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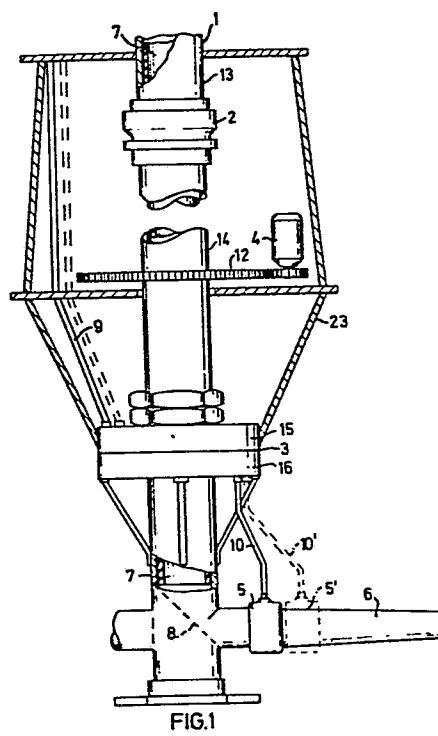
(54) Apparatus for spraying lining.

(57) The present invention describes primarily a sprayer for spraying lining on the inner surface of tunnels, deep vessels etc., e.g. ladles. The sprayer comprises a first elongated conduit (1) having an entrance end through which dry lining material is conveyed by a carrier gas and terminating at its other end in one or more mixing nozzles (5) with at least one discharge lance (6), through which the lining material is sprayed; at least one second elongated conduit (9,10) arranged outside and beside said first conduit (1) with an entrance end for a wetting agent for the lining material, and the other end of which being connected to the mixing nozzle (5); a first rotary coupling (2) intermediate the first conduit and the mixing nozzle (5); a second rotary coupling (3) intermediate the second conduit (9,10) and the mixing nozzle (5), said second coupling comprising a member (16) fixed to the first conduit (1) and a member (15) arranged around the first conduit, said members being rotatable relative to each other, the rotatably arranged member (15) being joined to the mixing nozzle(s) (5) so that the rotary couplings provide relative rotational movement between the conduits' entrance ends and outlet ends in the mixing nozzle(s) (5); and a drive means (4) for driving the mixing nozzle (5) with the discharge lance (6) in a rotating manner so that the lining material is sprayed out for even coating of the inner surface. If the dry lining material is left out, a plurality of nozzles (5) can be arranged which are supplied with different wetting agents,

and the sprayer according to the invention can be used for interior painting of cisterns and pipes of large diameter, for example.

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Apparatus for spraying lining

The present invention relates to an apparatus for spraying lining on the inner surface of tunnels, deep
5 vessels etc., e.g. ladles. There is often a need to line objects with a wear lining which for deep vessels such as ladles, for example, consists of a refractory material. In tunnels there can be a need to line the interior surface with cement.

10 Such sprayers are known; see for example U.S. patent 3,797,745. This patent describes a sprayer for lining ladles. By means of air, dry refractory material is conveyed to one or more mixing nozzles, in which the dry material is mixed with a wetting agent and leaves the
15 nozzles while they rotate by means of a drive means, so that an even lining is applied to the interior surface of the ladle. The apparatus is assumed to be movable along or parallel to the axis of the ladle. In this design, the wetting agent is applied centrally in a conduit, concentrically arranged in a pipe in which the dry material is
20 conveyed by air. Since the mixing nozzles rotate, it has proved difficult to get the wetting agent to them in a satisfactory manner. For certain applications, it may be necessary to add more than one wetting agent to the dry
25 material, and this problem is solved by the present invention as well. For certain completely different areas of application, the dry material can be eliminated and the sprayer according to the invention be used for interior painting of cisterns or pipes of relatively large diameter,
30 for example.

