casing on which said nose cone is mounted.

FIG. 1



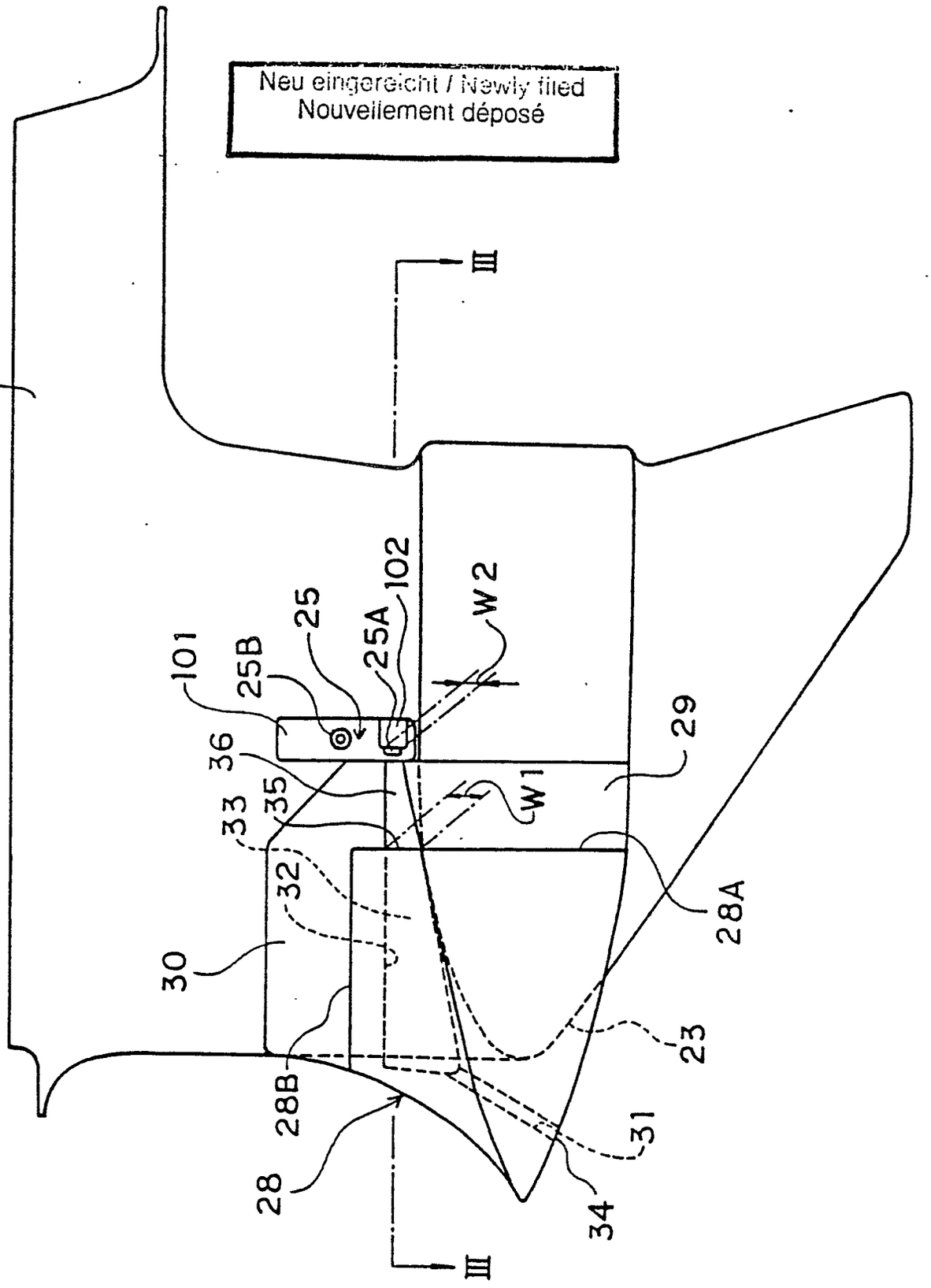



