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Prajsnar et al.

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[54] **DRAWING DIE ASSEMBLY WITH INTEGRAL COOLING SYSTEM IN DIE HOUSING**

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[52] **U.S. Cl.** **72/342,** 72/467

[51] **Int. Cl.** **B21d 37/16,** B21c 3/00

[58] **Field of Search** ..... 72/342, 467; 287/189.36 J; 49/479, 488

[56] **References Cited**

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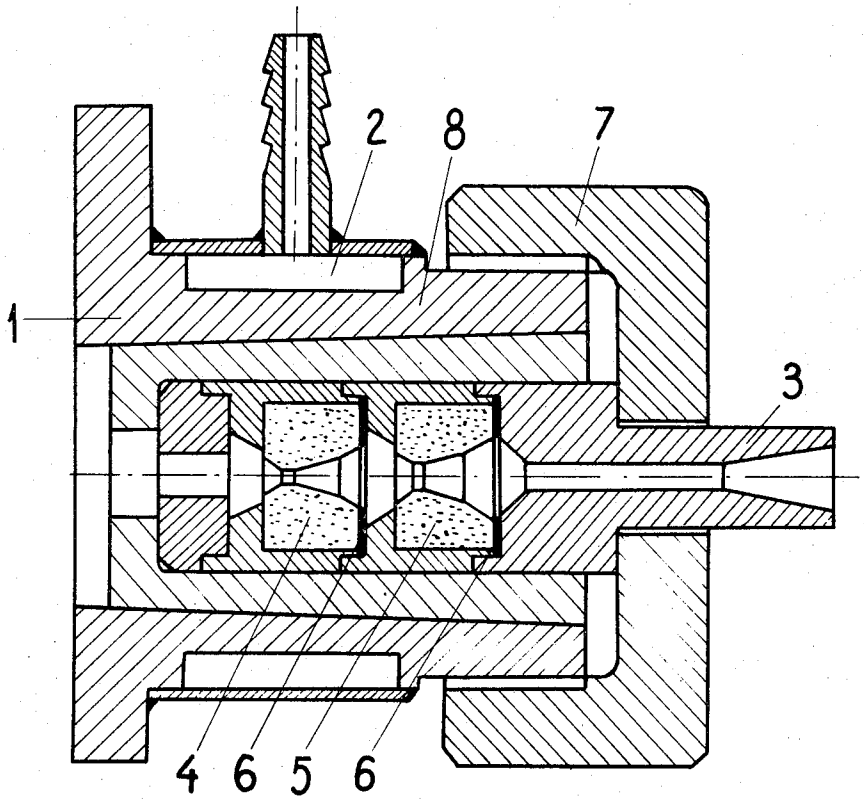
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Primary Examiner—Charles W. Lanham
Assistant Examiner—Robert M. Rogers
Attorney—Karl F. Ross

[57] **ABSTRACT**

A pressure drawing die designed for drawing wires, rods and tubes made of materials having varied mechanical properties, whereby use is made of the effect of hydrodynamic friction. The drawing die incorporates a system of dies with a pressure sleeve with hydrodynamic action. A cooling system is built into the drawing-die body or housing. The inlet portion of the pressure sleeve extends outside the body through the orifice in a pressure nut. Between dies a seal in a form of labyrinths and metal powders is provided. The working dies are provided with metal jackets which separate the die core from the pressure mounting.

