July 30, 1929. K. HIPSSICH 1,722,375

DIVING APPAREL ADAPTED TO WITHSTAND HIGH PRESSURE

Filed March 16, 1927 2 Sheets-Sheet 1

Fig. 1.

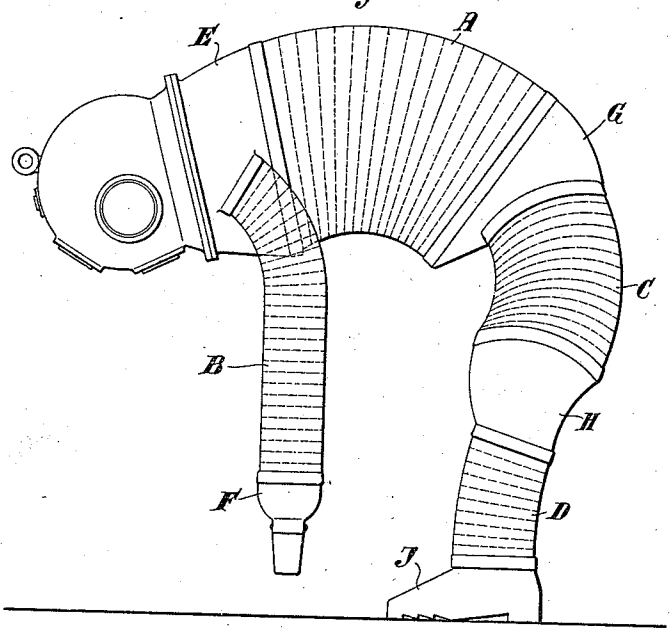
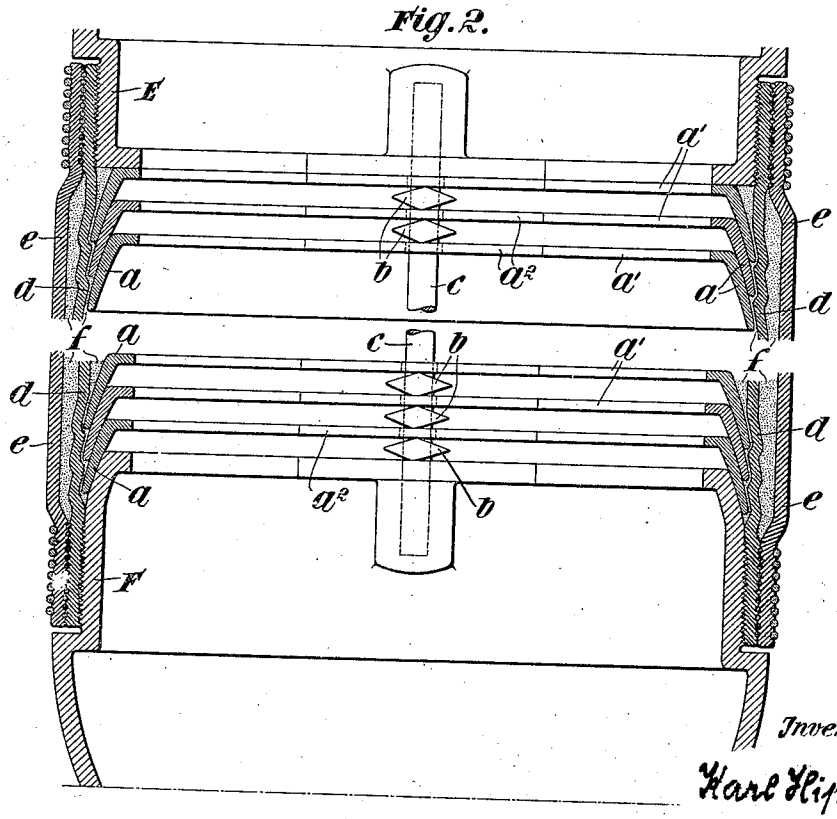


Fig. 2.



Inventor:

Karl Hipssich

July 30, 1929. K. HIPSSICH 1,722,375

DIVING APPAREL ADAPTED TO WITHSTAND HIGH PRESSURE

Filed March 16, 1927 2 Sheets-Sheet 2

Fig.3.

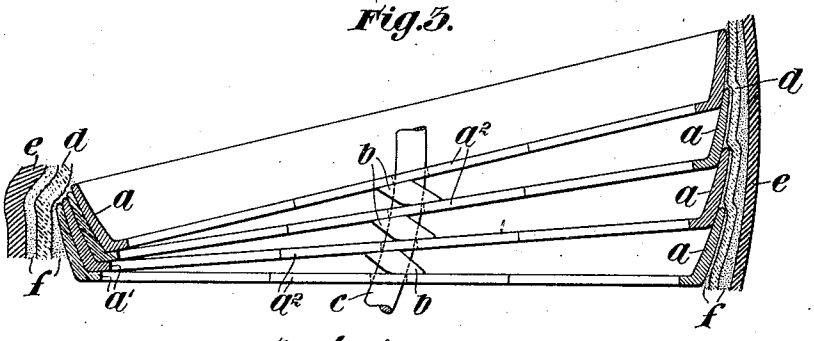


Fig.4.

