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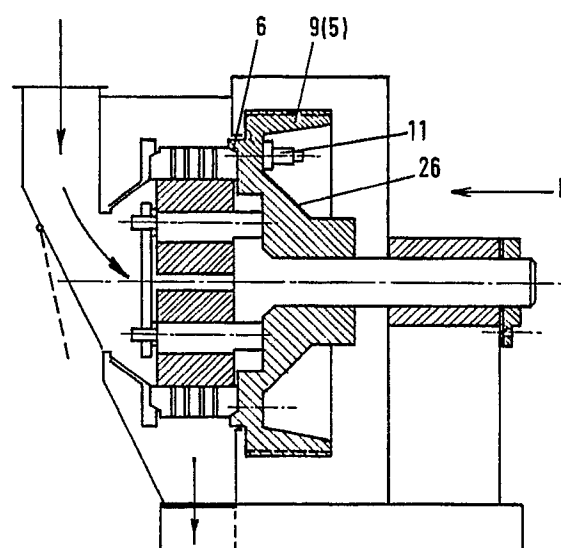
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54 **Pelleter for feed and the like.**

57 The invention relates to pelleter for feed and the like, comprising an annular extrusion die which is secured to a die holder by means of tie rods, said die holder being bearing-mounted on a stationary main shaft, a driving pulley being mounted on the die holder for rotating the extrusion die. According to the invention the extrusion die is firmly drawn onto the driving pulley (9), which forms one whole with the die holder (5). On the side of the pulley (9) that is remote from the die (1), three clamping/centering units (11) are uniformly spaced along the circumference, the free end of a tie rod (7) extending outside the corresponding clamping/centering unit (11) to which unit it can be secured by means of a securing nut (23).



**FIG. 2**

**EP 0 396 199 A1**

### Pelleter for feed and the like

The invention relates to a pelleter for feed and the like, comprising an annular extrusion die which is secured to a die holder by means of tie rods, said die holder being bearing-mounted on a stationary main shaft, a driving pulley being mounted on the die holder for rotating the extrusion die.

Such a pelleter is known from applicant's European patent application 0,246,710. In that pelleter it is difficult to draw the annular die to the die holder in a centred manner, because the free end of the tie rods is disposed in a space that does not allow easy access, being enclosed between a wall of the die holder and the driving pulley mounted on said die holder. To prevent the die from skewing and thus assuming a skewed position when the die is drawn against a conical edge of the die holder, the die has to be barred when the screwed rods are drawn, i.e. the die has to be rotated through parts of a turn so as to allow the interspaced screwed rods along the circumference to be drawn one by one, and, moreover, in a non-sequential order. Disassembling the die is also difficult in that the die often becomes wedged within the conical edge of the die holder and consequently has to be pressed clear from the die holder by means of locking nuts.

The invention aims to overcome these drawbacks and, accordingly, to provide a pelleter allowing ready assembly and disassembly of the die and permitting controlled centering.

To that effect the pelleter according to the invention is characterized in that the extrusion die is firmly drawn onto the driving pulley, which forms one whole with the die holder. Thus, the ends of the screwed rods, which do not allow easy access, have been moved to the other side of the driving pulley, which does allow easy access, and, furthermore, the possibility is created of elegantly solving the centering problems during assembly and the problems of wedging during disassembly.

For the purpose of solving the centering and disassembly problems, preferably on the side of the pulley that is away from the die, three clamping/centering units are arranged along the circumference in regularly spaced interrelationship, the free end of a screwed rod projecting outside the corresponding clamping/centering unit and being securable to it by means of a securing nut.

The three clamping/centering units regularly spaced about the circumference and preferably adapted to be hydraulically controlled, make it possible for the die to be drawn uniformly against the conical centering edge of the combined driving pulley/ die holder throughout the circumference. By loading the clamping/centering unit in the opposite

direction, the die, when drawn against the die holder, can be pushed clear uniformly, thus ensuring that the die comes off the conical centering edge when disassembled.

