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(54) **Apparatus for treating machined objects.**

(57) Apparatus for treating machined parts, such as motor vehicle components, at one or more treatment stations, comprises a transfer mechanism (6) for transferring objects from one treatment station to another. A housing (7, 8) has a treatment chamber. A cradle (1, 2) carries an object into and out of the treatment chamber, the housing (7, 8) and cradle (1, 2) being relatively movable horizontally. The transfer mechanism (6) places the object in the cradle (1, 2), the transfer mechanism (6) and cradle (1, 2) being relatively movable vertically.

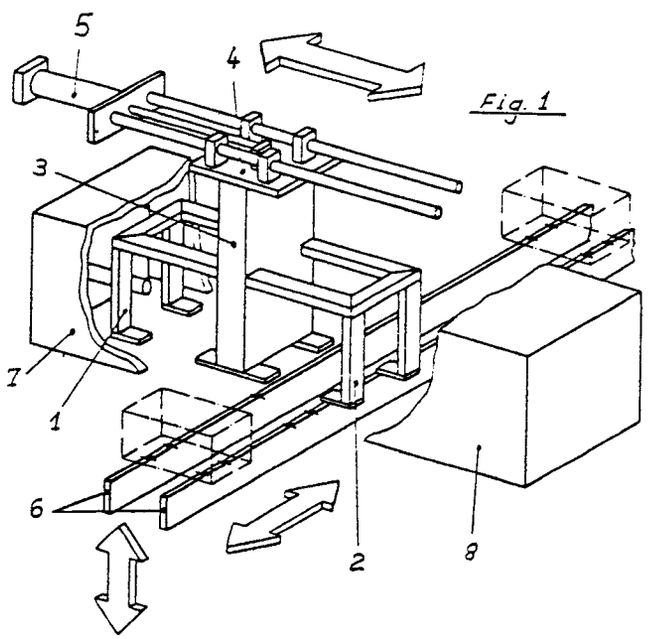



Fig. 1

EP 0 227 275 A1

# APPARATUS FOR TREATING MACHINED OBJECTS

This invention concerns apparatus for treating machined objects. The machined objects are, for example, motor vehicle components and are subject to treatments such as sand blasting, washing and drying.

Patent Specifications such as EP 0022307, EP 0065861 and ES 8600978 disclose apparatus for treating machined objects.

Patent Specification EP 0110525 in particular discloses apparatus which comprises a transfer mechanism for transferring objects from one treatment station to another, a housing having a treatment chamber at one treatment station, and means for carrying an object into and out from the treatment chamber. The transfer mechanism is a walking beam mechanism adapted to carry the parts in one rectilinear horizontal direction. The treatment chamber is disposed to one side of the horizontal direction. On the other side is a robot with a horizontal arm and a clamp at the free end of the arm. In use of the apparatus, each object is picked up by the clamp from the transfer mechanism, raised vertically and inserted horizontally along the length of the arm into the chamber. The clamp can rotate about the horizontal axis of the arm.

The present invention is characterised in that the apparatus includes a cradle, the housing and the cradle being horizontally movable with respect to each other, and the transfer mechanism is arranged to place the object in the cradle, the transfer mechanism and the cradle being vertically movable with respect to each other.

The cradle may be arranged to execute a vertical movement with respect to the transfer mechanism, and the housing may be arranged to execute a horizontal movement with respect to the cradle. Preferably however, the transfer mechanism is arranged to have a horizontal direction of movement, a downward direction of movement after placing an object in the cradle for treatment and an upward direction of movement to collect an object from the cradle after treatment, the treatment chamber is disposed to one side of the horizontal direction of movement of the transfer mechanism, and the cradle is arranged to have a horizontal direction of movement cross-wise of the horizontal direction of movement of the transfer mechanism.

An embodiment of the invention will now be described by way of example, reference being made to the accompanying drawings, of which:

Figure 1 is a perspective view of one treatment station of apparatus for treating machined objects;

Figure 2 is a cross-section of the treatment station showing further parts of the apparatus;

Figure 3 is part of a cross-section of another treatment station having rotary cradles;

Figure 4 is a plan of part of a longitudinal section of a treatment station in which the housing has hinged walls;

Figure 5 is a view similar to Figure 3 but to an enlarged scale and in greater detail; and

Figure 6 is a plan of apparatus having a plurality of treatment stations.