7 Claims, 7 Drawing Figures



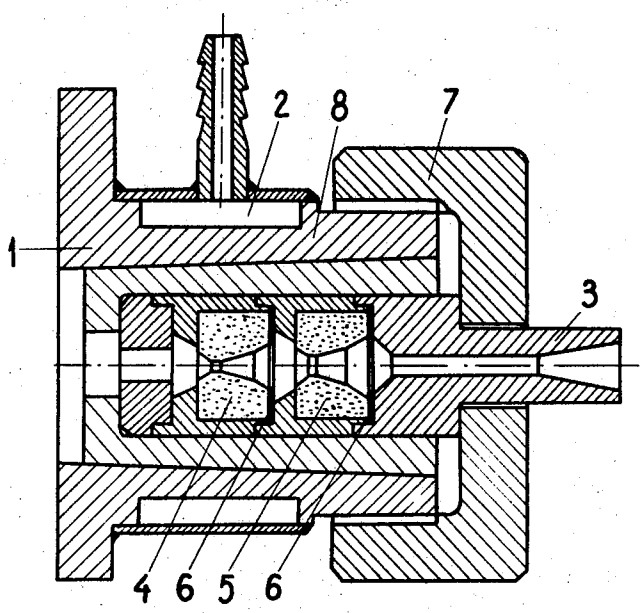


Fig. 1

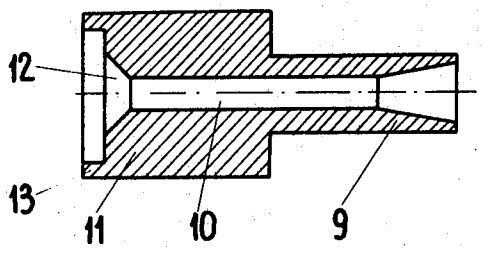


Fig. 2

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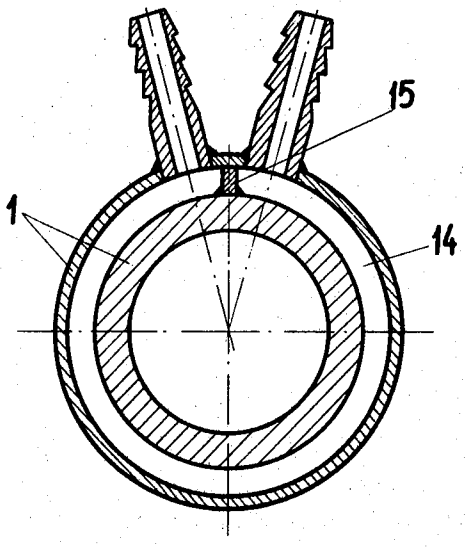


Fig.3

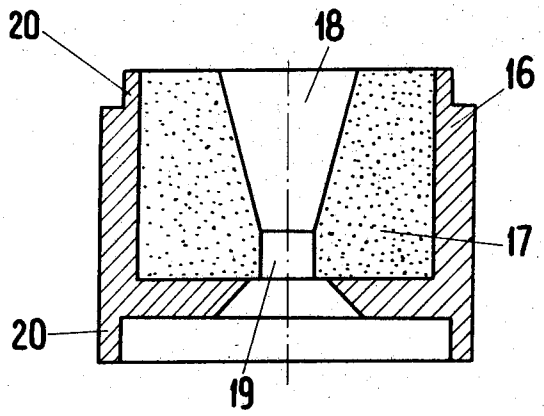


Fig.4

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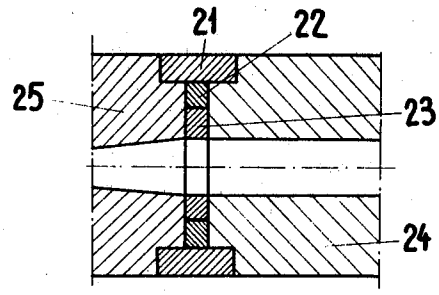