One embodiment of the pelleter according to the invention will now be further explained, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a schematic view of a known pelleter;

Fig. 2 shows the pelleter according to the invention with a combined pulley/die holder;

Fig. 3 shows a manually operated clamping/centering unit to an enlarged scale;

Fig. 4 shows a hydraulically controlled clamping/centering unit similar to the one shown in Fig. 3; and

Fig. 5 shows a schematic view of the driving pulley / die holder viewed in the direction of arrow F of Fig. 2.

The known pelleter shown in Fig. 1 comprises an annular die 1 mounted on a die holder 5 which is bearing-mounted on a stationary main shaft 2. The main shaft 2 is supported by a machine frame 10. Mounted on the die holder 5 is a driving pulley 9 adapted to be driven by an electric motor for rotating the annular die 1 about the stationary main shaft 2. Arranged within the die 1 are two press rollers 3 mounted on press roller shafts 8. At both ends the press roller shafts 8 comprise eccentric bearing journals 4 which serve for adjusting the press rollers 3 in the direction of the die 1. The shaft journals disposed on the left-hand side of Fig. 1 are mounted in a front plate 12, while the shaft journals 4 disposed on the right-hand side are mounted in recesses provided in the end plate of the stationary main shaft 2. In accordance with certain improvements we have invented, adjustment of the press rollers 3 is preferably effected through an adjusting apparatus as described in the co-pending European patent application based on Netherlands patent application No.8901130. The die 1 comprises a conical edge which is drawn against the conical edge 6 of the die holder 5 by means of screwed tie rods 7. As shown in Fig. 1 the ends of the tie rods 7 are not readily accessible because they are disposed in a space bounded on opposite sides by the die holder 5 and the driving pulley 9, respectively.

The material to be processed in the pelleter is supplied in the direction of the arrow X to the interior of the rotating, annular die 1 driving the press rollers 3. The press rollers 3 press the material through the channels provided in the annular die 1, after which the product leaves the pelleter in

granular or pellet form in the direction designated by arrow Y

Fig. 2 shows the pelleter according to the invention, the driving pulley 9 and the die holder 5 being combined into a single member. Provided in the driving pulley/die holder 9, 5 is a recess 26 extending in circumferential direction, in which three clamping/centering units 11 can be arranged in regularly interspaced relationship along the circumference for drawing the die 1 against the conical edge 6 of the combined driving pulley/die holder. The construction of the clamping/centering unit 11 is shown in detail in Figs. 3-4.

Fig. 4 shows the pulley/die holder 9, 5 bearing-mounted on the stationary main shaft 2 of the pelleter. The pulley/die holder has a conical centering edge 6 on its side proximal to the die 1, and the die 1 has a corresponding conical centering edge. Provided in the die 1 are a plurality of journal holes 13 arranged in regularly interrelationship along the circumference for receiving the end 14 of a screwed rod 7. The screwed rod 7 extends through an opening in the pulley/die holder 9, 5 and a clamping/centering unit 11, the end face 20 of the clamping/centering unit 11 forming a stop for the die 1 when the securing nut 23 is tightened. The clamping/centering unit 11 comprises a hydraulic cylinder 12 which is mounted by means of bolts 15 on the bottom of the groove-shaped recess 26 provided in the pulley /die holder 9, 5. The hydraulic cylinder 12 comprises an oil chamber 17 to which oil can be supplied under pressure via an oil duct 18. Arranged round the screwed rod 7 is a pressure sleeve 16, which can be slid relatively to the screwed rod 7. The left-hand end 20 of the pressure sleeve 16 projects outside the end face of the pulley/die holder 9, 5 and forms a stop for the edge of the die 1. The right-hand end of the pressure sleeve 16 projects from the end wall of the cylinder 12 and forms a stop for a nut 21 to be mounted to the screwed rod 7. Within the hydraulic cylinder 12 the pressure sleeve 16 has the form of a piston 25, which can be loaded in two directions. Between the piston 25 and the wall of the pulley/die holder a packet of Belleville washers 19 are arranged which load the piston 25 and hence the screwed rod 7 in one direction, the centering edge of the die 1 being drawn against the conical edge 6 of the pulley/die holder 9, 5. The oil chamber 17 of the hydraulic cylinder 12 is bounded on the left side by the piston 25 of the pressure sleeve 16 and on the right side by the end face of the hydraulic cylinder 12. For the sake of clarity oil seals, necessary in various places and accordingly provided in practice, have been omitted from the drawings.