Figure 1 shows a treatment station in apparatus for treating machined objects. The apparatus comprises a transfer mechanism, which includes bars 6, for transferring the objects from one treatment station to another in a horizontal direction. Two box shaped housings 7 and 8 are disposed an opposite sides of the bars 6. Each housing 7, 8 defines a treatment chamber with openings facing each other. Two cradles 1 and 2, which face the respective openings of the housings 7 and 8, are supported by an upstanding wall 3, cradle 2 being vertically aligned with the bars 6. The wall 3 depends from a carriage 4 which is connected to a hydraulic piston and cylinder device 5. The bars 6 of the transfer mechanism have a pre-determined forward stepping distance at the end of which the object to be treated is positioned inside one of the cradles 1, 2. The bars 6 then move downwardly leaving the object supported by the cradle 1, 2. The hydraulic cylinder 5 is activated to move the carriage 4 and thus the cradles 1, 2 horizontally cross-wise of the bars 6 and cause the respective cradle to carry the object into the treatment chamber of one of the housings 7 and 8. This movement brings the other cradle 1, 2 out of the other treatment chamber carrying another object, its treatment at this station being completed. This other cradle 1, 2 is vertically aligned with the bars 6. The bars 6 move upwardly to collect the other object, move forward the predetermined distance to bring a third object into the other cradle 1, 2 and then move donwardly again to leave the third object in the other cradle. This procedure is repeated when the treatment of the first object is completed, the hydraulic cylinder 5 bringing the cradles 1 and 2 back to their initial positions. When one cradle 1, 2 is in its respective housing 7, 8 the upstanding or vertical wall 3 closes the opening in the side of the housing.

The boxes 7 and 8 comprise housings fed with washing liquid when there is a part or object inside them. The housing is completely closed on all sides, except one which is the one through which the applicable cradle and the respective part enters.

Figure 2 shows that box 7 is formed with hollow walls, through the interior of which circulates the washing liquid or the drying air. On the inside wall are mounted nozzles 9 through which liquid or air is discharged, and a large apertured tubular nozzle 10 is arranged extending inside the part to be washed, whilst the latter is in the box.

Box 7 is furnished with a washing liquid intake through a four-way automatic valve 11, which is fed through a duct 12 coming from a main pump 13. Box 8 is fed through a duct 14 from the pump 13 through another four-way valve 15. One outlet of each valve 14, 15 feeds the respective box, the other one discharges the liquid to a collecting tank or sump 20 and the other is blind, that is, it does not have a outlet.

Box 7 has an outlet duct 16 for the used dirty liquid (or air, in the case of blowing), and a similar duct 17 is arranged for box 8.

The liquid leaving ducts 16 and 17 passes through a bottom grating 18 and along duct 19 to the tank 20, that collects and filters the used liquid.

Boxes 7 and 8 have elastic joints 21, so that vertical wall 3 can close tightly the chamber where the part 22 to be washed is supported by the cradle 1.

Vertical support wall 3 comprises a movable box and is formed by two independent chambers 23 and 24, so that chamber 23 closes, and has a functional relation with, the box 7 and chamber 24 closes, and has a functional relation with the box 8.

On the other hand, chamber 23 may be fed either directly from box 7, at the same time as it closes the chamber, or else through an independent valve mounted on the carriage 4. The same applies to the chamber 24; it may be fed by box 8.

In addition, there is an air extraction fan 25, which creates a vertical air current on wall 3 and transfer mechanism 6, so that it collects the mist formed when the closed chamber of box 7 or 8 is opened rapidly. This air is led through the ducts 18 and 19.

Each housing box 7, 8 has an external thermal and/or acoustic insulation 26, so that the general noise inside the box is kept low and/or heat loss is minimised.

Figure 3 represents a construction in which, in use, cradles 31 rotate in order to wash the part more thoroughly. These cradles rotate once they are inside box 7, while the washing or blowing is carried out. When they are outside box 7, or at the moment of loading and unloading the part, they are in a vertical position. Vertical support wall 3 is in this case divided into two parts, each of which supports an independent cradle 31. Each rotating cradle 31 has hollow arms 32, which have the double function of supporting the part to be washed and at the same time channelling the washing liquid through nozzles 33 similar to those arranged on box 7. In order to feed liquid to both these arms, there is a rotatable coupling 34 for each rotary cradle 31.

Figure 4 represents box 7 with its side walls 27 and 28 joined on vertical hinges 29 and 30, so that once these walls are open access is gained to inside the box and inside the walls 27 and 28, which also have washing spray nozzles, as they are really parts composing the washing or blowing box 7.