Fig.5

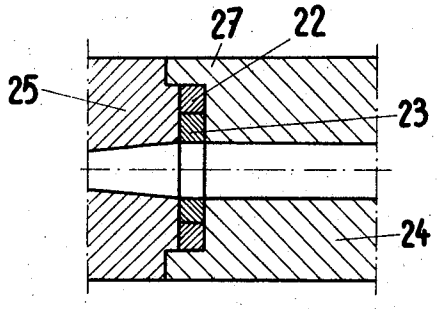


Fig.6

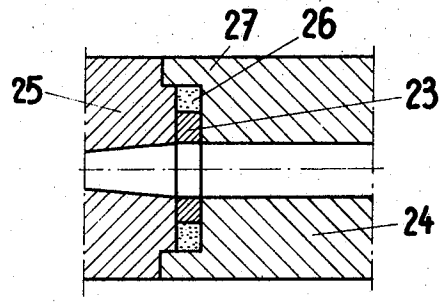


Fig.7

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DRAWING DIE ASSEMBLY WITH INTEGRAL COOLING SYSTEM IN DIE HOUSING

FIELD OF THE INVENTION

The invention relates to the die designed for drawing wires, rods, and tubes made of material having varied mechanical properties, using the effect of hydrodynamic friction.

BACKGROUND OF THE INVENTION

Two-part drawing assemblies which consist of two dies: the working die and the thrust die, made in a form of sinter cores, divided by a gasket, built into a collet and enclosed in the common casing consisting of a body (housing) and a nut, are known.

With this drawing die, it is possible to build in, instead of the thrust die, a pressure sleeve, with a view to obtaining a higher lubricant pressure, whereby, for each sleeve length another body is employed. This sleeve is located entirely inside the body or housing.

Another known design is represented by a die provided with a mounting inside which a die made of sintered carbides, a gasket, and a sleeve with flange are placed. This die is designed for drawing wires with the use of liquid lubricants.

Still another system uses a pressure die in which pressure is obtained by means of pumps.

In some other designs a working die made of sintered carbides with a metal mounting is used; however, the outer diameter of the mounting amounts to more than 1.4 times the outer diameter of the die core, whereby, in these cases a clamping device is not employed.

All these designs do not provide satisfactory results. They do not guarantee constant pressures and with the progressing use of the system or changing dimensions of the blank being drawn are not able to ensure fluid friction. Besides, the designs described above make it necessary each time the dimension or production program is changed, to change also the casing of the pressure drawing die.

OBJECT OF THE INVENTION

The object of the invention is the development of such a pressure die, which with unchanged overall dimensions of the clamping sleeve, casing, and pressure seat of the die, will ensure a hydrodynamic lubrication in drawing a material of any kind. This object is achieved with a pressure die assembly incorporating a tandem system of dies with pressure sleeves with hydrodynamic action, whose body or housing includes a permanently built-in cooling system, and a pressure sleeve, whose outlet part partly extends outside the body through the orifice in the clamp nut.

Between the dies and the die and pressure sleeve a seal in the form of metal rings or metal powder is provided. The working dies have a metal jacket which separates the core of the working die from the clamping mounting.

The working dies and the pressure sleeve are provided with cooperating labyrinths forming seals. A version of the die, according to the invention, has working dies whose core has only the die reduction angle and the calibrating part.

The pressure die also may have a plurality of working dies, whereby, the first die downstream of the pressure sleeve is the thrust-working die, i.e., depending on needs, this die deforms the metal being drawn, or it reduces the diameter of the sleeve orifice.

DESCRIPTION OF THE DRAWING

The invention is illustrated in the accompanying drawing, in which:

FIG. 1 is a longitudinal section of the universal pressure die;

FIG. 2 is a cross-section through the pressure sleeve of the universal die;

FIG. 3 is a cross-section through the cooling system of the universal die;

FIG. 4 is a section through a die;

FIG. 5 is a section through the seal; and

FIG. 6 and FIG. 7 are sections of other versions of the seal.

SPECIFIC DESCRIPTION

FIG. 1 shows the die according to invention, which has the body 1 with a permanently built-in cooling system. In the body 1 the centering clamp sleeve 8 tapered complementary to the wall of body 1 in contact therewith, away from the threaded end of the body is located, inside which are provided working dies 4 and 5, and the pressure sleeve 3, whose outlet part extends outside the die through the orifice in the clamp nut 7 which bears on a shoulder of the pressure sleeve. Between the dies 4 and 5 and the pressure sleeve 3 a seal 6 is included. The cooling channel 2 (FIG. 1) axially spans both dies for the collective cooling thereof.

