



## Description

Mixed - gas  
swim - diving apparatus

Model FGT I/A

T 12 200

**DRÄGERWERK LÜBECK**

24 Lübeck 1 · Postfach 1339 · Moislinger Allee 53/55 · Ruf (0451) 8 10 21 · FS. 026807

D e s c r i p t i o n

Mixed - gas

swim - diving apparatus

Model FGT I/A

Order number T 12 200

1. Description of the FGT 1/A

- 1.1. Designation : Mixed-gas swim-diving apparatus  
Model : FGT I/A  
Order number : T 12 200  
Manufacturer : DRÄGERWERK LÜBECK

1.2. The apparatus conforms to the corresponding Nato Stanag regulations for underwater apparatus for mine defusing.

It is designed for 3 ready-made gas mixtures.

The diving depths are: 0 - 24 m for mixture B

24 - 42 m for mixture C

42 - 54 m for mixture D



Fig.1 Mixed-gas swim-diving apparatus FGT I/A

1.3. Construction of the FGT I/A

The lower shell houses all the elements of the apparatus.



Fig.2 Mixed-gas swim-diving apparatus FGT I/A, open

The mixed-gas cylinders, pressure reducer with pressure gauge line and finimeter, breathing bag, pressure relief valve and hood, breathing tube, soda-lime cartridge, harness and cylinder mounting are connected to the lower shell in such a way that they can easily be removed and replaced.

The casing cover protects the fittings from damage. It is hooked onto the lower shell and held in place with a rubber strap.

The lower shell and casing cover are made from impact-resistant and scratch-resistant plastic.

The apparatus is also provided with a strap for transport by hand.

1.3.1. Mixed-gas cylinders

3 pairs of mixed-gas cylinders are available.

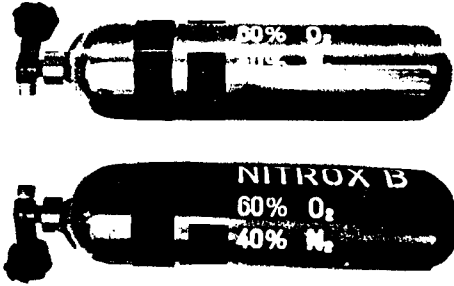


Fig.3 Mixed-gas cylinders,  
mixture cylinder pair B

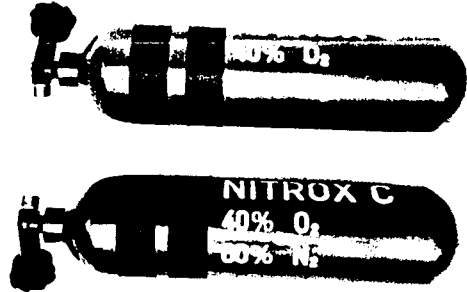


Fig.4 Mixed-gas cylinders,  
mixture cylinder pair C

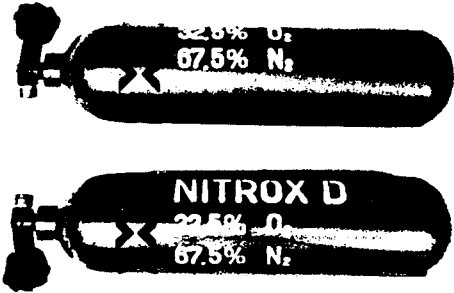


Fig.5 Mixed-gas cylinders,  
mixture cylinder pair D

The capacity of each mixed-gas cylinder is 2.5 litres, the maximum working pressure 200 kg/cm<sup>2</sup>.

The connection threads are W 21.8 x 1/14".

The mixed-gas cylinders are fitted in the apparatus by a profile, gasket-sealed manual screw connection on the pressure reducer and a rubber strap on the lower shell.

1.3.2. Pressure reducer with dosage unit

The cylinder pressure is reduced to a constant sampling pressure by the single-stage pressure reducer. One of the three dosages allocated to the mixture used can be set on the selector switch, which is equipped with a safety mechanism preventing displacement. The air passages can be rapidly filled through the additional dosage unit (bypass) which has a high rate of flow.

The pressure reducer is connected to the lower shell of the casing with two screws and can easily be removed.

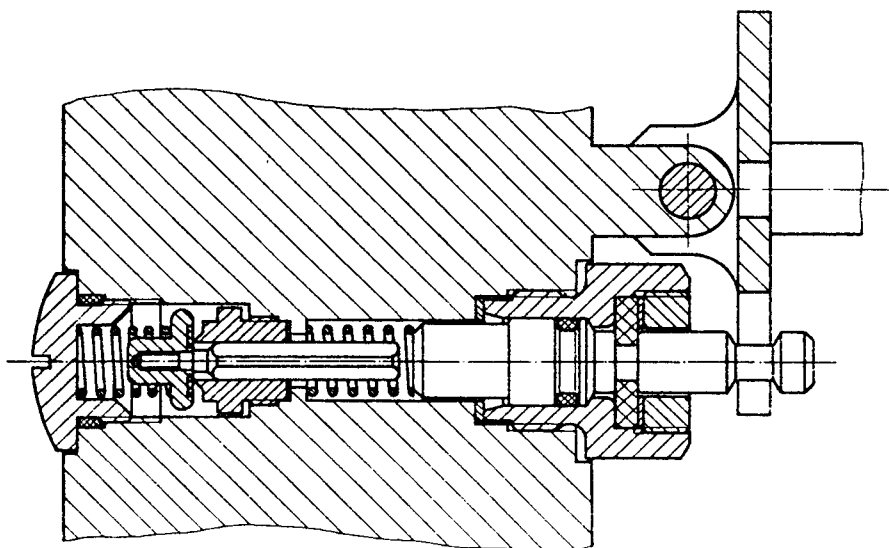


Fig.6 Additional dosage unit (cross-section drawing)