Provided between the securing nut 23 and the end face of the hydraulic cylinder 12 is a pressure

block 22.

As shown in Fig. 5 a total of three clamping/centering units 11 are provided along the circumference of the pulley/die holder 9, 5. Between each pair of clamping/centering units 11 one or two locking bolts 24 may further be provided for drawing the die 1 against the pulley/die holder 9.

A die 1 is mounted on a pulley/die holder 9 as follows:

In the oil chambers 17 of the three clamping/centering units 11 oil is supplied under pressure via the oil duct 18, as a result of which the piston 25 of the pressure sleeve 16 in Fig. 4 is pressed to the left, the spring packet 19 thus being compressed. The end 20 of each pressure sleeve 16, which end forms a stop, is thus pressed further from the pulley/die holder 9 than shown in Fig. 4. The hollow space within each pressure sleeve 16 is empty, i.e. the tie rods 7 have not yet been mounted in the pressure sleeves 16.

The die 1, comprising three tie rods 7 which are screwed into the tapped holes 13, is then moved against the projecting stops 20, the three tie rods 7 projecting through the corresponding pressure sleeves 16. The centering edge of the die remains clear of the centering edge 6 of the pulley/die holder 9. A nut 21 is tightened on the end of the tie rod 7 that projects outside the pressure sleeve 16.

Then in all three clamping/centering units 11 the oil pressure is removed from the oil chamber 17, the pressure sleeves 16 thus moving uniformly to the right (Fig. 4) under the influence of the spring packet 19, the centering edge of the die 1 being drawn uniformly and in a centred manner against the conical centering edge 6 of the pulley/die holder 9. It is clear the piston 25 of the pressure sleeve 16 is to remain at a distance from the end wall of the hydraulic cylinder 12. In this position the tie rods 7 are kept under tensile stress by the spring packets 19.

Then a pressure block is mounted on the end of the tie rods 7 and the securing nut 23 is tightened. The die 1 is then pressed against the conical centering edge 6 under the proper pressure.

Then the locking bolts 24 provided between each pair of clamping/centering units 11 can be tightened without the centering of the die having to be checked.

The die 1 is disassembled in the following manner:

- unscrew and remove the locking bolts 24 (Fig. 5),
- remove the securing nuts 23 and the pressure blocks 22,
- pressurize simultaneously the oil chambers 17 of the clamping/centering units 11, the centering edge of the die 1 thus being forced clear of the conical centering edge 6 of the pulley/die holder 9,

- after unscrewing the nuts 21 remove the die with the tie rods 7 screwed into them horizontally using suitable hoisting apparatus.

The clamping/centering unit 11 shown in Fig. 3 is different from the one in Fig. 4 only in that the hydraulic control is absent. The spring packet 19 is mounted on the other side of the piston 25 on the pressure sleeve 16, and accordingly presses the pressure sleeve 16 to the left (Fig. 3), so that the end 20, forming a stop, extends outside the pulley/die holder 9 by the maximum distance. In this position the die 1 is drawn against the stops 20 by tightening the nuts 21, the conical edge of the die 1 still remaining clear of the conical edge 6 of the pulley/die holder 9.

The die is then drawn against the edge 6 by alternately and turn-by-turn tightening the nuts 23 of the clamping/centering units 11 distributed along the circumference.

During disassembly the spring packets 19 cause the die 1 to be pressed clear.

## Claims

1. A pelleter for feed and the like, comprising an annular extrusion die which is secured to a die holder by means of tie rods, said die holder being bearing-mounted on a stationary main shaft, a driving pulley being mounted on the die holder for rotating the extrusion die, characterized in that the extrusion die is firmly drawn onto the driving pulley (9), which forms one whole with the die holder (5).