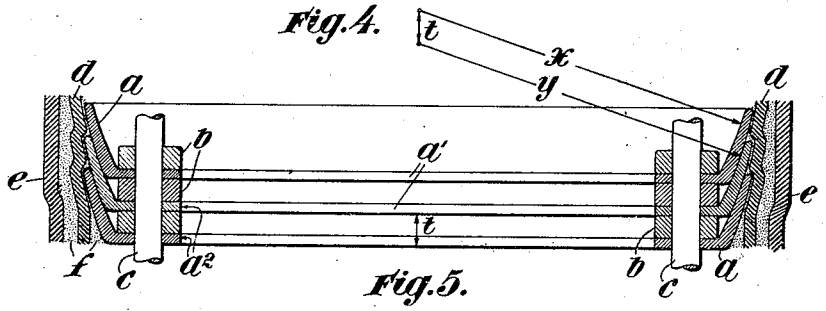


Fig.5.

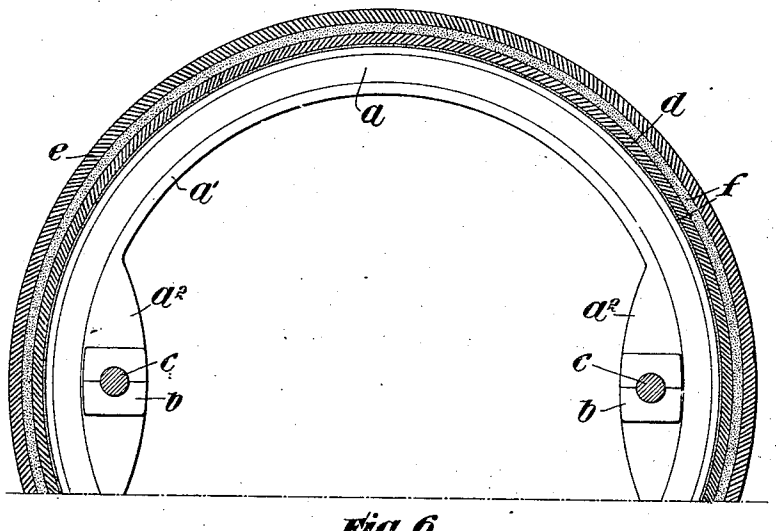
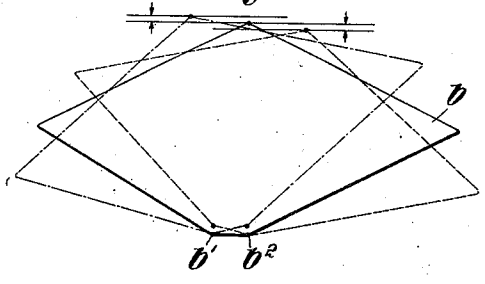


Fig.6.



Inventor:
Karl Hipssich.

Patented July 30, 1929. 1,722,375

UNITED STATES PATENT OFFICE.

KARL HIPSSICH, OF HAMBURG, GERMANY.

DIVING APPAREL ADAPTED TO WITHSTAND HIGH PRESSURE.

Application filed March 16, 1927. Serial No. 175,889.

This invention relates to diving apparel and has for its object to provide diving apparel capable of withstanding high external pressure, while allowing the body to be moved at this pressure and the carrying out of work. The diver is enabled to breathe at normal atmospheric pressure and to move the body, the arms and the legs with almost the same ease as in an ordinary diving suit. The parts of the apparel in question consist of interengaging members capable of tilting with respect to one another and effectively protected by an overall covering, for instance of rubber, against the penetration of water, sand and the like.

The invention is illustrated diagrammatically and by way of example in the accompanying drawings, in which Figure 1 is a side-view of the diving apparel, it being assumed that a diver is just enclosed in it and is in a stooping position; Figure 2 shows axial or longitudinal sections through parts of the arm, the upper portion of the figure showing the upper end of the arm where it joins the body and the lower portion of the figure showing the lower end of the arm where it joins the hand member, the middle portions of the arm being omitted and the figure being drawn to a greatly enlarged scale relatively to Figure 1; Figure 3 is an axial or longitudinal section through a part of a leg near the knee of the same, the knee being assumed to be bent and the members being, therefore, in another position with respect to each other; Figure 4 is a view similar to Figure 3, but showing the members not turned or tilted relatively to each other, and the plane of section lying by 90° remote from that of Fig. 3; Figure 5 is a plan of the members shown in Fig. 4, and Figure 6 shows a detail in several positions, all as fully dealt with hereinafter.