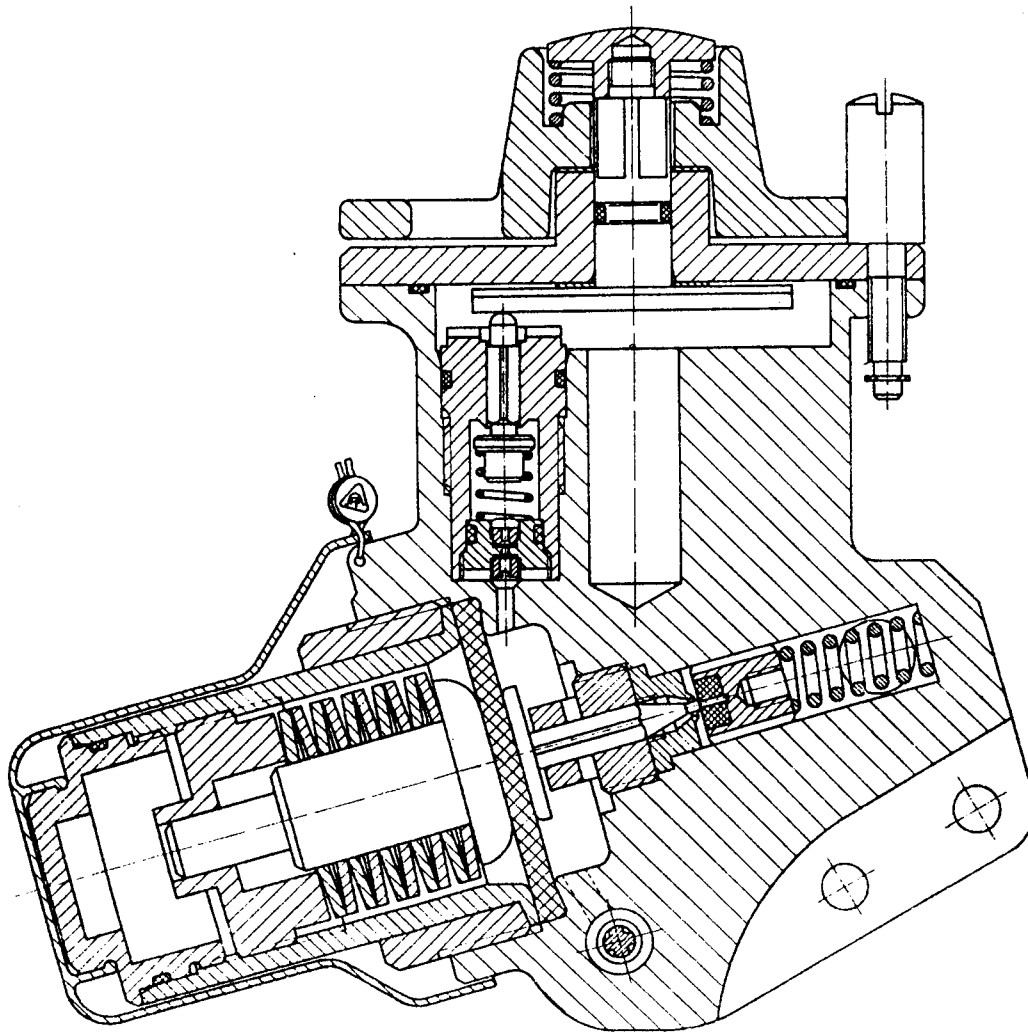


Fig.7 Pressure reducer (Cross-section drawing)

1.3.3. Pressure reducer

The pressure reducer with its flexible high-pressure line is fitted in a holder on the left-hand side of the apparatus.

The pressure reducer can be swung down from the apparatus to read the cylinder pressure. It is calibrated in  $\text{kg}/\text{cm}^2$ .

The maximum admissible cylinder pressure of  $200 \text{ kg}/\text{cm}^2$  and the bottom pressure range of  $0 - 50 \text{ kg}/\text{cm}^2$  are marked with luminous paint.

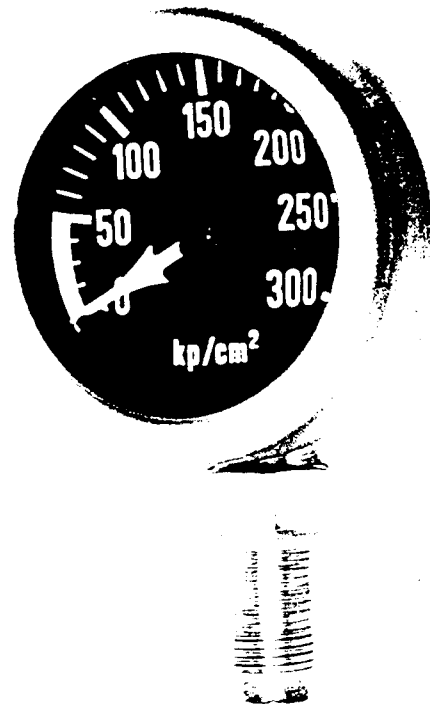


Fig.6 View of the finimeter



1.3.4. Breathing bag

The breathing bag is subdivided into an inhalation bag and an exhalation bag.

