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UNDERWATER SWIMMING AND DIVING SUITS

Filed June 21, 1960

2 Sheets-Sheet 1



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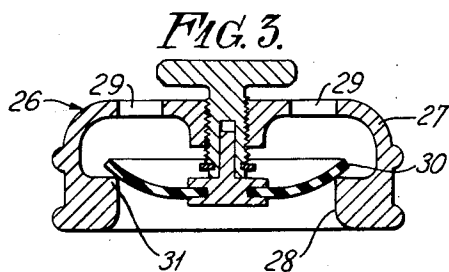
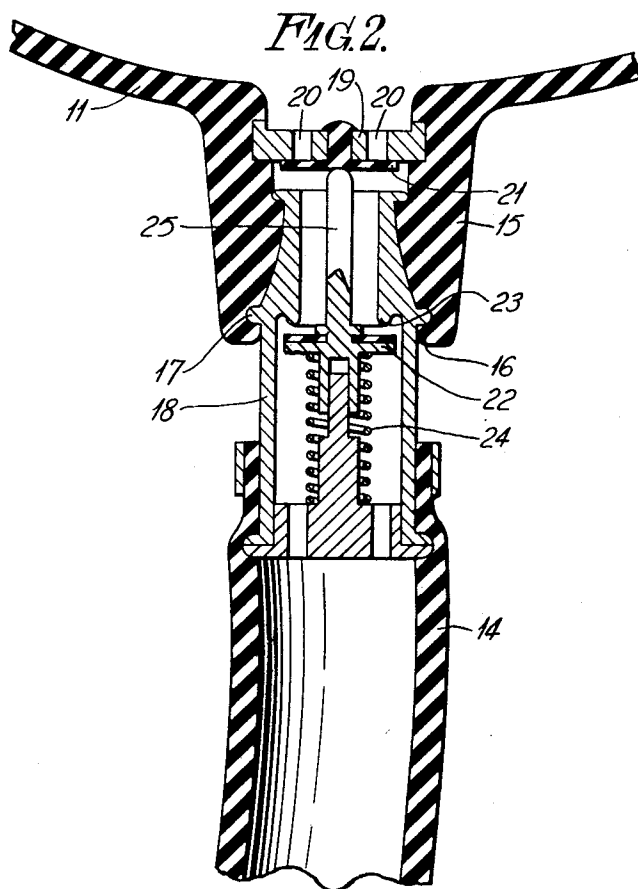
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2 Sheets-Sheet 2



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1

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UNDERWATER SWIMMING AND DIVING SUITS
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5 Claims. (Cl. 128—144)

This invention relates to underwater swimming and diving suits of the kind manufactured from thin and flexible material which fits closely from the body of the diver.

When such a suit is in use the external pressure of the water tends to collapse it against the body of the diver and when swimming at depths greater than approximately 100 ft. this collapsing, and the consequent creasing of the suit, frequently result in pinching of the skin of the diver and may cause quite severe bruises. In order to overcome this it has been proposed to provide such a suit with a compressed gas reservoir from which gas can be fed under control of a valve into the suit when the diver descends in the water so as to increase the internal pressure and so prevent the suit from being collapsed by the external water pressure.

The invention provides an underwater swimming and diving suit of the above specified kind comprising a conduit whereby the diver may exhale air into the suit to increase its internal pressure and valve mechanism for preventing return of air from the suit to the diver's breathing apparatus.

The diver can accordingly breathe at will into his suit during a descent so as to counteract the tendency of the increasing external water pressure to collapse it as he descends.

One embodiment of the invention will now be described in more detail, by way of example, with reference to the accompanying drawing in which:

FIGURE 1 is a front elevation of the swimming and diving suit,

FIGURE 2 is an enlarged longitudinal section through the valve mechanism controlling the flow of air from the diver's breathing apparatus to the interior of the suit, and

FIGURE 3 is an enlarged longitudinal section through one of the relief valves.

The suit 10 includes a face mask 11 connected by breathing tubes 12 to an air bottle carried on the diver's back. By turning a cock 13 the diver is able to draw air from a surface breathing tube 13a instead of from the bottle. The mask 11 includes an internally projecting breathing tube which can be gripped between the diver's teeth. A connection tube 14 to the suit is connected to the mask so that it is in combination with its interior. Then, by simply breathing out into the mask instead of into the breathing tube the diver can breathe into the suit. The connection between the tube 14 and the mask 11 is detachable and includes valves which will prevent the entry of water into either the tube or the mask should they become detached whilst the diver is submerged. To this end the mask includes a tubular projection 15 of rubber or like resilient material having an inwardly projecting flange 16 engaging beneath an

2

outwardly projecting flange 17 on a tubular valve casing 18.