Figure 5 shows in more detail the above-mentioned rotary mechanism of Figure 3. Hollow support arms 32, with nozzles 33, are joined to the rotary cradle 31, part of which extends into vertical support wall 3 and is joined to gear ring 35. The gear ring 25 is rotatable on a ring 36 that is joined to central wall 37, which forms a part of the supporting wall 3. Between rotatable gear ring 35 and fixed ring 36, there are balls or rollers 60, allowing precision rolling as with a bearing. Gear ring 35 is driven by a pinion gear 38, that is rotatably driven by a motor 39, electric or hydraulic, mounted fixed and joined to the support wall 3.

The rotary coupling 34 fixed to the wall 3, and inside which rotates cradle 31, has radial ducts 40 through which passes the liquid or air feeding the hollow arms 32. The fluid enters the rotary coupling 34 through a flexible tube 41.

The right side of Figure 5 is the same as the described and illustrated left side.

Figure 6 shows the construction of a complete machine, with a washing station with two housings 42, a blowing station with two housings 43 with compressed air and multiple drying stations 44 for treating several parts at the same time. In this case, a central support wall 45 carried three pairs of cradles for placing three objects at the same time in the three stations 44 formed by the housing 46 in which there are arranged blowing nozzles 47. A similar housing 48 is located on the other side. At the given moment shown, the cradles supported by the central support wall 45 move parts 49, 50 and 51 to the transfer mechanism, while they carry parts 52, 53 and 54 into the stations 44 on the opposite side formed by housing 48.

Housings 46 and 48 are fed alternately by air coming from a fan 55, according to the position of automatic flap valve 56, so that it only feeds the housing closed by the support wall 45.

The same as wall 3 described above, support wall 45 is formed by two separate chambers.

## Claims

1. Apparatus for treating machined objects at one or more treatment stations, which apparatus comprises a transfer mechanism (6) for transferring objects from one treatment station to another, a housing (7, 8, 42, 43, 46, 48) having a treatment chamber at one treatment station and means for carrying an object into and out from the treatment chamber, characterised in that the apparatus includes a cradle (1, 2, 31), the housing and cradle being horizontally movable with respect to each other, and the transfer mechanism (6) is arranged to plate the object in the cradle (1, 2, 31), the transfer mechanism (6) and the cradle (1, 2, 31) being vertically movable with respect to each other.

2. Apparatus as claimed in Claim 1, characterised in that the transfer mechanism (6) is arranged to have a horizontal direction of movement, a downward direction of movement after placing an object in the cradle (1, 2, 31) for treatment, and an upward direction of movement to collect an object from the cradle (1, 2, 31) after treatment, the treatment chamber is disposed to one side of the horizontal direction of movement of the transfer mechanism (6), and the cradle (1, 2, 31) is arranged to have a horizontal direction of movement cross-wise of the horizontal direction of movement of the transfer mechanism (6).

3. Apparatus as claimed in Claim 1 or 2, characterised in that the housing (7, 8, 42, 43, 46, 48) has an opening leading to the chamber and facing the cradle (1, 2, 31), and the cradle (1, 2, 31) is supported by an upstanding wall (3, 45), the upstanding wall (3, 45) closing the opening when the cradle (1, 2, 31) supports an object for treatment inside the chamber.

4. Apparatus as claimed in Claim 2 or 3, characterised in that there is a second treatment chamber disposed on the opposite side of the horizontal direction of movement of the transfer mechanism (6) to the first said treatment chamber, and there is a second cradle (1, 2, 31) also arranged to move cross-wise horizontally of the horizontal direction of movement of the transfer mechanism, such that when one cradle (1, 21 31) supports an object for treatment inside one chamber, the other cradle (1, 2, 31) is vertically aligned with the transfer mechanism (6).

5. Apparatus as claimed in Claim 3, characterised in that the upstanding wall (3, 45) has a chamber (23, 24) for the passage of material for treating an object.

6. Apparatus as claimed in any preceding claim, characterised in that the housing (7, 8) has thermal and/or acoustic insulation (26).

7. Apparatus as claimed in any preceding claim, characterised in that the or each cradle (31) is rotatable.

8. Apparatus as claimed in any preceding claim, characterised in that the housing (46, 48) has a plurality of chambers enabling a plurality of objects to be treated at one and the same time.

9. Apparatus as claimed in any preceding claim, characterised in that the housing has hinged openable walls (27, 28) allowing access to the or each chamber.