2. A pelleter according to claim 1, characterized in that on the side of the pulley (9) that is remote from the die (1), three clamping/centering units (11) are arranged along the circumference in regularly spaced interrelationship, the free end of a tie rod (7) extending outside the corresponding clamping/centering unit (11) to which unit it can be secured by means of a securing nut (23).

3. A pelleter according to claims 1-2, characterized in that each clamping/centering unit (11) comprises a cylinder (12) mounted on the pulley (9) and a pressure block (22) to be placed on said cylinder (12) to form a stop for the securing nut (23).

4. A pelleter according to claims 1-3, characterized in that each tie rod (7) is surrounded by a pressure sleeve (16) adapted to slide over said tie rod, the end (20) of said sleeve (16) that is proximal to the die (1) forming a stop extending outside the pulley (9), and the other end of the pressure sleeve (16) extending outside the cylinder (12) and forming a stop for a securing nut (21), the pressure sleeve (16) further comprising a piston (25) arranged within said cylinder and loaded by a spring assembly (19).

5. A pelleter according to claims 1-4, characterized in that the pulley (9) is connected to the die (1) by means of locking bolts (24) mounted on the same pitch circle between the three clamping/centering units (11).

6. A pelleter according to claims 1-5, characterized in that the integrated pulley/die holder (9, 5) has a groove-shaped recess (26) extending in circumferential direction for mounting the clamping/centering units (11).

7. A pelleter according to one of claims 1-6, characterized in that each clamping/centering unit (11) is controlled hydraulically in the unclamping direction and is loaded by a spring assembly (19) in the clamping direction.