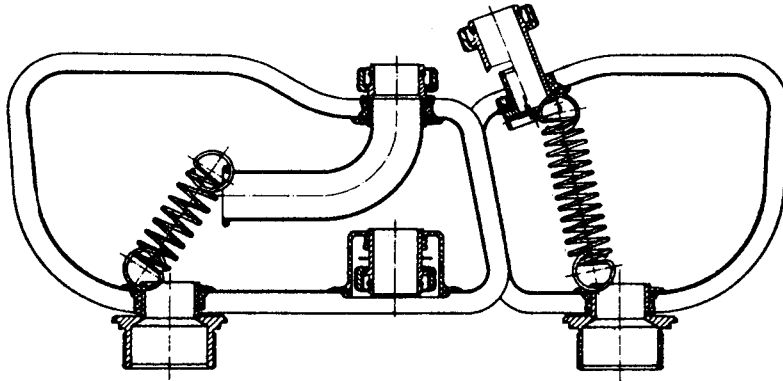


Fig.9 Breathing bag (cross-section drawing).

The breathing bags are made from fabric coated on both sides with a neoprene-natural rubber mixture. The moveable capacity is 5.5 litres with a differential pressure between + 10 and - 10 cm w.g. The tube in the exhalation bag serves as a water trap. The springs keep the airways free. The breathing bags are to be protected from the action of direct sunlight.

1.3.5. Pressure relief valve with hood

The pressure relief valve is connected to the exhalation bag via a gasket-sealed manual screw connection. The blow-off pressure can be adjusted between 11 and 17 cm w.g.

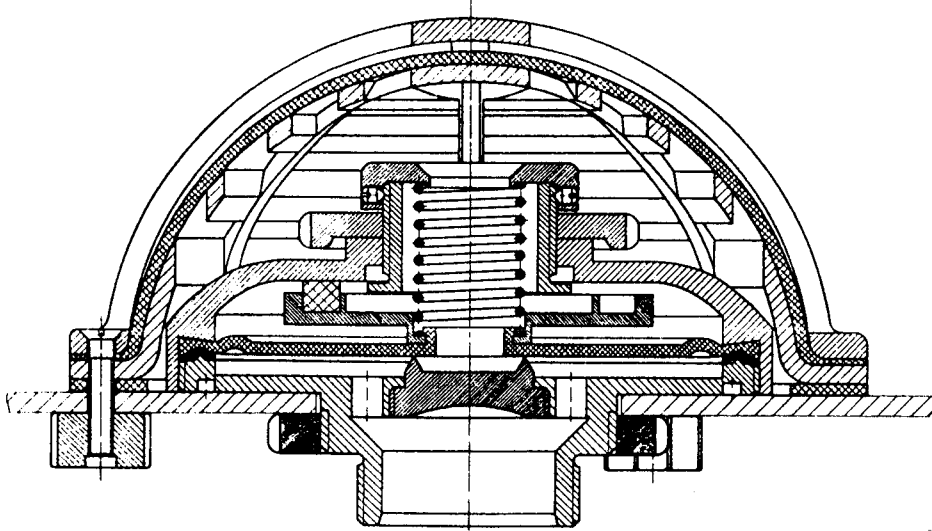


Fig.10 Pressure relief valve with air bubble distributor  
(cross-section drawing)

An air bubble distributor is fitted above the pressure relief valve to reduce noise.

1.3.6. Twin breathing tube

The twin breathing tube consists of:

Inhalation tube, valve mouthpiece and exhalation tube.

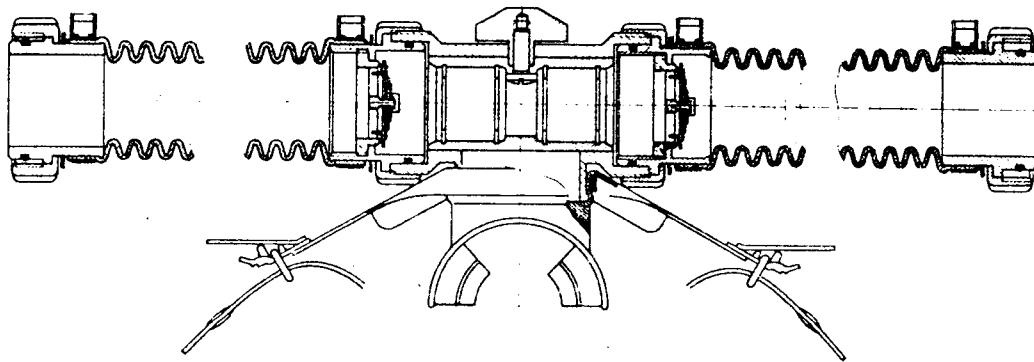


Fig.11 Valve mouthpiece with inhalation and exhalation tube  
(cross-section drawing)

The built-in control valves regulate the circulation.

The valve mouthpiece is equipped with a rotary slide valve so that the wearer of the apparatus can make or close the connection to the respiratory circuit.

1.3.7. Rechargeable soda-lime cartridge

The soda-lime container is designed as a rechargeable cartridge. It is connected to the respiratory circuit with gasket-sealed manual screw connections.