FIG. 2

FIG. 3



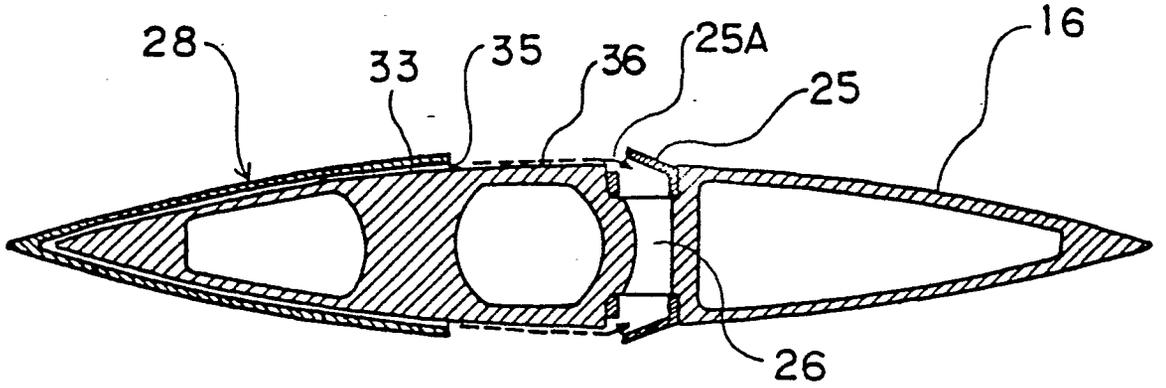



FIG.4

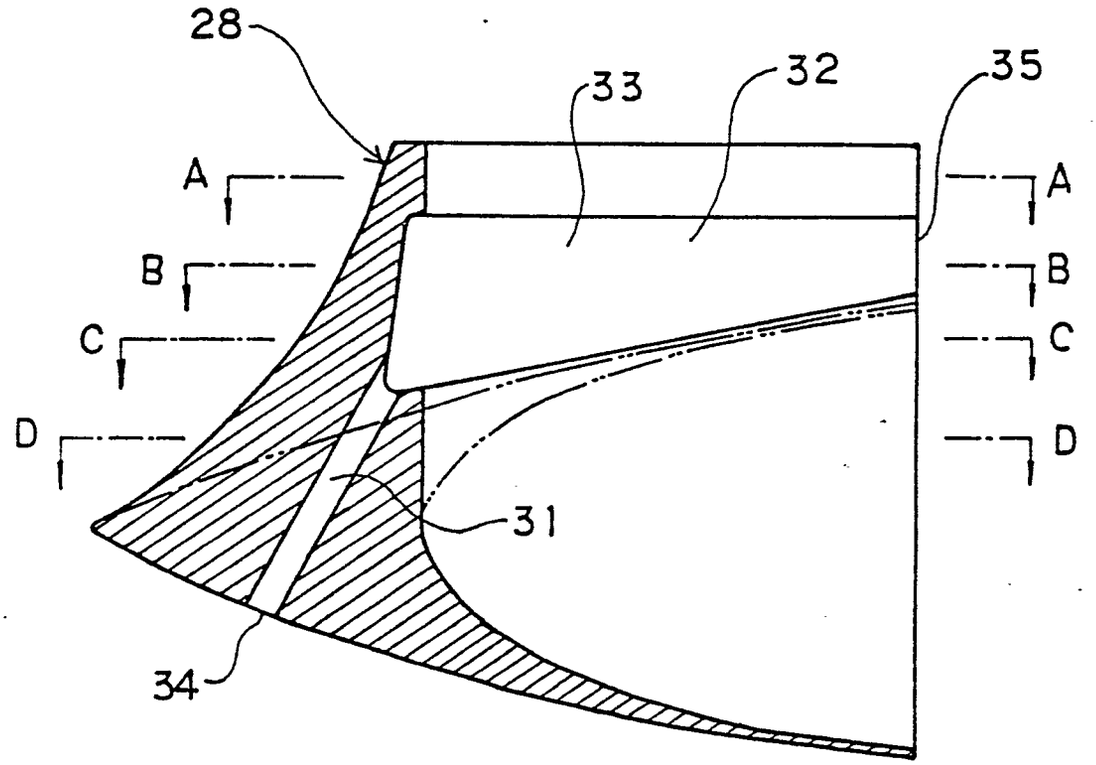