The invention relates to an apparatus for spraying lining onto the inner surface of tunnels, deep vessels etc. such as ladles, comprising

35 a first elongated conduit having an entrance end through which dry lining material is conveyed by a carrier gas and terminating at its other end in one or more mixing nozzles with at least one discharge lance, through which

the lining material is sprayed;

at least one second elongated conduit arranged outside and beside said first conduit with an entrance end for a wetting agent for the lining material, and the other end
5 of which being connected to the mixing nozzle;

a first rotary coupling intermediate the first conduit and the mixing nozzle;

a second rotary coupling intermediate the second conduit and the mixing nozzle, said second coupling comprising a member fixed to the first conduit and a member
10 arranged around the first conduit, said members being rotatable relative to each other, the rotatably arranged member being joined to the mixing nozzle(s) so that the rotary couplings provide relative rotational movement between the conduits' entrance ends and outlet ends in the
15 mixing nozzle(s); and

a drive means for driving the mixing nozzle with the discharge lance in a rotating manner so that the lining material is sprayed out for even coating of the inner
20 surface.

According to the invention, the second rotary coupling is provided with one or more annular grooves in each coupling half, directly facing each other, and with the required sealing means between the coupling halves, said
25 annular grooves being in communication with the entrance and outlet conduit for wetting agent.

In one embodiment of the invention, the sprayer is provided with one lance and one or more mixing nozzles.

In another embodiment, the sprayer according to the
30 invention is provided with two lances and one or more mixing nozzles to each lance.

According to the invention, the outer pipe of the first conduit can be arranged to be driven by means of the drive means with a rotary motion thus imparting the same
35 rotary motion to the lance arrangement.

In an alternative embodiment, the rotating coupling half of the second rotary coupling is arranged to be driven

by means of the drive means with a rotary movement and thus impart the same rotary movement to the lance arrangement.

The invention will be described in more detail below with reference to the accompanying schematic drawings, of which

Fig. 1 shows a side view, partially in section, of a sprayer according to the invention,

Fig. 2 shows a side view of another embodiment of a sprayer according to the invention,

Fig. 3 shows a section of the second rotary coupling used in the embodiment according to Fig. 1, and

Fig. 4 shows a section of the second rotary coupling used in the embodiment according to Fig. 2.

According to Figs. 1 and 2, the sprayer according to the invention comprises a central pipe 1, a first rotary coupling 2, a second rotary coupling 3, a drive means 4, at least one mixing nozzle 5, and at least one lance 6. A hose 7 is inserted in the central pipe 1, through which the dry material is conveyed by means of a carrier gas. The hose, which is surrounded in the pipe 1 by suitable spacers (not shown), terminates at or slightly above the deflector plate 8, which directs the dry material into the lance 6 past the mixing nozzle 5. In this embodiment the sprayer is only provided with one lance. A wetting agent for the dry material is conducted through a conduit 9, 10 via the second rotary coupling 3 to the mixing nozzle 5. The drive means 4 includes an electric motor for example which in this embodiment drives, via a gear 11, a gear ring 12 which is fixed to the central pipe 1, whereby the lance 6 is caused to rotate. This is made possible by the first rotary coupling, of known design, by means of which the central pipe 1 is divided into an upper fixed portion 13 and a rotary lower portion 14.

The second rotary coupling 3 consists of members 15 and 16, one 16 of which is fixed to the central pipe 1, by welding for example (see Fig. 3). In each member 15 and 16

there is an annular groove 17 and 18, respectively. The grooves 17 and 18 are arranged directly facing each other. Between the members 15 and 16 there are seals 19 arranged in annular grooves. The second member 15 is mounted by
5 means of a bearing 20 on the central pipe 1. The two members 15 and 16 are provided with connections 21 and 22, one the inlet and one the outlet for wetting agent. In this embodiment the connection 21 is the inlet and 22 is the outlet, which is connected to the mixing nozzle 5 via
10 the conduit 10.

If supply of more than one wetting agent is desired, several pairs of annular grooves of the same type as 17 and 18 can be arranged in the rotary coupling, and then be provided with their respective connections. The outlet of
15 such a connection is then connected to its mixing nozzle, for example 5' via a conduit 10'.