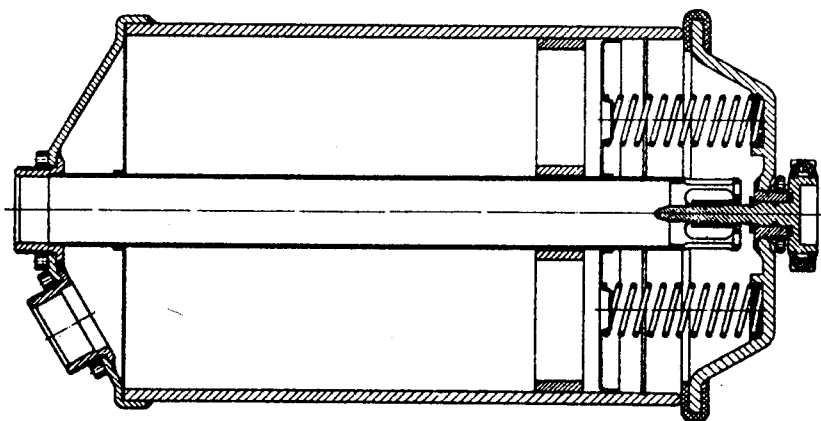


Fig.12 Rechargeable soda-lime cartridge (cross-section drawing)

The exhaled gas passes from the exhalation bag through the central pipe into the rechargeable soda-lime cartridge, is led through the soda lime where it is freed from  $\text{CO}_2$  and is then led into the inhalation bag. The soda lime is held between 2 perforated plates which prevent soda-lime particles passing into the respiratory circuit. One perforated plate is spring-loaded and prevents displacement of the soda lime.

The cartridge cover is fixed with a central manual screw connection. The packing washer in the cover guarantees reliable sealing.

### 1.3.8. Harness

The harness consists of two carrying straps, a waist belt and a crutch belt.

The harness is constructed in such a way that the wearer can take off the apparatus in seconds.

The waist belt and crutch belt are reliably fixed to a central breech plate.

The right-hand carrying strap has a disconnecting point, so that the wearer can take off the diving apparatus from the shoulder.

### 1.4. Function of the apparatus

The mixed-gas swim-diving apparatus model FGT I/A is a self-contained apparatus with semi-closed circuit. The gas supply is from the mixed-gas cylinders in the apparatus, the gas composition of which is tuned to the diving depth range.

The constant dosages are specifically adjusted to the mixture compositions.

As shown by the circuit diagram, the mixed gas flows from the cylinders through the single-stage pressure reducer to the constant dosage units, only one of which is open at any time.

The back pressure setting of the pressure reducer is  $12 \text{ kg/cm}^2$ .

The gas passes through the mixed-gas line into the inhalation bag and through the inhalation tube and the mouthpiece into the diver's air passages.

The exhaled gas flows through the exhalation tube into the exhalation bag and through the rechargeable soda-lime cartridge back into the inhalation bag. Excess gas escapes through the pressure relief valve with the noise-deadening air bubble distributor.

For more rapid filling of the air passages, additional gas can be obtained through the make-up valve located in the dosage block, which can be operated from the exterior.