In the projection 15 is fitted a valve disc 19 formed with apertures 20 and provided with a rubber sealing flap 21 which acts as a non-return valve, permitting air to be blown from the mask 11 into the tube 14 but preventing water from entering the mask 11 in the event of the tube 14 becoming separated from the mask. In the valve casing 18 is a valve 22 urged by a spring 24 towards a seat 23 but having a projecting stem 25 which engages the fixed, central part of the flap 21 which acts as a stop when the parts are assembled to hold the valve 22 away from the seat 23 as shown in FIGURE 2. If the parts 18 and 14 become disconnected from the part 15 the spring 24 will close the valve 22 against its seat 23 to prevent escape of air from the tube 14 and from the suit 10.

The suit 10 has relief valves 26 at the top and near each ankle. As shown in FIGURE 3, each relief valve includes a casing 27, having an aperture 28 for communication with the air space in the suit and apertures 29 through which water can enter the casing, and a rubber diaphragm 30 which is normally held by the water pressure against a seat 31. When, however, the air pressure within the suit exceeds a predetermined value, the diaphragm 30 will lift to allow air to escape from the suit. Thus if the diver continually breathes into his suit the relief valves 26 will open whenever the internal pressure exceeds the external pressure by a predetermined amount and will thus retain the suit at a constant inflated volume. This prevents excessive buoyancy of the diver. The relief valves in the ankle regions may be set to open at a somewhat lower pressure than the relief valve at the top of the suit so as to avoid excessive build-up of air pressure in the region of the feet if the diver swims in an inverted position, so avoiding the possibility that he may be suspended in the inverted position and be unable to revert to his normal position.

Having now described my invention, what I claim is:

1. An underwater swimming and diving suit comprising a body portion of thin, flexible material to enclose the body of a diver, a face mask having an inlet for air under pressure and a connection from said mask to said body portion comprising a tubular extension opening from said mask, a normally closed flap valve fixed in said extension and opening from said mask into said extension, a connecting tube from said body portion to said extension, a valve casing mounted fluid-tightly in said connecting tube and detachably secured fluid-tightly in said extension, an annular valve seat in said valve casing, a valve, means resiliently pressing said valve toward said normally closed flap valve to seat on said valve seat and said valve having a stem projecting to contact with said normally closed flap valve to lift said valve from said valve seat when said valve casing is secured in said extension and to release said valve when said valve casing is detached from said extension.

2. The underwater swimming and diving suit of claim 1 in which said normally closed flap valve comprises a valve seat disc and a valve flap secured centrally to the disc and in which said stem contacts the central part of said disc and flap when said valve casing is secured to said extension.

3

3. The underwater swimming and diving suit of claim 1 having ankle regions and a shoulder region of the body portion, and pressure relief valves in said shoulder and ankle regions adjustable to open at a lower pressure in the ankle regions than in the shoulder region.

4. The underwater swimming and diving suit of claim 3 in which said pressure relief valves comprise a casing having a valve seat and a resilient valve member adjustable in the casing against said valve seat.

5. A connection from a body portion to a face mask of an underwater swimming and diving suit which comprises an extension from said mask, a normally closed flap valve fixed in said extension and opening from said mask into said extension, a connecting tube from the body portion to said extension, a valve casing mounted fluid-tightly in said connecting tube and detachably secured fluid-tightly in said extension, an annular valve seat in

4

said valve casing, a valve and means pressing said valve toward said normally closed flap valve to seat on said valve seat and having a stem projecting to contact with said assembly of extension and normally closed flap valve to lift said valve in said casing from said valve seat when said casing is secured in said extension.

References Cited in the file of this patent

UNITED STATES PATENTS

1,476,286	Czyzykowski	Dec. 4, 1923
2,168,695	Asari	Aug. 8, 1939
2,316,101	Norred	Apr. 6, 1943
2,593,988	Cousteau	Apr. 22, 1952
2,730,380	Espy et al.	Jan. 10, 1956
2,761,154	Horiuchi	Sept. 4, 1956