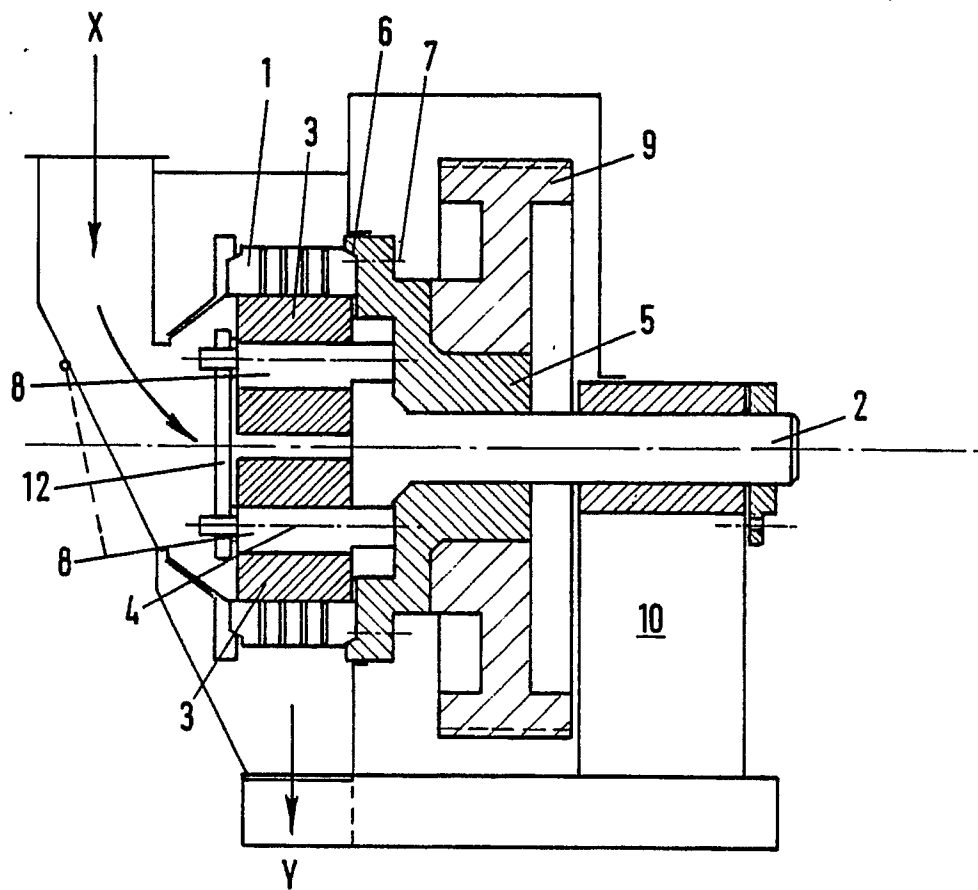


FIG. 1

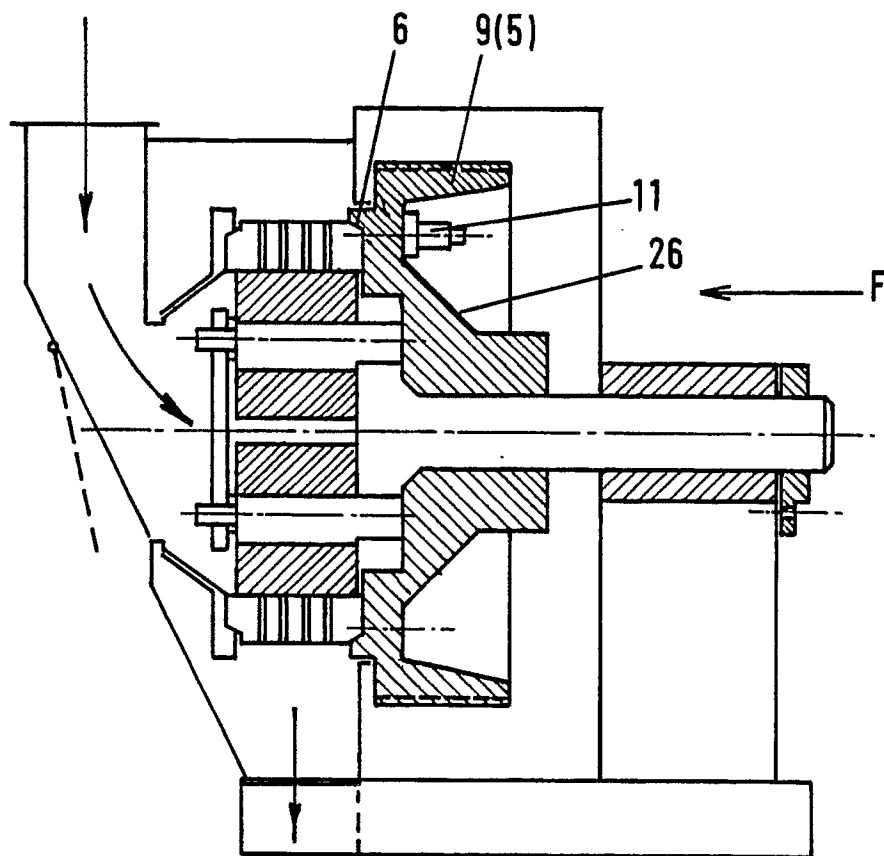


FIG. 2

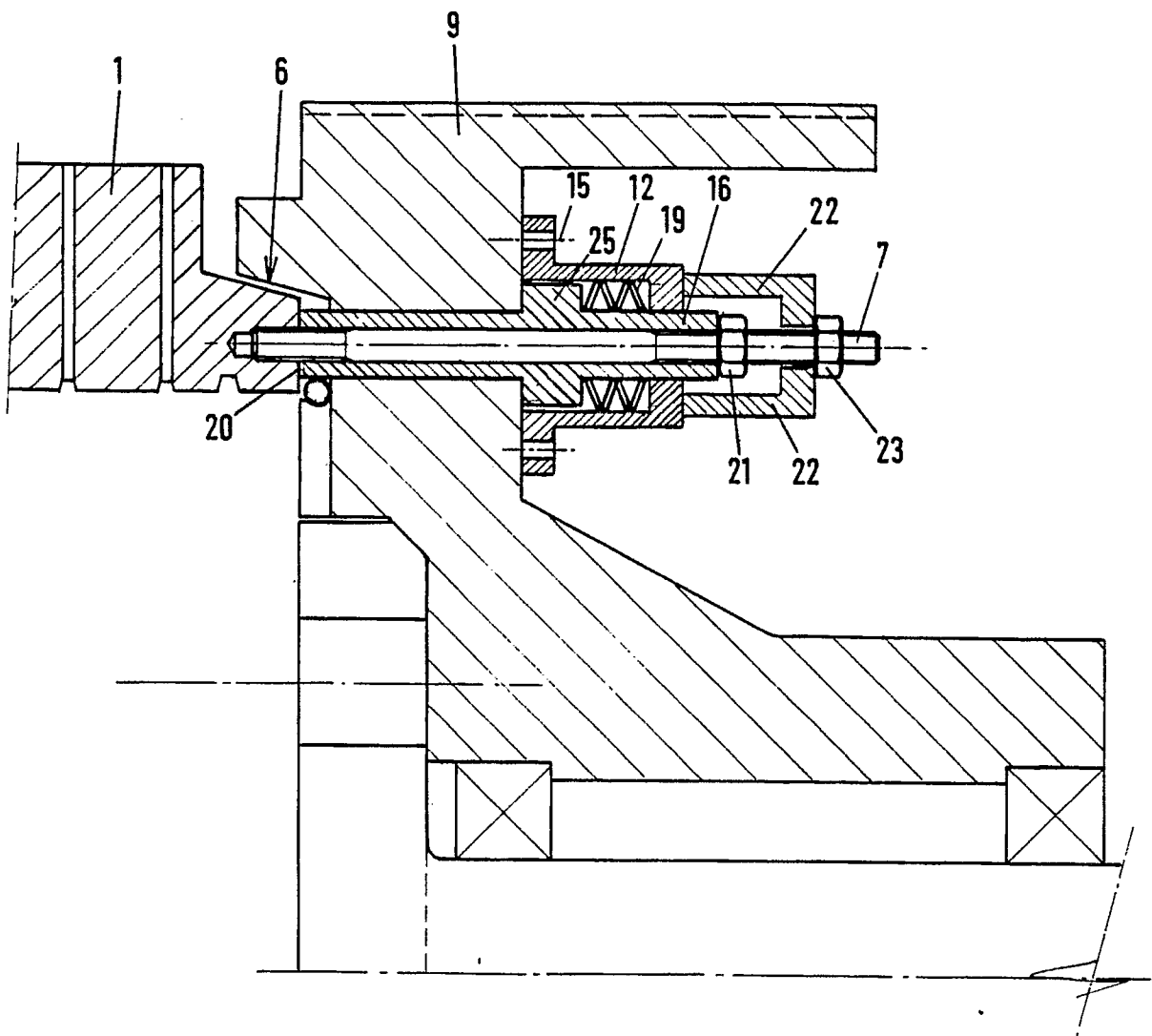


FIG. 3

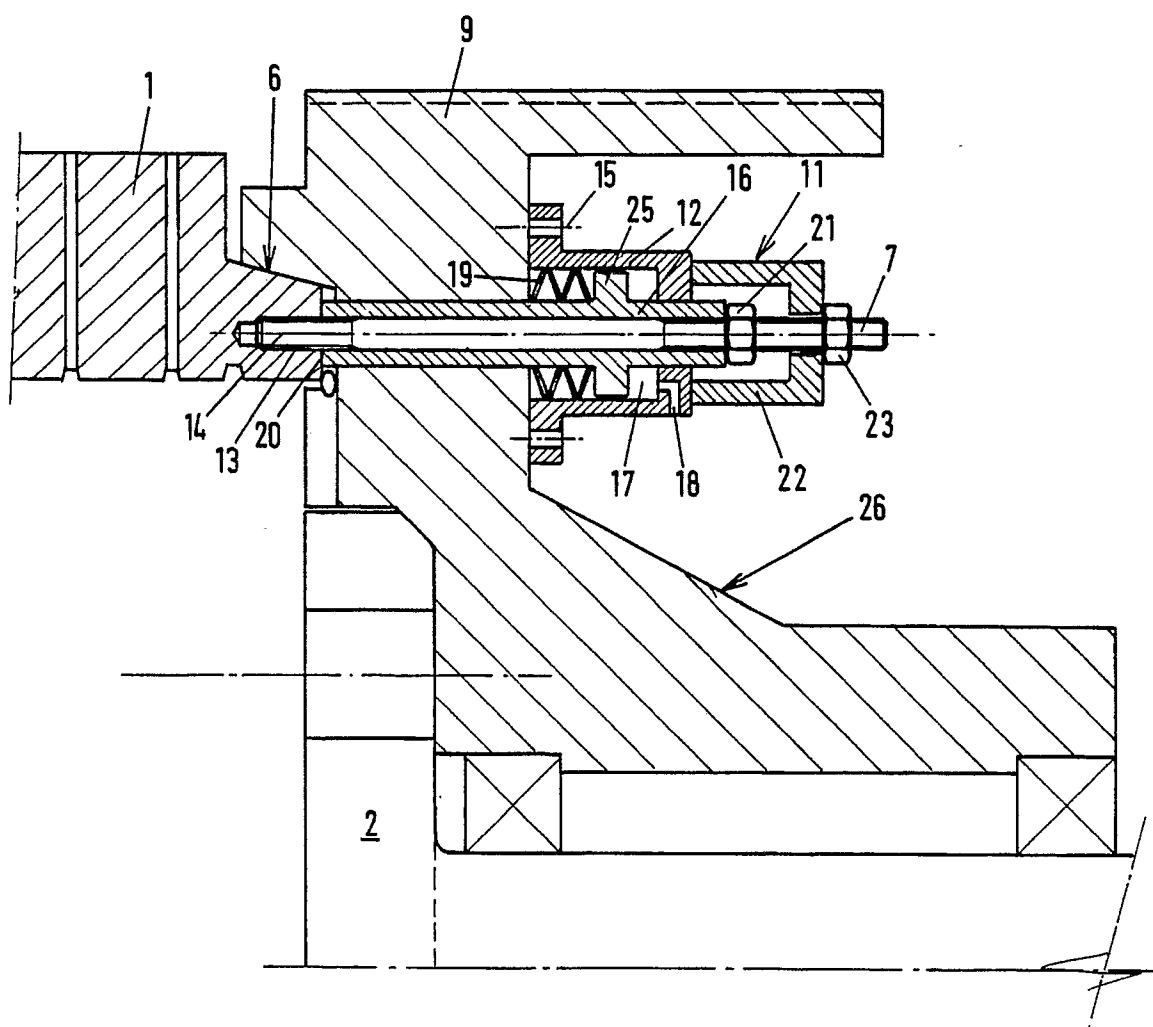


FIG.4

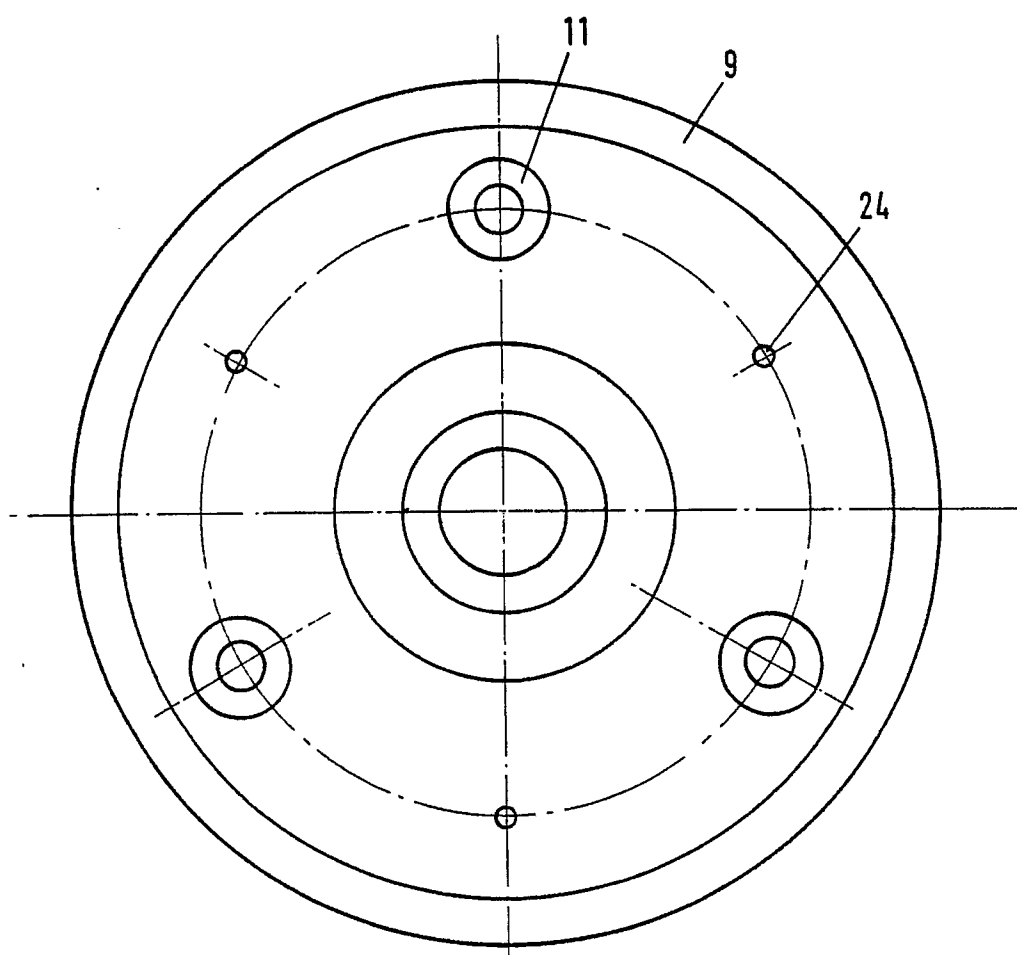


FIG. 5



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## EUROPEAN SEARCH REPORT

Application Number

EP 90 20 1107

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                          |                                                                               |                                                |                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------|-----------------------------------------------|
| Category                                                                                                                                                                                                                                                                     | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim                              | CLASSIFICATION OF THE APPLICATION (Int. Cl.5) |
| Y                                                                                                                                                                                                                                                                            | GB-A-1 578 501 (HEESEN)<br>* Page 2, lines 4-14; figure *                     | 1                                              | B 30 B 11/20                                  |