It should be noted here that it is possible to use the sprayer according to the invention without supplying dry material, using a suitably design mixing nozzle(s) and
20 lance(s) for interior painting of cisterns, for example.

The sprayer according to the invention functions in the following manner. The sprayer is suspended in a suitable suspension means (not shown). The hose 7 communicates with a suitable storage vessel (not shown) and by means of
25 a carrier gas, dry lining material can be conveyed through the hose 7 to the lance 6 past the mixing nozzle 5. The drive means 4 sets the lance 6 in rotary motion, which means that the lower portion 14 of the central pipe 1, the lower member 16 of the second rotary coupling 3, the
30 conduit 10 and the mixing nozzle 5 will rotate at the same speed. Wetting agent, which is supplied through the conduit 9, can be fed in in a predetermined amount by a known measuring means (not shown) and will flow via the annular groove 17, 18 in the coupling 3 to the mixing nozzle 5
35 and be mixed with the dry lining material and be applied to the interior walls of the vessel in question via the lance 6. A suitable lifting means, an overhead crane or the

like can move the sprayer up and down through the vessel so that its walls are evenly coated. Reference numeral 23 designates a cover which is of course removable and which serves as a heat radiation protector.

5 The sprayer according to Fig. 1 appears to be quite tall, but this is not the case in practice since, as is shown in Fig. 2, the first 2 and second 3 rotary couplings and the drive means 4 can be brought together so as to shorten the length of the sprayer. It is possible, by
10 means of suitable arrangements, to use the sprayer horizontally, i.e. with the central pipe 1 horizontal, for lining or painting tunnels or pipes of large diameter, for example. The drive means 4 can also be so constructed that the lance 6 (lances) is pivoted back and forth over a
15 certain predetermined sector.

 The embodiment according to Fig. 2 is similar to the one in Fig. 1 but it is intended for two lances 6 each with a mixing nozzle 5. Only one lance and one mixing nozzle are shown. The deflecting plate 8 in Fig. 1 has
20 been replaced here with a conical distributing means for dry material, schematically shown here and labelled 24.

 As in Fig. 1, the central pipe 1 is divided into an upper portion 13 and a lower portion 14 connected to the first rotary coupling 2, now placed near the lances 6. As
25 compared to Figs. 1 and 3, the second rotary coupling 3, as shown in Fig. 4, is turned upside down so that its member 16 is rigidly fixed to the central pipe 1 as before. The member 17, which is now the bottom member as seen in Fig. 4, can rotate about the pipe 1 on the bearing 20.
30 Fig. 2 shows the drive means 4 fixed to the upper portion of the coupling 3 and driving the gear ring 12 fixed to supports 25, which rigidly join the lower member 15 of the coupling 3 to the lower portion 14 of the central pipe 1, on which the lances 6 with the mixing nozzles 5 are
35 arranged. Neither the second lance, the second mixing nozzle nor the second supply conduit 10 to the second mixing nozzle are shown in Fig. 2.

As in the embodiment in Fig. 1, in the central pipe 1 there is a hose 7 (not shown) inserted which terminates at the conical distributor means 24.

The lance 6 (lances) can suitably be inclined downwards as seen in Figs. 1 and 2 by an angle of 5-10° and a suitable rotational speed of the lances can be between 1 and 10 r.p.m. or higher when the r.p.m. is continuously variable. The higher speed is of course used when one desires to apply thin coats. A practical measure is to keep the pressure of the wetting agent in the mixing nozzles higher than the pressure of the carrier gas for the dry material.

The construction in the present invention solves in a practically feasible manner the problem of supplying a solid dry material and at least one wetting agent to the lances 6. It has proved impossible to implement in practical operation the disclosure in U.S. patent specification 3,797,745 mentioned in the introduction.