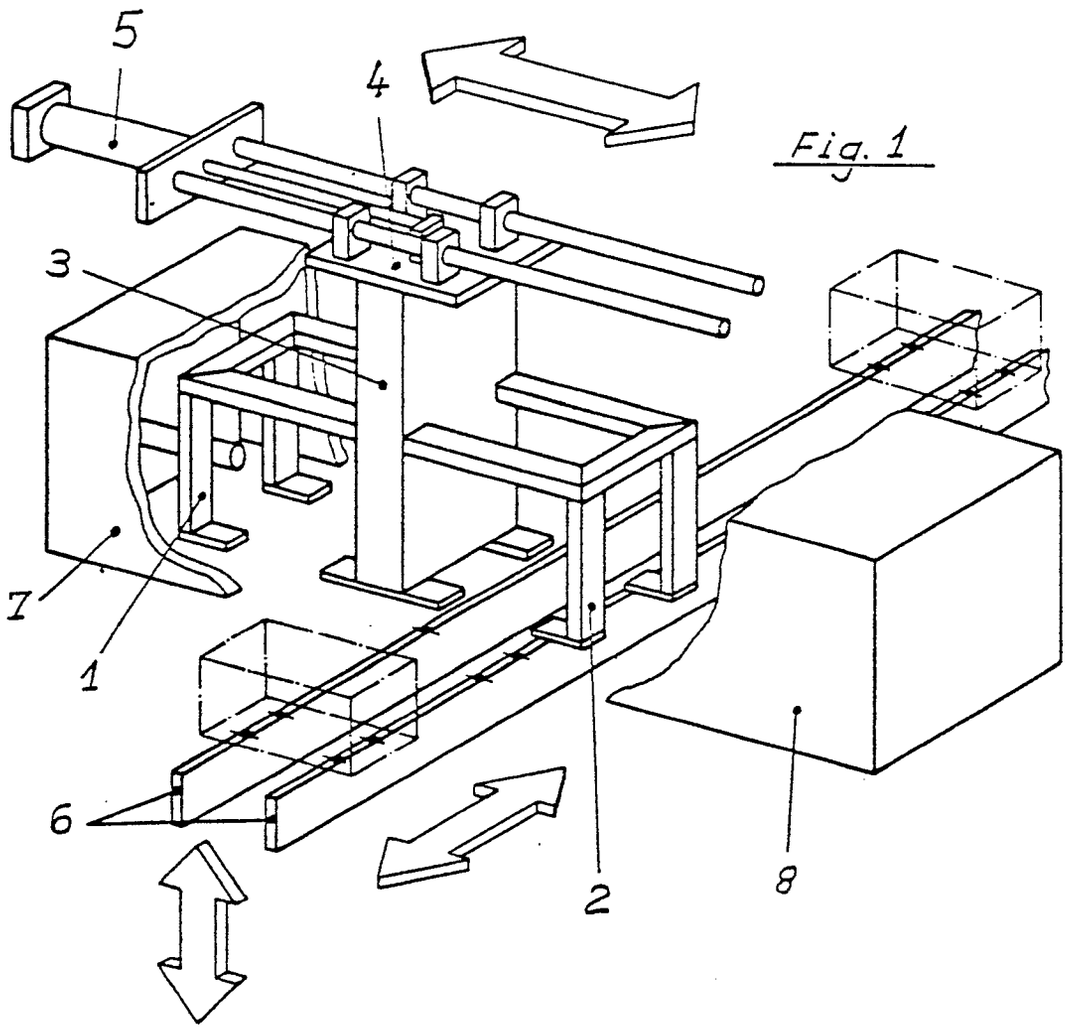



Fig. 1