FIG. 5

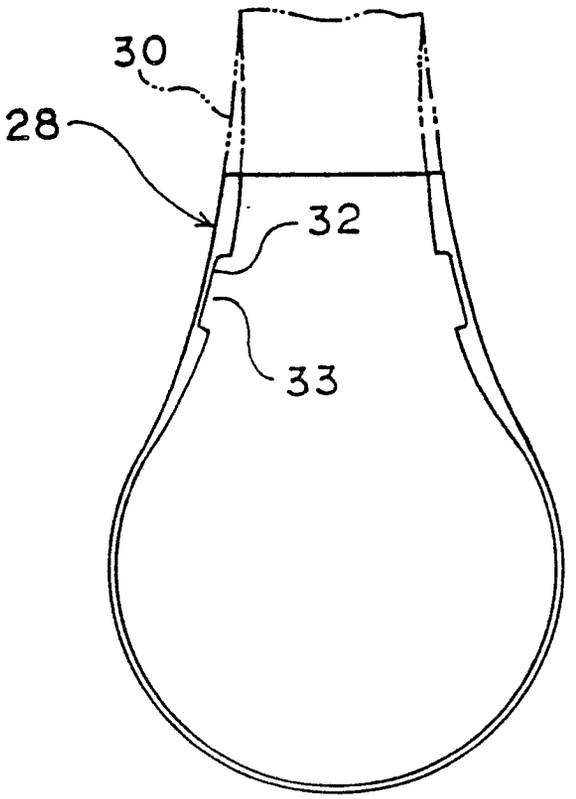
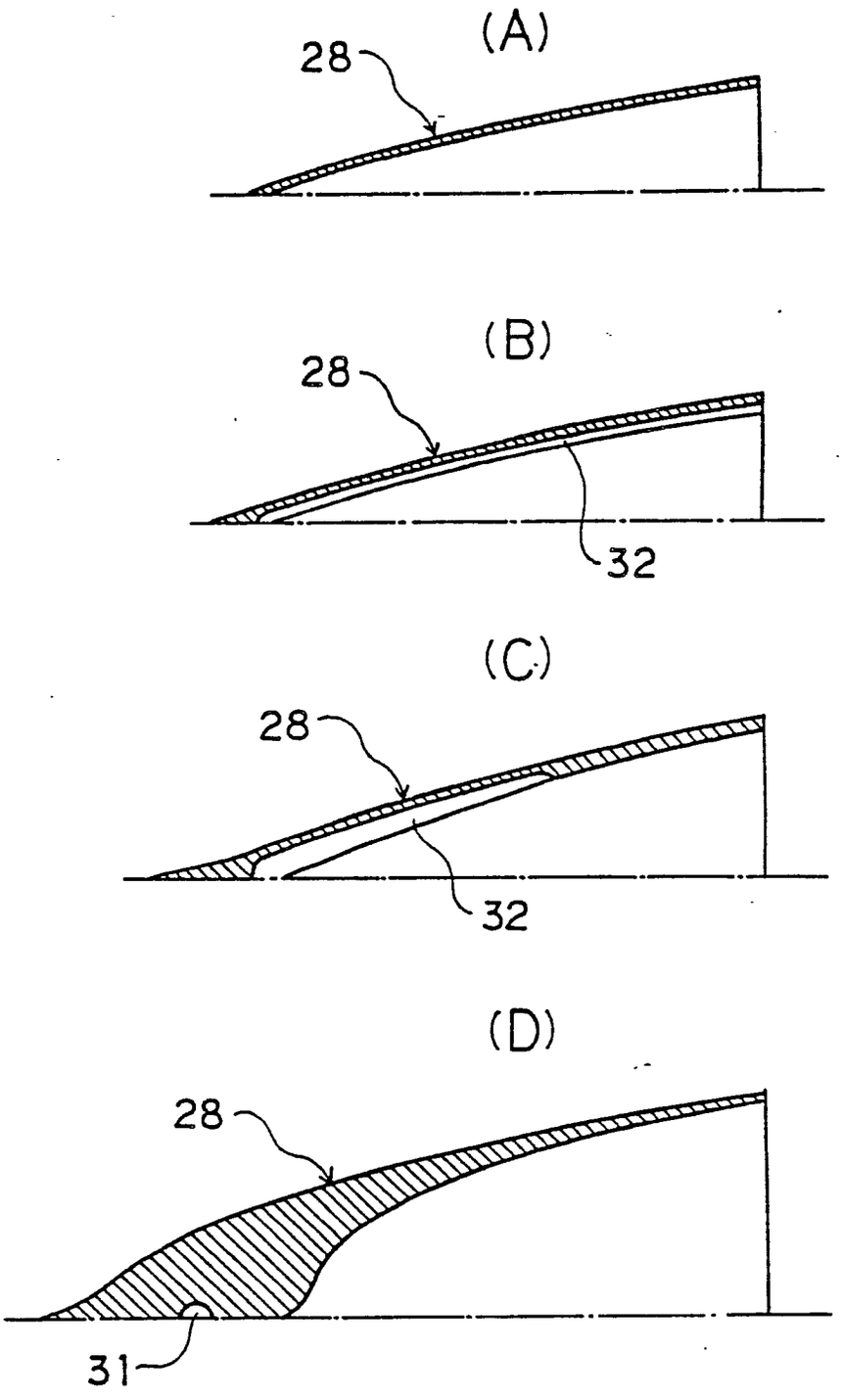