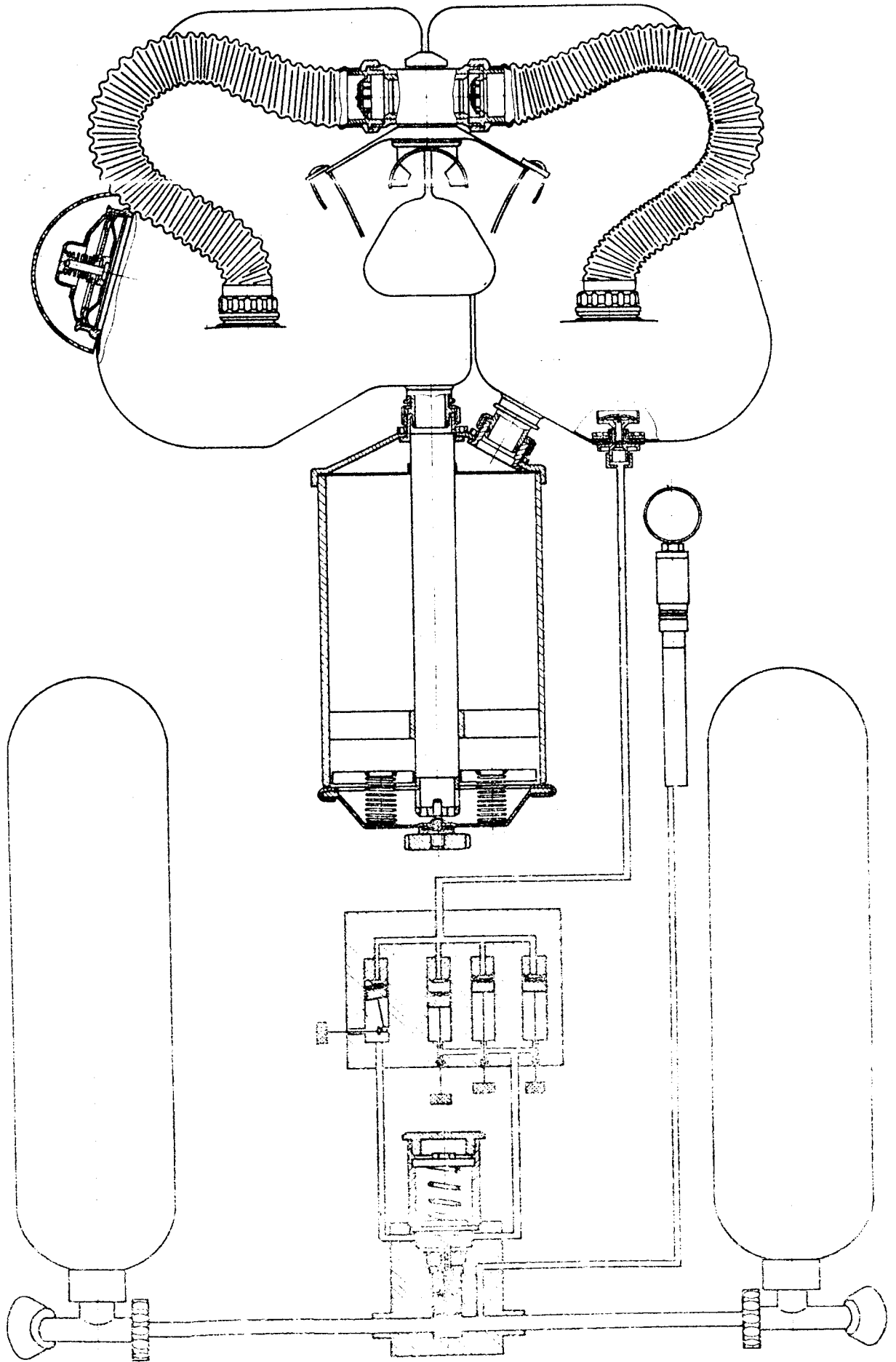
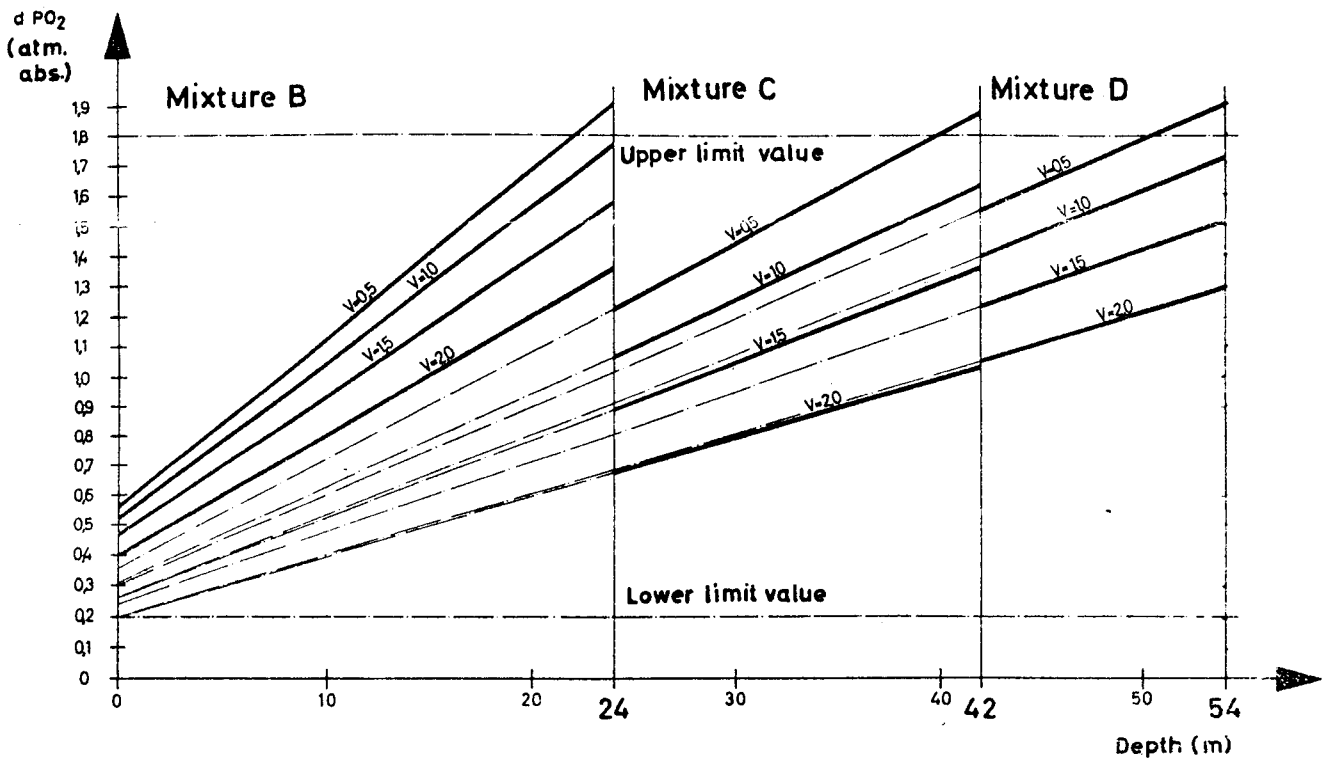


Fig. 13 Circuit diagram (cross-section drawing)



Mixture B

60% O<sub>2</sub>, 40% N<sub>2</sub>  
6 l mixture/min

Depth (m)	d PO <sub>2</sub> (atm. abs.)			
	V=0.5	V=1.0	V=1.5	V=2.0
0	0.56	0.52	0.47	0.4
24	1.91	1.77	1.58	1.36

Mixture C

40% O<sub>2</sub>, 60% N<sub>2</sub>  
8 l mixture/min

Depth (m)	d PO <sub>2</sub> (atm. abs.)			
	V=0.5	V=1.0	V=1.5	V=2.0
0	0.36	0.31	0.26	0.2
24	1.22	1.07	0.88	0.68
42	1.87	1.63	1.36	1.04

Mixture D

32.5% O<sub>2</sub>, 67.5% N<sub>2</sub>  
13 l mixture/min

Depth (m)	d PO <sub>2</sub> (atm. abs.)			
	V=0.5	V=1.0	V=1.5	V=2.0
0	0.5	0.27	0.24	0.2
42	1.55	1.4	1.23	1.05
54	1.9	1.72	1.52	1.29

Fig. 14 Oxygen partial pressure as a function of the consumption with different oxygen-nitrogen mixtures at different diving depths.