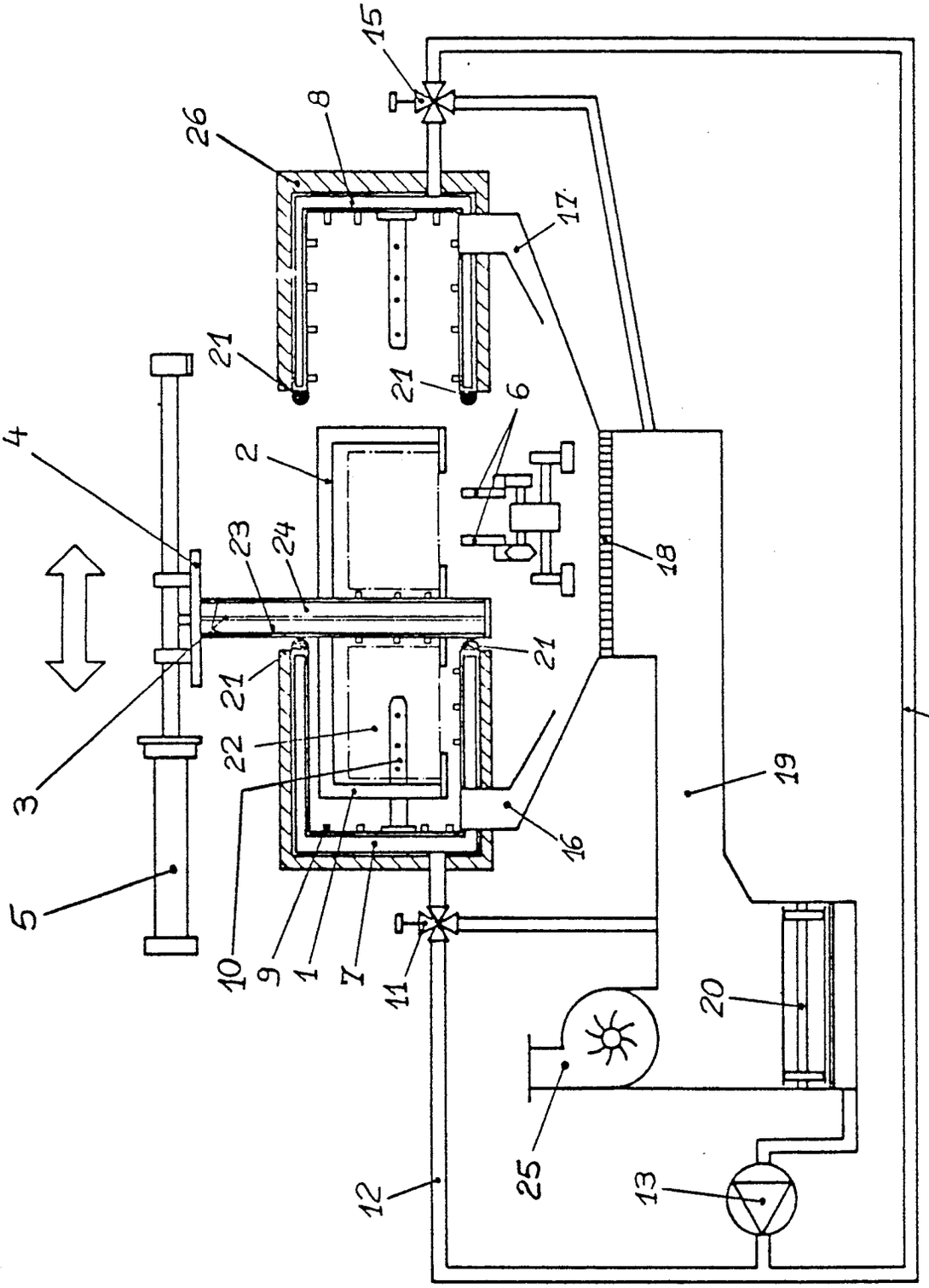



Fig. 2