FIG. 6



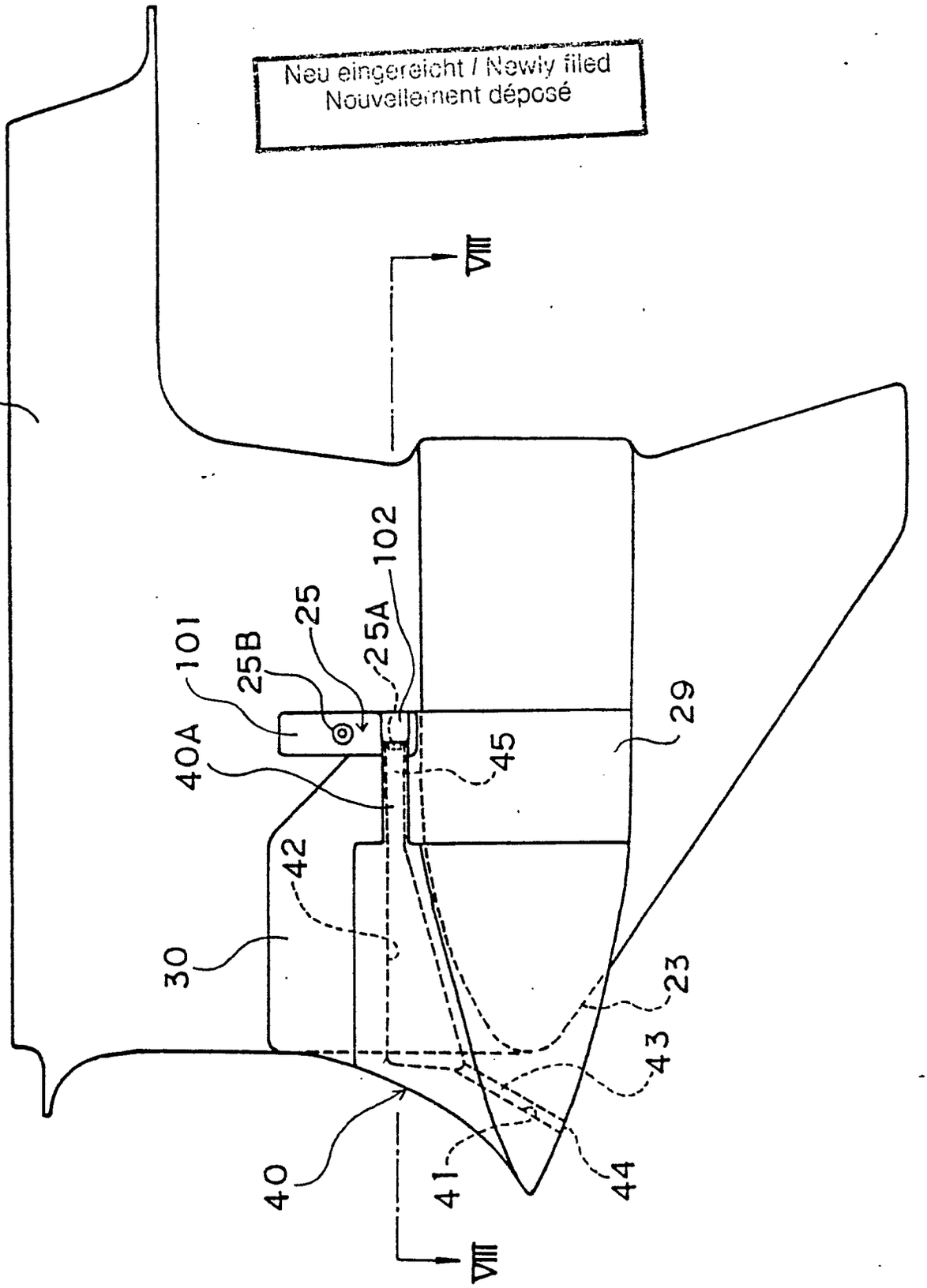
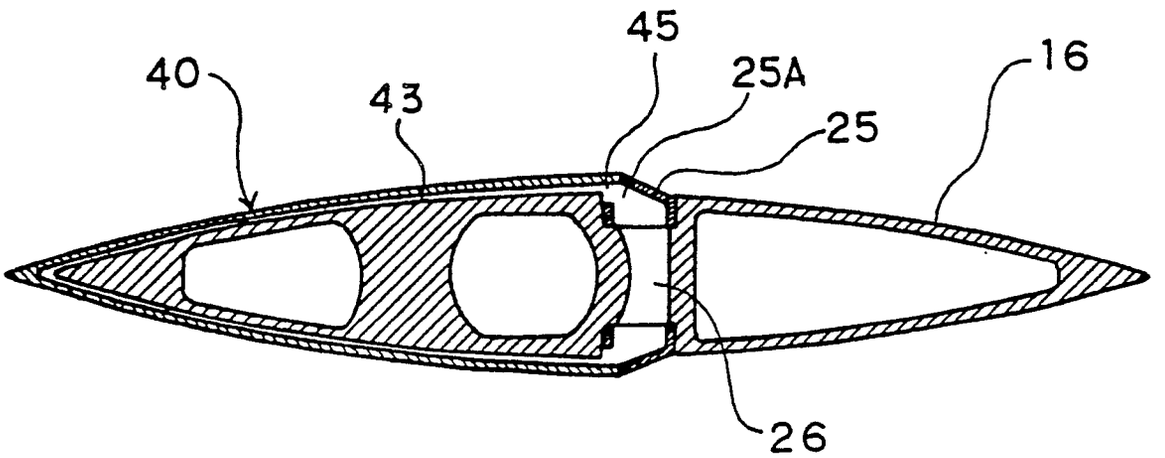



FIG. 7

FIG. 8



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# EUROPEAN SEARCH REPORT

Application number

EP 87 10 6947

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl.4) |
|---|---|---|---|
| X | US-A-1 762 957 (W.F.A. BUEHNER) * Page 1, lines 11-20; page 2, lines 16-29; claim 3; figures 1,2 * | 1,2 | B 63 B 13/02<br>F 01 P 3/20 |
| A | US-A-2 616 386 (E.C. KIEKHAEFER) * column 3, lines 45-58; claim 1; figures 1,2,8,9 * | 1,2 | |
| P,X | US-A-4 636 175 (M.E. FRAZZEL) * Abstract; column 1, lines 29-49; column 2, lines 18-24; column 2, line 50 - column 3, line 3; figures 1-3,5 * | 1,2 | |

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 63 B
B 63 H
B 63 J
F 01 P
F 02 B

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 16-09-1987 | VURRO, L. |

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