1.5 Technical Data

Principle of the apparatus: Semi-closed respiratory circuit with three adjustable constant dosages. CO<sub>2</sub> absorption in the apparatus through a rechargeable soda-lime cartridge.

Gas mixture	B		C		D	
	60% O <sub>2</sub>	40% N <sub>2</sub>	40% O <sub>2</sub>	60% N <sub>2</sub>	32.5% O <sub>2</sub>	67.5 % N <sub>2</sub>
Diving depth	0 m - 24 m		24 m - 42 m		42 m - 54 m	
Dosage	6 l/min		8 l/min		13 l/min	
Diving time	150 min		110 min		70 min	

Apparatus weight : without gas and soda-lime charge app. 20.5 kg  
 with gas and soda-lime charge app. 25 kg  
 ready for diving in water app.

Dimensions : Length app. 650 mm  
 Width app. 460 mm  
 Height app. 215 mm

Soda-lime charge : 3.5 litres  
 Type of soda lime recommended: Dräger Sorb 650 or 500  
 or soda lime of similar quality with a grain size of  
 2.4 ..... 5 mm

Gas supply cylinders: Capacity 2 x 2.5 litres  
 Charging pressure 200 kg/cm<sup>2</sup>  
 Test pressure 300 kg/cm<sup>2</sup>  
 Working pressure: max. 200 kg/cm<sup>2</sup>  
 min. 12 kg/cm<sup>2</sup>  
 Material : Light metal

2. Use

2.1. Preparation

2.1.1. Charge mixed-gas cylinders with corresponding gas mixture

(Watch charging pressure; if necessary check gas mixture)

2.1.2. Connect mixed-gas cylinders in apparatus

Screw the manual screw couplings of the pressure reducer to the cylinder valve connection threads. Fit straps.

2.1.3. Set the dosage corresponding to the cylinder charge

Unscrew fixing screw.

Turn selector switch to the left or right until the code letter required can be seen, then secure selector switch again with the fixing screw.

The code letters signify:

B = mixture B 60 % O<sub>2</sub> 40 % N<sub>2</sub>  
C = mixture C 40 % O<sub>2</sub> 60 % N<sub>2</sub>  
D = mixture D 32.5 % O<sub>2</sub> 67.5 % N<sub>2</sub>

Attention !

Do not turn selector switch with cylinder valves open or allow to rest between 2 code letters.

2.1.4. Check dosage

Connect connection tube of the test unit to the dosage line of the FGT I.

(The precision regulating valve of the test unit must be open)



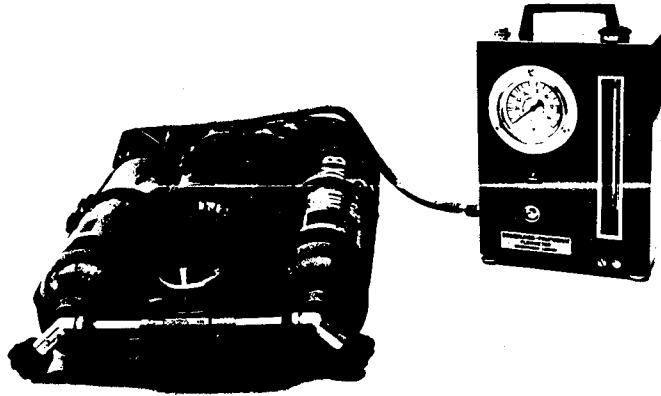


Fig.15 Check dosage

Open cylinder valves of the mixed-gas cylinders.

The measuring tube float must lie within the field of tolerance of the code letter set on the pressure reducer.

Now turn the precision regulating valve until a pressure head, corresponding to the maximum diving depth, is indicated for the mixture.

Max. diving depth for mixture B = 24 m w.g.

C = 42 m w.g.

D = 54 m w.g.

The float must lie within the same field of tolerance.

Close mixed-gas cylinders.

Relieve test unit of pressure and detach connecting tube.

2.1.5. Fill soda-lime cartridge and fit in apparatus

Fill soda-lime cartridge up to the marking groove with soda lime, shaking down the soda lime by tapping on the wall of the container.

Close the soda-lime cartridge by manual tightening of the central thread in the cover, place cartridge in the apparatus and secure with the straps.

Connect inhalation and exhalation bag.

2.1.6. Connect twin breathing tube

Connect twin breathing tube to the breathing bag pipe connections.

2.1.7. Check the apparatus for leaks

The following methods can be used for this purpose:

✦ Completely empty the apparatus by breathing through the valve mouthpiece with the gas mixture cylinders closed and then close the valve mouthpiece. If the apparatus is tight, the deflated breathing bags will not re-inflate. The empty apparatus must be watched for a few minutes.

✦ Open gas mixture cylinders and fill the breathing bag through the additional dosage unit (bypass), keeping the valve mouthpiece closed. Now immerse the entire unit in water. Air bubbles should not appear at any point.

Leaks must be eliminated by changing the sealing elements.