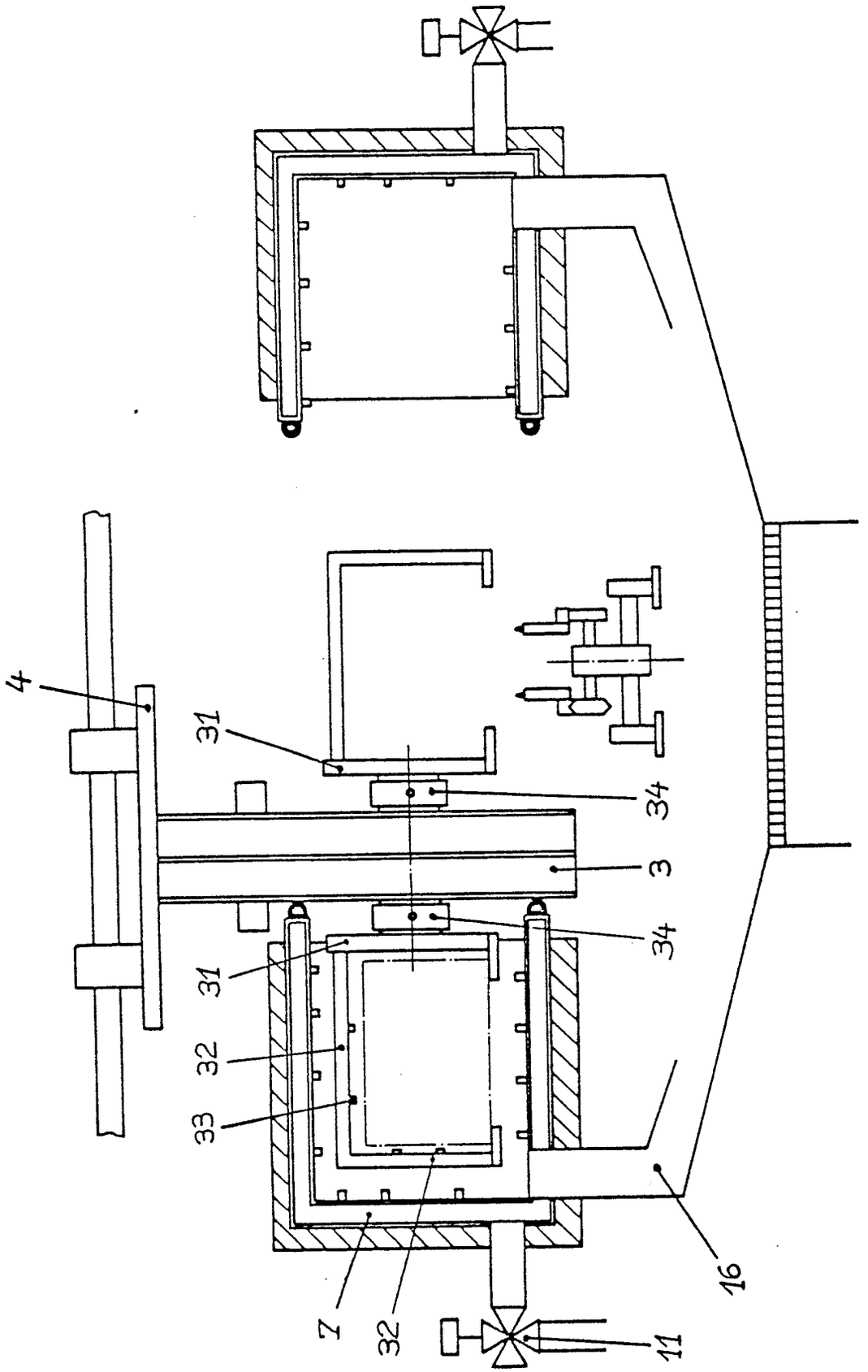



Fig. 3

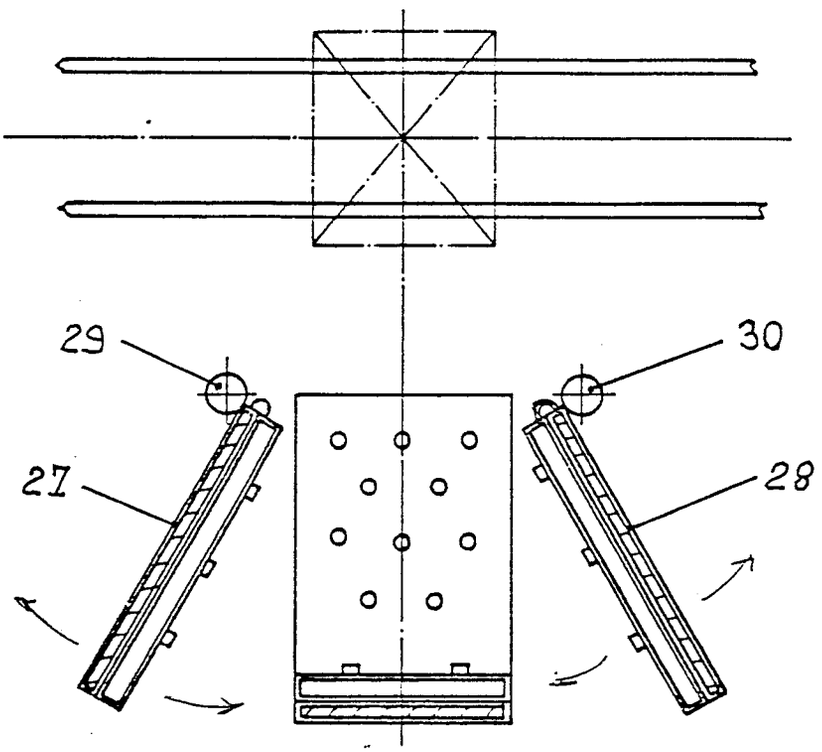