Through the rotary coupling shown in the present Figs. 3 and 4, the supply of the wetting agent to the lances 6 is separate from the supply of the dry material. It should be mentioned here that in Figs. 3 and 4, the inlet 21 and the outlet 22 in Fig. 3 and the inlet 22 and the outlet 21 in Fig. 4 do not agree in their placements with the placement of the conduit 9 and 10 in Fig. 1 and in Fig. 2, respectively. Figs. 3 and 4 show the principle of the second rotary coupling, and as will be understood, the member 15 of the coupling 3 in Fig. 3 must be rotated 180° so that the inlet 21 will be on the same side as the conduit 9. In Fig. 4, member 15 must be rotated 180° in the same manner for the outlet 21 to be on the same side as the conduit 10 in Fig. 2. Furthermore it can be mentioned that the conduit 10 can be connected anywhere on the circumference of the annular groove 18 in Fig. 3 or the groove 17 in Fig. 4.

CLAIMS

1. An apparatus for spraying lining on the inner surface of tunnels etc., e.g. ladles, comprising

- 5 a first elongated conduit (1) having an entrance end through which dry lining material is conveyed by a carrier gas and terminating at its other end in one or more mixing nozzles (5) with at least one discharge lance (6), through which the lining material is sprayed;
- 10 at least one second elongated conduit (9,10) arranged outside and beside said first conduit (1) with an entrance end for a wetting agent for the lining material, and the other end of which being connected to the mixing nozzle (5);
- 15 a first rotary coupling (2) intermediate the first conduit and the mixing nozzle (5);
- a second rotary coupling (3) intermediate the second conduit (9,10) and the mixing nozzle (5), said second coupling comprising a member (16) fixed to the first
- 20 conduit (1) and a member (15) arranged around the first conduit, said members being rotatable relative to each other, the rotatably arranged member (15) being joined to the mixing nozzle(s) (5) so that the rotary couplings provide relative rotational movement between the conduits'
- 25 entrance ends and outlet ends in the mixing nozzle(s);
- and
- a drive means (4) for driving the mixing nozzle (5) with the discharge lance (6) in a rotating manner so that the lining material is sprayed out for even coating of the
- 30 inner surface.

2. An apparatus according to claim 1, characterized in that the second rotating coupling (3) is provided with one or more annular grooves (17,18) in each coupling half (15,16), directly facing each other, and with the required
- 35 sealing means (19) between the coupling halves, said annular grooves (17,18) being in communication with the entrance and outlet conduit for wetting agent.

3. An apparatus according to claims 1 and 2, characterized in that it is provided with a lance (6) and one or more mixing nozzles (5).

4. An apparatus according to claims 1 and 2, characterized in that it is provided with two lances (6) and one or more mixing nozzles (5,5') to each lance.

5. An apparatus according to claims 1 and 2, characterized in that the outer pipe (1) of the first conduit is arranged to be driven by means of the drive means (4) with a rotary movement thus driving the lance arrangement (6).

6. An apparatus according to claims 1 and 2, characterized in that one coupling half (15) of the second rotary coupling (3) is arranged to be driven by means of the drive means (4) with a rotational movement thus driving the lance arrangement (6).