2.1.8. Fit casing cover and apply strap.

2.1.9. The apparatus is ready for diving.

2.2. Diving procedure

2.2.1. Put on the apparatus

The apparatus is carried on the back. It is held in place by the shoulder straps, the body belt and the crutch belt. The straps must be adjusted such that the apparatus rests firmly and securely against the body at the correct height.

2.2.2. Mouthpiece position

Correct the mouthpiece position of the twin breathing tube if necessary. This is done by loosening the screw connections on the casing a little, turning the mouthpiece and carefully tightening the connections again.

2.2.3. Empty the diving apparatus by breathing

Empty the breathing bags by breathing with the cylinder valves closed.

Inhale through the mouthpiece and exhale through the nose until a high resistance can be felt, indicating that the breathing bags are completely empty. Close the rotary slide valve on the valve mouthpiece.

2.2.4. Open cylinder valves

Check the cylinder pressure on the finimeter.

2.2.5. The diver makes the connection to the apparatus circuit

Put on diver's goggles; exhale deeply, take the valve mouthpiece in the mouth and then open the rotary slide valve.

Fill apparatus circuit via the bypass.

2.2.8. The diver is ready for diving

Attention !

The cylinder pressure must not drop below 12 kg/cm<sup>2</sup>, since the constant dosage required is no longer guaranteed below this pressure. The pressure gauge serves for checking. The luminous area in the lower pressure range of the pressure gauge is intended as a reserve.

As soon as the pointer indicates reserve, the selector switch settings on the pressure reducer still permit diving times of:

- app. 40 min for selector switch setting B,
- app. 20 min for selector switch setting C,
- app. 12 min for selector switch setting D.

The diving times are shortened by actuation of the bypass.

2.3. Safety instructions for use

- 2.3.1. Observe the special marine regulations for diving.
- 2.3.2. Before surfacing, the diver should remain for a short time below the surface of the water, so that a second diver can be sure that the apparatus is absolutely free from leaks and ready for diving.
- 2.3.3. The mouthpiece must never be removed from the mouth either under or above the water without closing the mouthpiece valve.

Infiltration of water destroys the absorption capacity of the soda lime.

Infiltration of air enriches the breathing circuit with nitrogen.

- 2.3.4. The soda lime is always to be renewed when the oxygen cylinder is changed. A full oxygen cylinder should never be used with a partly or completely consumed soda-lime charge.
- 2.3.5. For reasons of hygiene, the apparatus should only be used by one person, but if this is not the case, the easily removeable parts of the respiratory circuit should at least be disinfected.

### 3. Maintenance

The apparatus must be thoroughly cleaned after each diving operation. For this purpose, all the components which are directly linked with the respiratory circuit can be removed from the apparatus without using tools.

We recommend rinsing these parts in a disinfectant bath or at least with clear tap water.

- 3.1. Remove the soda-lime cartrodge from the apparatus and empty it completely. Then rinse thoroughly.

Warning ! With water, soda lime forms a strong alkali, which must not be allowed to come into contact with the pressure reducer and the other elements of the apparatus.

- 3.2. Thoroughly rinse the breathing tubes and the valve mouthpiece.
- 3.3. Remove the breathing bags from the apparatus and rinse them out.
- 3.4. When cleaning the apparatus shell with the pressure reducer fitted, it must be ensured that no moisture passes into the connecting lines and pipe connections.

3.5. All the cleaned parts should be dried in a well-ventilated, shady place. In particular, the breathing bags must be laid out such that any moisture can run out.

3.6. Reassemble the apparatus in accordance with the instructions after cleaning and drying.

If required, lubricate the gasket-sealed connections in accordance with the lubrication chart, so that the connections are made smoothly and the gaskets are not damaged.

The apparatus should always be stored with full cylinders but with empty soda-lime cartridge.

3.7. Testing and adjustment of the pressure relief valve

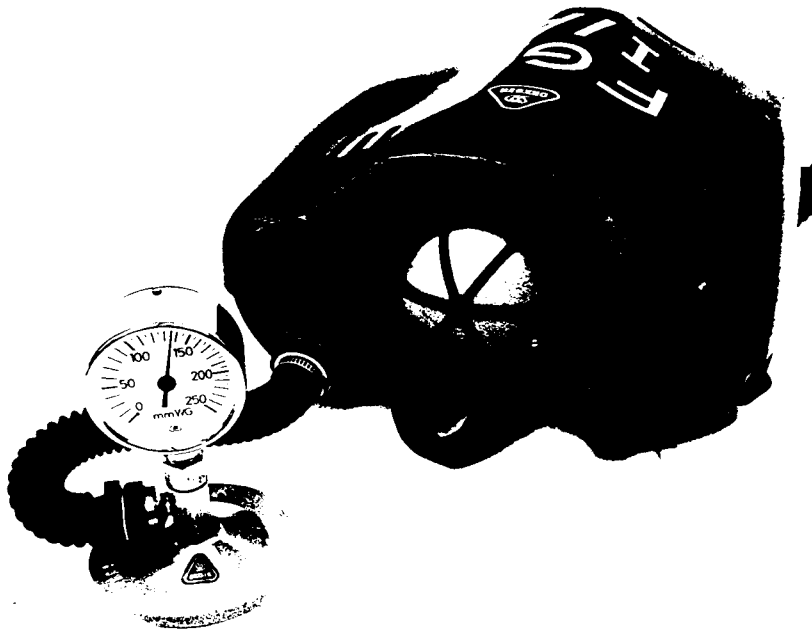


Fig.16 Testing the pressure relief valve

3.7.1. Testing (with test unit T 10 900)

- \* Seal off the pipe connection of the inhalation bag.
- \* Connect the test unit connecting tube to the exhalation bag pipe connection.
- \* Open cylinder valves and read the blow-off pressure of the pressure relief valve on the pressure gauge.
- \* Close cylinder valves.