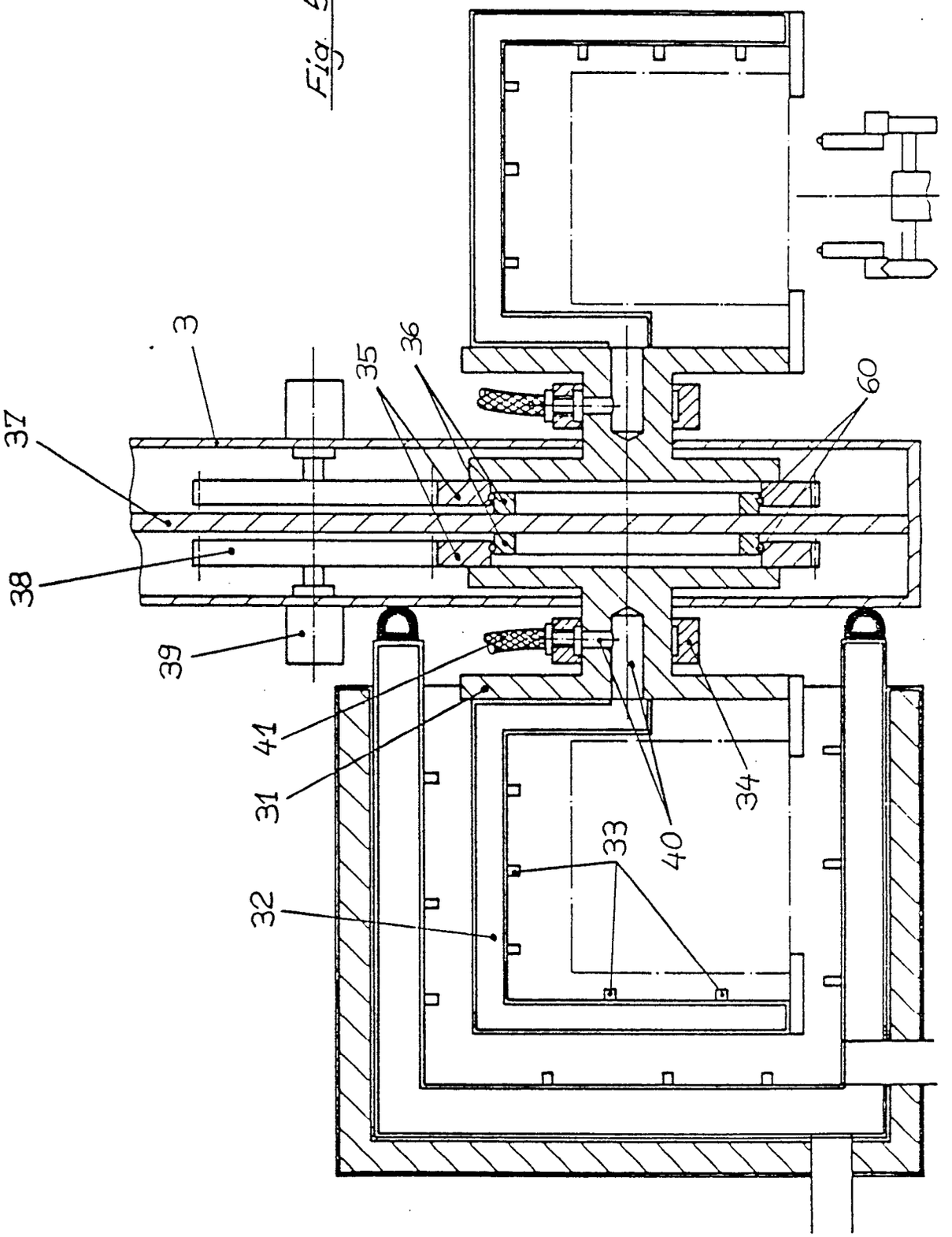