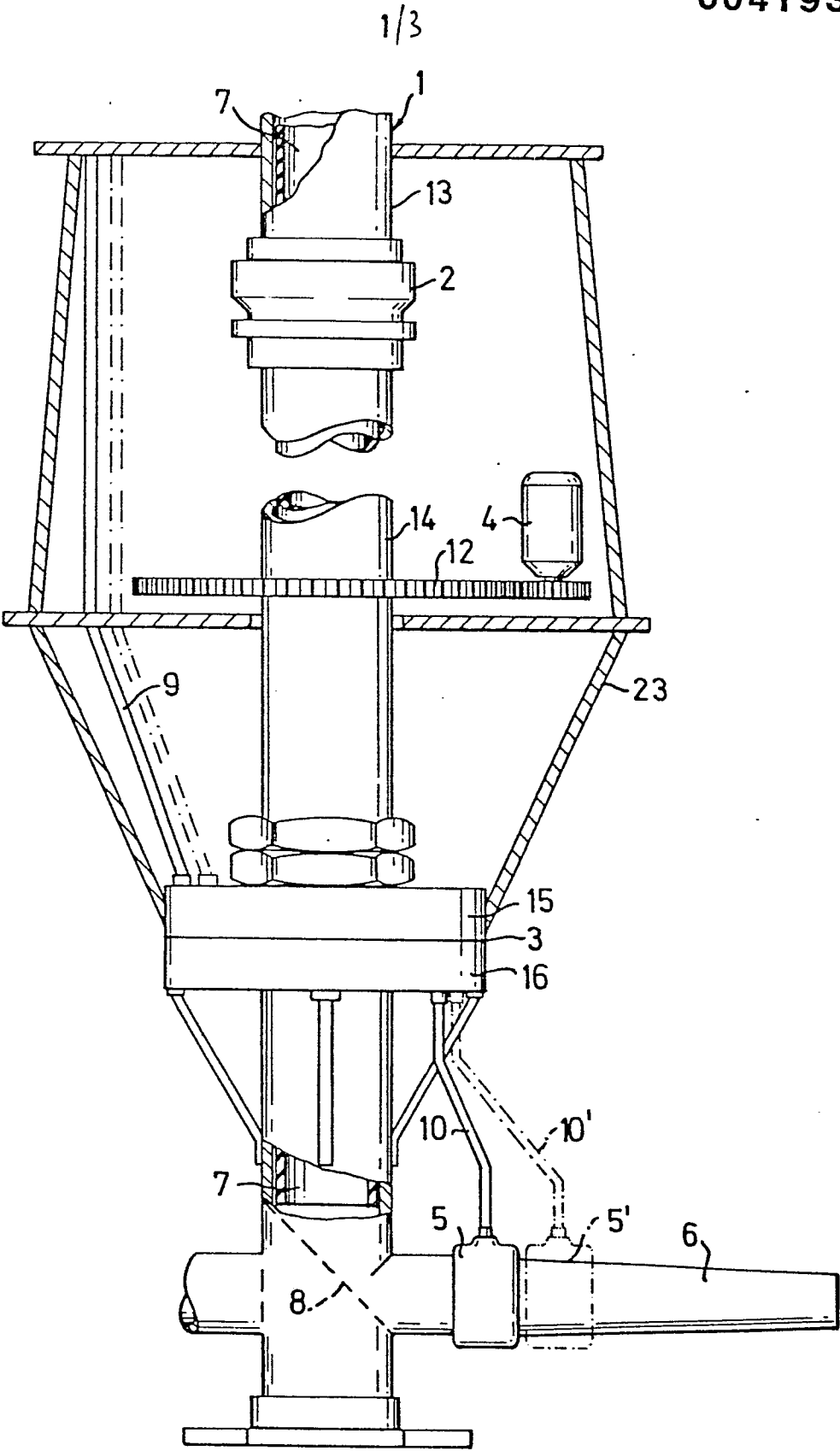


FIG.1

FIG. 2

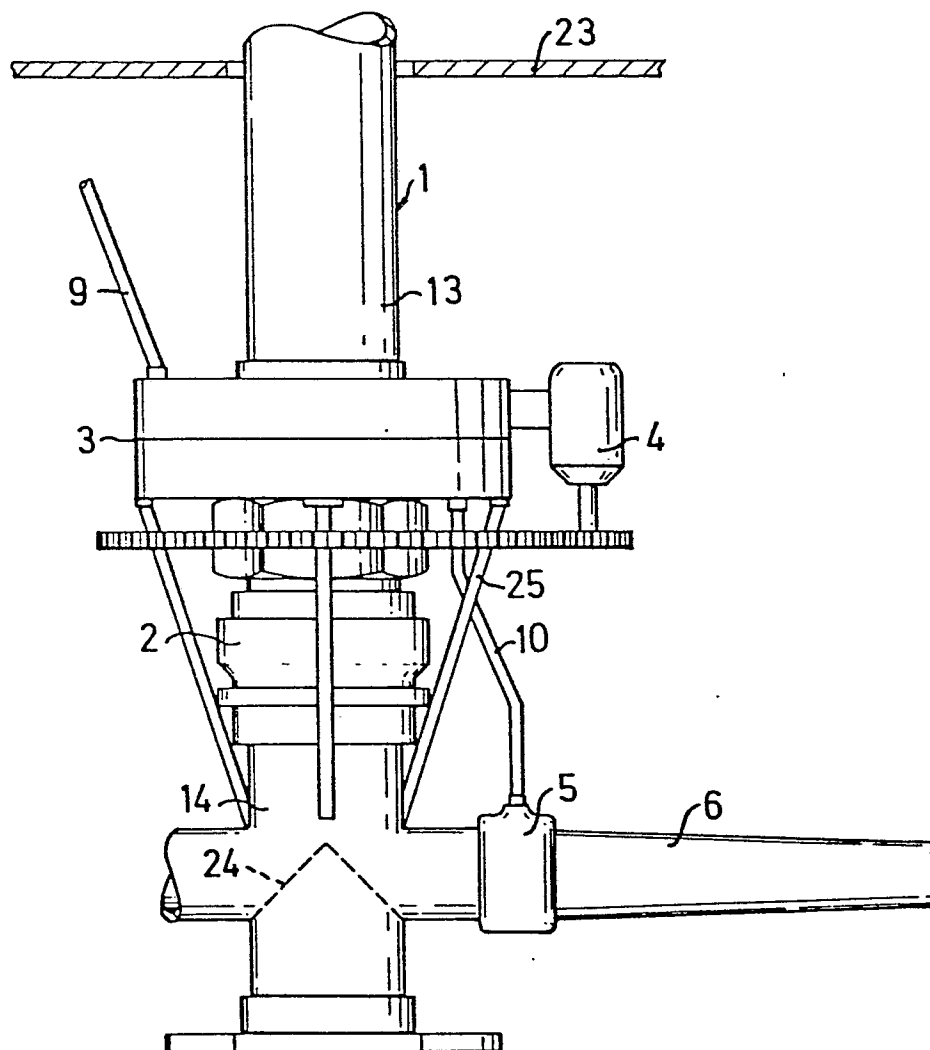


FIG. 3

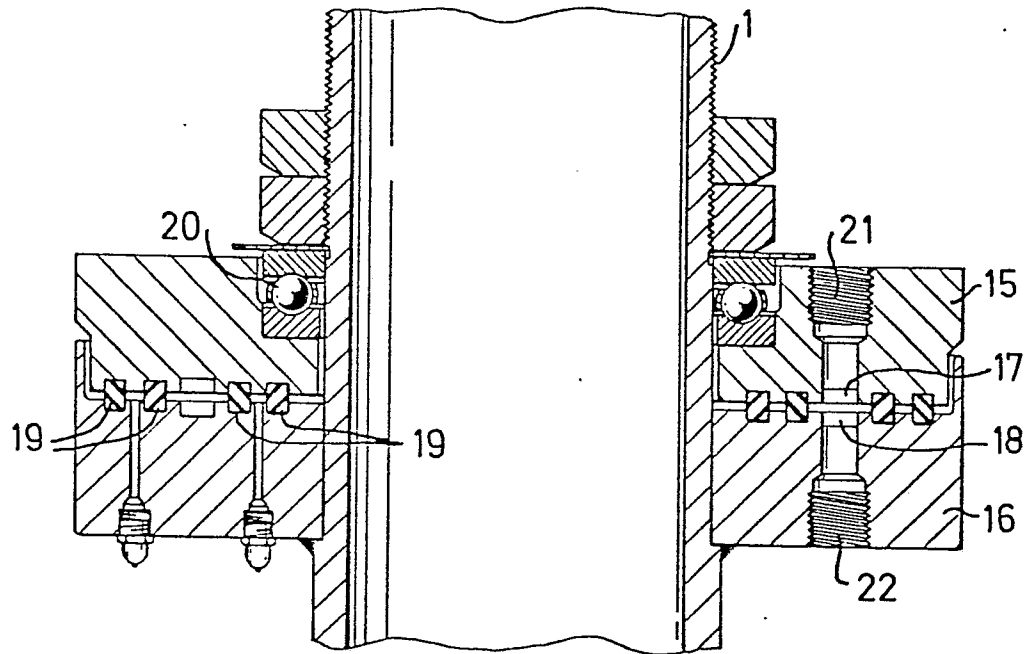
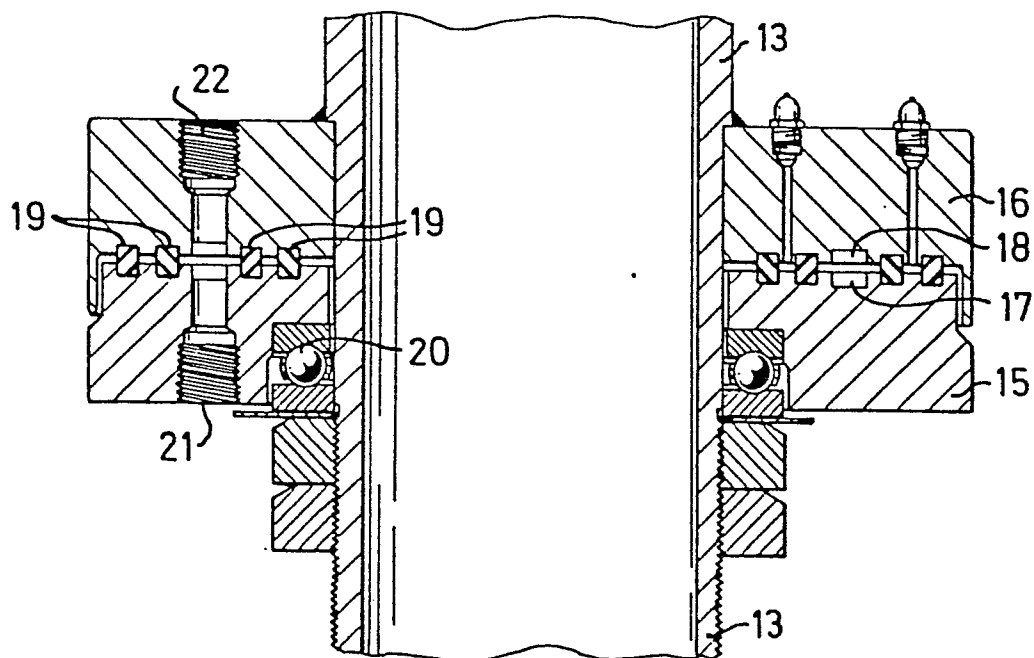


FIG. 4





European Patent
Office

EUROPEAN SEARCH REPORT

0041932

Application number

EP 81 85 0099

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<u>US - A - 4 163 546</u> (MORRIS) * Column 2, claim 1; figure 1 * --	1,5,6	F 27 D 1/16 B 22 D 41/02
P	<u>US - A - 4 211 367</u> (ALLISON) * Claim 1; figures 2,3 * --	1,5,6	
D	<u>US - A - 3 797 745</u> (HAUS) * Claims ; column 3,4; figure 1 * --	1,4,5 6	TECHNICAL FIELDS SEARCHED (Int. Cl.)
A	<u>US - A - 3 847 353</u> (WYNNE)		F 27 D B 22 D B 05 B
A	<u>US - A - 3 931 959</u> (TRUMAN)		
A	<u>US - A - 3 799 445</u> (MARINO) ----		
			CATEGORY OF CITED DOCUMENTS X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
☒ The present search report has been drawn up for all claims			&: member of the same patent family, corresponding document
Place of search The Hague		Date of completion of the search 16-09-1981	Examiner COULOMB