In FIG. 2 the pressure sleeve 3 is shown; the sleeve 3 has the inlet part 9, orifice 10 through which the metal being drawn passes, the outlet part 11, the labyrinth undercut 13, whereby the orifice 10 in the outlet part 11 has a widening or enlargement 12.

In FIG. 3 the cooling system of the universal die is shown, which consists of the chamber of the cooling cycle 14 built in the body 1 of the die, whereby, for the proper circulation of the cooling agent, the chamber is divided by the rib 15.

The structural details of the working die 4 and 5 are shown in FIG. 4 which comprises the metal jacket 16, inside which the core 17 made of sintered carbides is provided, whereby, the die has the die reduction angle 18, and the calbrating part 19, as well as the labyrinth undercuts 20 that cooperate with labyrinth undercuts 13 of the pressure sleeve 3.

FIG. 5 shows the seal 6 which consists of inner gasket 23, outer gasket 22 of the thrust ring 21, and the sealed elements 24 and 25, which may be working dies, or working die and pressure sleeve. The version of the seal 6, according to invention, as shown in FIG. 6 has the labyrinth undercut 27 in the form of a flange.

The other version of the seal 6 shown in FIG. 7 has an outer gasket 26 made of metal powders.

The material being drawn passes through the pressure sleeve 3 and the working dies 4 and 5, and produces in the slot between the pressure sleeve 3 and working die 5 and the material being drawn a high pressure of the lubricant, which at the inlet of the die reduction angle reaches the value of plasticity limit of material being drawn, and at the same time provides hydrodynamic lubrication.

Among the advantages of the universal die, according to invention, is the fact that it can be operated as the single- or multi-stage die, whereby, no change of

the casing for working dies with different core sizes and at different sleeve lengths are required.

The die makes it possible to obtain pressures up to 15,000 atmospheres and provides fluid lubrication for each material to be drawn. One of the most important advantages is the fact that the die enables the obtaining of considerable deformations at a raised drawing speed, as compared with speeds achieved up to now.

We claim:

1. A drawing die comprising a housing formed with a unitary tubular housing body provided integrally with an axially extending annular coolant channel, and means for passing a fluid through said channel to cool the interior wall of said housing body; a pair of dies axially aligned along said housing body and collectively cooled thereby, said channel axially spanning both said dies and at least partly surrounding same; a pressure sleeve ahead of said dies and axially aligned therewith, said pressure sleeve having an annular shoulder; a centering sleeve in contact with said wall and said dies and coaxially nested therewith for conducting heat between said body and said dies, said clamping sleeve and said wall having complementary tapers away from said shoulder; and a clamping nut threaded onto an end of said housing leading in the direction of drawing, said clamping nut having an axial orifice and bearing upon said shoulder in the direction of taper of said wall, said pressure sleeve having an axially extending portion traversing said orifice, said dies being in axially abutting engagement.

2. The assembly defined in claim **1**, further comprising a metal annular seal between said dies and said pressure sleeve.

3. The assembly defined in claim **2** wherein said seal is composed of metal powder.

4. The assembly defined in claim **1** wherein said housing includes a jacket surrounding said housing body and defining an annular compartment therein, respective ducts connected with said jacket for leading a cooling fluid to and removing the cooling fluid from said compartment, and a rib in said compartment partitioning the same.

5. The assembly defined in claim **4** wherein at least one of said dies has a sintered carbide body, a metal jacket surrounding and receiving said sintered carbide body, and a clamping sleeve receiving said metal jacket and said sintered carbide body within said housing body, the height of said metal jacket being between 1.0 and 1.4 times the height of said sintered carbide body.

6. The assembly defined in claim **5** wherein said dies and said pressure sleeve are formed with co-operating labyrinths.

7. The assembly defined in claim **6** wherein said sintered carbide body only has the die reduction angles and calibrating bore.

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