Fig. 4

Fig. 5



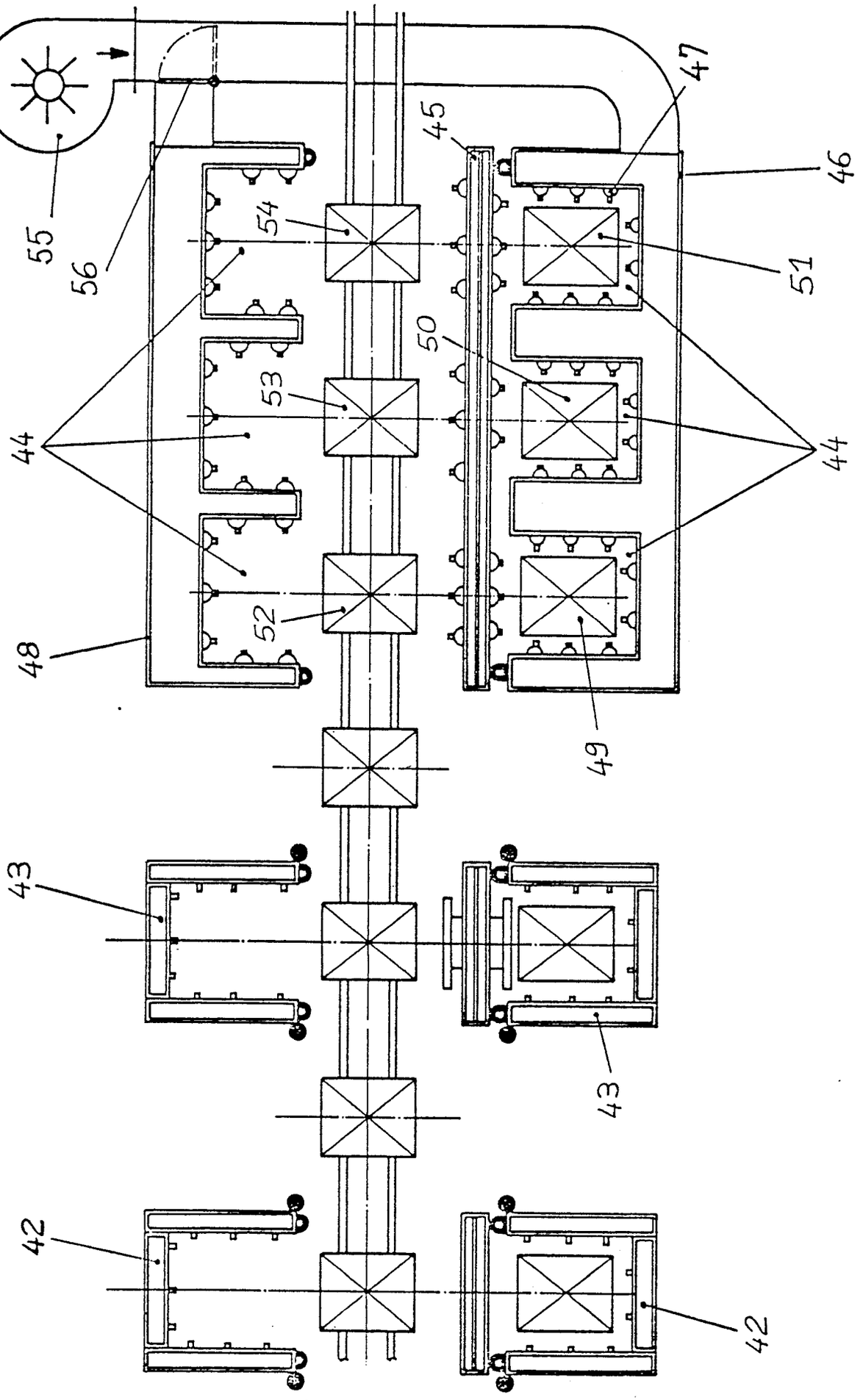



Fig 6

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# EUROPEAN SEARCH REPORT

Application number

## DOCUMENTS CONSIDERED TO BE RELEVANT

EP 86308692.2

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl 4) |
|---|---|---|---|
| D,Y | EP - A1 - 0 022 307 (INGENIERIA AGULLD, S.A.)<br>* Page 4, paragraph 4 - page 5, paragraph 1; page 6, paragraph 2; fig. 1 *<br>-- | 1-4,8 | B 08 B 3/02 |
| Y | US - A - 4 476 627 (MATSUURA et al.)<br>* Column 5, line 20 - column 6, line 2; fig. 5,6 *<br>-- | 1-4,8 | |
| P,Y | SOVIET INVENTIONS ILLUSTRATED, Sections P,Q, P43, week 8606, 19. März 1986<br>DERWENT PUBLICATIONS LTD, London<br>* SU-1 142 182 A (Moldselkhoztekhproe) *<br>-- | 1-4,8 | |
| D,A | ES - A1 - 8 600 978 (INGENIERIA AGULLO, S.A.)<br>* Page 8, line 11; fig. 4,6, 8,9 *<br>-- | 6,9 | |
| D,A | EP - A1 - 0 110 525 (AGULLO NEGUI)<br>* Claim 5; fig. 3 *<br>-- | 7 | |
| A | DE - A1 - 2 306 851 (FA. OTTO DÜRR)<br>* Totality *<br>---- | | |

| TECHNICAL FIELDS SEARCHED (Int. Cl 4) |
|---|
| B 08 B 1/00 |
| B 08 B 3/00 |
| B 23 P 19/00 |
| B 23 P 21/00 |
| B 23 P 23/00 |
| B 23 Q 7/00 |
| B 23 Q 39/00 |
| B 23 Q 41/00 |
| B 24 C 9/00 |
| B 65 G 49/00 |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| VIENNA | 13-02-1987 | TROJAN |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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