| A                                                                                                                                                                                                                                                                            | ---                                                                           | 6                                              |                                               |
| Y                                                                                                                                                                                                                                                                            | US-A-3 358 328 (KUHN)<br>* Figure 2 *                                         | 1                                              |                                               |
| P,A                                                                                                                                                                                                                                                                          | EP-A-0 320 747 (GEBR. BÜHLER)<br>* Figures 1-3 *                              | 1                                              |                                               |
| A                                                                                                                                                                                                                                                                            | US-A-2 648 296 (OLIVER)<br>* Column 2, lines 31-48; figure 3 *                | 1-4                                            |                                               |
|                                                                                                                                                                                                                                                                              | -----                                                                         |                                                |                                               |
|                                                                                                                                                                                                                                                                              |                                                                               |                                                | TECHNICAL FIELDS SEARCHED (Int. Cl.5)         |
|                                                                                                                                                                                                                                                                              |                                                                               |                                                | B 30 B                                        |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                   |                                                                               |                                                |                                               |
| Place of search<br>THE HAGUE                                                                                                                                                                                                                                                 |                                                                               | Date of completion of the search<br>06-08-1990 | Examiner<br>BOLLEN J.A.G.                     |
| <b>CATEGORY OF CITED DOCUMENTS</b>                                                                                                                                                                                                                                           |                                                                               |                                                |                                               |
| X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document                                                      |                                                                               |                                                |                                               |
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