The pressure gauge pointer must come to rest after a slight drop in pressure.

3.7.2. Adjustment

Separate the hood from the lower shell by loosening the nuts.

Now loosen the valve counter-ring. The blow-off pressure is increased by turning the adjusting screw to the right, reduced by turning it to the left.

3.8. Defective parts must be replaced.

Replacement of gaskets or profile gaskets on the pressure-reducer - cylinder connection should only be carried out using gasket removers suitable for this purpose. Damage to the sealing groove caused by unsuitable tools would result in leaks.

The mixed-gas cylinders are pressure vessels and are, therefore, subject to regular inspection by the appropriate inspection authority (e.g. the TÜV (Technical Acceptance Authority) in Germany).

The apparatus should be overhauled by the manufacturer at regular intervals.

DRÄGERWERK

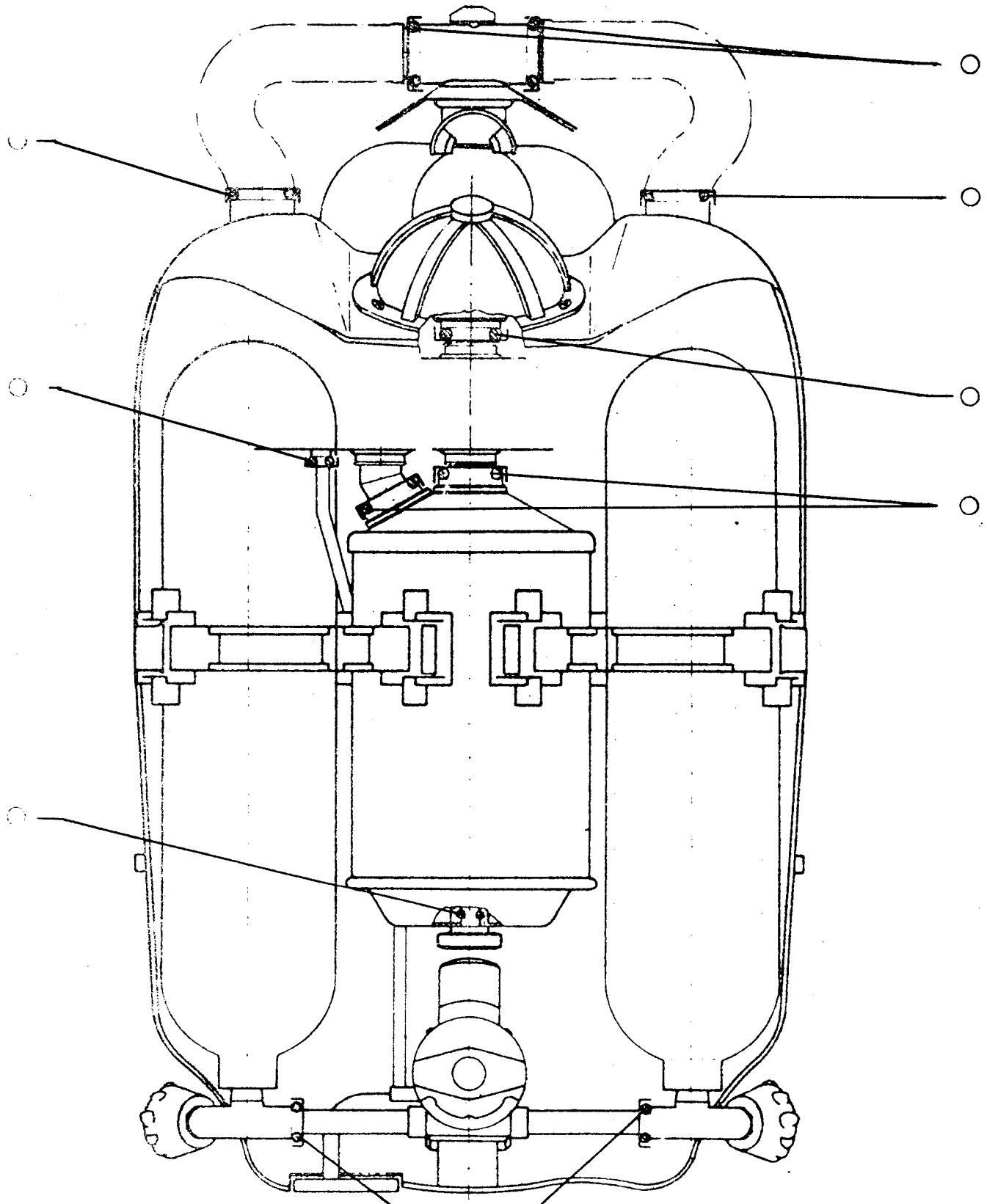
Heinr. & Bernh. Dräger

KA - DIVING TECHNIQUES

Lübeck, 19.3.1970

KA-TT/Schom/VÜ

*Schmierplan FGT 1/A*  
*Lubrication plan*



*Hier nicht schmieren !*  
*Do not grease here*

- An diesen Stellen mit O-Ring Fett .. KRYTOX .. schmieren
- These places should be greased with .. KRYTOX ..