The members belonging to the body part A (Fig. 1), the arms B, the upper parts C and the lower parts D of the legs, differ only as regards their diameter and their number. The constructional details in all are the same. All the members of the parts A, B, C, D consist of successive and interengaging rings *a* (Figs. 2 and 5) of angular cross-section, the contacting surfaces of which are spherical, having their convex surface to the outside and their concave surface to the inside (Figs. 2–4), so that, when the parts (A or B or C/D) of the apparel are flexed, the outer surfaces and the inner surfaces remain in close contact with one another up to a certain given limit, as shown in Fig. 3. Let these rings (Fig. 3) belong, for instance, to the part C of the apparel. In Fig. 4 they are represented as being turned through 90° with respect to Fig. 3 and Fig. 5 shows a horizontal section through Fig. 4. The radii of curvature of the outer and the inner spherical surfaces are of equal length, as is indicated by the radii X and Y in Fig. 4, the centres of curvature being displaced axially by the distance *t* between the rings.

Between each two successive rings are two distance pieces *b* lying opposite one another and each having a central hole (Figs. 3–5), the distance pieces lying at the sides of the apparel at either side of the body of the diver. At these places the inwardly directed flanges a^1 of the rings *a* are widened, as shown at a^2 in Fig. 5, holes being bored through the widened portions, having the same diameter as the holes in the distance pieces *b*. Through the alternate holes in the distance pieces *b* and the flanged parts a^2 wire ropes *c* are passed (Figs. 3–5), which prevent the rings *a* and the distance pieces *b* from being turned with respect to one another and are also capable of taking up any tensile forces, the said ropes being substantially vertical, when the body is held upright, and curved when the body is curved, as shown in Fig. 3.

The distance pieces which also take up the axial pressure are of peculiar shape. One such distance piece is shown in side view to an enlarged scale in Fig. 6. As will be seen it is rhomboidal or, more accurately speaking, approximately rhomboidal, for the lower broken surface has two edges of deflection b^1 and b^2. This is an important arrangement, for it prevents any part of the apparel from becoming shorter, which would result from its being twisted, the rope and the distance pieces being given a slightly helical twist, as indicated in Fig. 3.

Each set of rings *a* has a covering *d* common to them all (Figs. 2–5) of rubber, leather or the like, which encloses each sets of rings in a completely water-tight manner. At either end each covering *d* is connected to the correspondingly shaped connecting parts of the undivided or rigid parts of the apparel (E, F, G, H, J of Fig. 2 which relates to the set of rings B) by means of a large number of convolutions of wire so as to make a perfectly tight joint. Preferably these parts of the connecting parts are provided with a

large number of threads, into which the rubber is pressed by the wire convolutions. Leather protective coverings *e* are secured in a similar manner against external damage, and finally between the coverings *d* and *e* and the rings *a* a layer *f* of stiff grease is provided which helps to keep the suit perfectly water-tight and reduces friction.

I claim:

1. A diving apparel in the form of a diving suit and adapted to withstand high external pressure, comprising, in combination with a rigid shoulder part and a rigid seat part and with hose-like members of a water-tight flexible material connected tightly with said rigid parts, sets of successive and interengaging rings located within said hose-like members, each ring having an inwardly directed flange and each flange being provided with two oppositely located holes located at the sides of the diver's body; distance pieces of approximately rhomboidal shape located between said holes and having each a bore co-axial with the said holes, and pieces of rope extending through the alternating holes and bores of the flanges and the distance pieces and being affixed at their ends to the said rigid parts, substantially as set forth.

2. A diving apparel in the form of a diving suit and adapted to withstand high external pressure, comprising, in combination with a hollow rigid shoulder part and a hollow rigid seat part and with hose-like members of a water-tight flexible material connected tightly with said rigid parts, sets of successive and interengaging rings located within said hose-like members, each ring having an inwardly directed flange and each flange being provided with two oppositely arranged holes located at the sides of the diver's body; distance pieces of approximately rhomboidal shape located between said holes and having each between two of its inclined faces two tilting edges lying close to one another, and having each a bore co-axial with the said holes, and pieces of rope extending through the alternating holes and bores of the flanges and the distance pieces and being affixed at their ends to the said hollow rigid parts, substantially as set forth.

3. A diving apparel in the form of a diving suit and adapted to withstand high external pressure, comprising, in combination with a hollow rigid shoulder part and a hollow rigid seat part and with double hose-like members of water-tight flexible materials connected separately and tightly with said rigid parts, sets of successive and interengaging rings located within said double hose-like members, each ring having an inwardly directed flange and each flange having two oppositely located holes provided at the sides of the diver's body; distance pieces of approximately rhomboidal shape located between said holes and having each a bore co-axial with the said holes, and pieces of rope extending through the alternating holes and bores of the flanges and the distance-pieces and being affixed at their ends to the said hollow rigid parts, substantially as set forth.

In testimony whereof I affix my signature.

KARL HIPSSICH.