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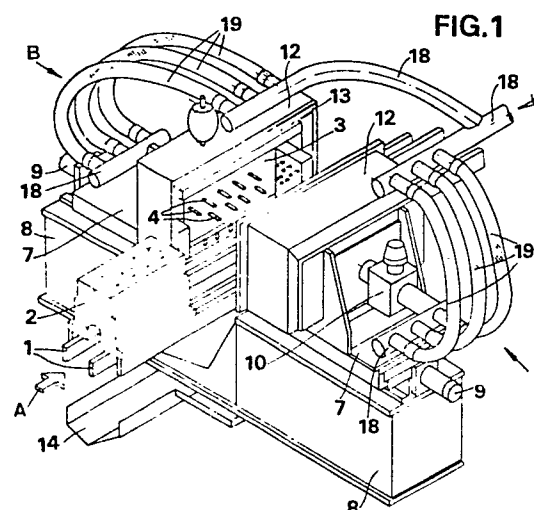
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54 **Improvements in machines for washing machined parts.**

57 The machine has a washing station 22, a blowing station 23, and a drying station 24 to which machined parts are transferred in sequence. The washing station 22 has a washing device 3 including a mobile housing 3 which is movable between a loading and unloading inoperative position in which a part can be placed in or removed from the housing 3 and an operative washing position in which a major portion of the part is enclosed within the walls of the housing 3, and an automatic valve device 10 for supplying washing liquid to nozzles 4, 4' only when the housing 3 is in the operative position.



IMPROVEMENTS IN MACHINES FOR
WASHING MACHINED PARTS

The present invention relates to an improved machine for washing machined parts of the kind which incorporates a washing station which includes a washing device provided with washing nozzles for directing a washing liquid onto a part to be washed.

Machines of this type used until now in production lines of machined parts, have been based on the following concepts:

1) Great flow of liquid at pressures between 2 and 12 kg/cm².

2) The jets of washing liquid are continuous and the whole spray gear, mechanical transfer equipment, arrival collectors, etc....., are completely immersed inside a large encasing structure.

3) Washing times are relatively long (between 0.5 to 1.5 minutes) and consequently, the size of the machine and its auxiliary elements, such as filters, pumps, etc..., increase to an enormous extent, as production augments.

According to our invention in a machine of the kind set forth the washing device is movable between an inoperative loading and unloading position in which a part to be washed can be placed in or removed from the washing device and an operative washing position in which the walls of the washing device define an enclosure for surrounding at least the top, ends and sides of the part to be washed, and automatic valve means for controlling the supply of washing liquid to the washing nozzles is operable in response to the position of the washing device to permit washing liquid to be supplied to the nozzles only when the washing device is in the operative position and otherwise to cut-off the supply of washing liquid to the nozzles.

Since the jets of washing liquid work intermittently, i.e., the washing liquid is only sprayed during a predetermined and only if there are parts to be washed, unlike the machines used until now, in which the jet is continuous, represents a considerable saving in energy.

Also the machining times are much shorter, as a result of the work method, pressures and design of the machine, it being possible to establish, in principle, practical time of 5 to 15 seconds, according to the type of part, and how dirty it is.

Preferably the nozzles are supplied with liquid at medium and high pressure from two independent circuits. This enables small flow rates to be used with washing pressures of between 15 and 50 kg/cm² for the medium washing pressure and

between 200 and 300 kg/cm² for the high washing pressure.

Other advantages and characteristics of the improvements provided by the present invention will be gathered from the description made below with relation to the annexed drawings, which illustrate, by way of unlimited example, a form of embodiment of same.

Figure 1 shows a perspective view of a washing machine station, with a part about to enter it, and with a mobile housing provided with horizontal displacement;

Figure 2 illustrates a perspective view, on an enlarged scale, of a part of a washing liquid circuit;

Figure 3 is a front elevation view of the washing station represented in Figure 1, but with the mobile housing in a closed or working position;

Figure 4 represents a plan view of the whole of a machine for washing machined parts, according to the invention;

Figure 5 and 6 are both similar views to Figure 3 and 4, respectively, but with a mobile housing shiftable in a vertical direction; and

Figure 7 shows a detailed view, on an enlarged scale and as a cross-section, of a washing box according to the invention.

In the attached drawings, an application of the invention has been illustrated in the washing of large engine parts, like those used in the motor industry.

In Figure 1 we can see that the washing station as such includes a transport system made up of some bars 1, which transfer the part to be washed 2, to an exact position in the middle of the two washing boxes, 3, following the direction of the arrow A. To understand the drawings better, the part 2 has been drawn in the position prior to entering the actual machine station. Once the part 2 is between the two machine boxes 3 (Figure 3), these close according to the direction indicated by the arrows B, the part 2 being clamped between the body formed by the two boxes. These boxes 3 are hollow, to receive the washing liquid inside them and feed the washing nozzles 4 located inside the body formed by the boxes 3, i.e. at the sides, above, in front of and behind the part 2 to be washed.

In Figure 3 we can see the box 3 in the closed position over the part 2 and the situation of the nozzles 4 around it. At the lower part, a mixed closed solution is adopted, formed by some boxes 5 which are an integral part of the boxes 3, and another main washing box 6, which is a joint part of the transfer system, formed by the bars 1.

The boxes 3 are mounted on opposed mobile tables 7, which slide on a bedframe 8, when driven by hydraulic cylinders 9. Semi-bodies formed by combinations of the respective boxes 3 and 5 are an integral part of the mobile tables 7. Three

positions are fixed for the tables 7, and thus for the boxes 3: the closed position for working, as shown in Figure 3; the intermediate position, with the jets stopped and the boxes open, as seen in Figure 1 (in order to transfer the part 2); and a third position, with the boxes 3 and the tables 5 withdrawn to a maximum in the direction opposite to the arrows B, in order to assist maintenance and access to the nozzles 4.

The tables 7 are the type used in machine tools and have the guides which are hardened and ground. With the use of these conventional tables, great precision is achieved in positioning the boxes 3 with respect to the part to be washed. This precision factor in positioning the boxes 3, and consequently the nozzles 4, is essential for the quality of the washing.

The positioning error is under 0.2mm., thanks to the design of the machine, which does not happen with known washing machines.

The bedframe 8, which is common to both the tables 7, is constructed from very thick metal sheet and which at the same time acts as a support for the transfer system of the blocks to be washed.

When the body formed by the boxes 3 has been closed over the parts 2, the automatic valve 10 opens, which opens the passage to the washing liquid. The valve 10 is mounted as an integral part of the boxes 3, and therefore moves with them. A pressure accumulator II is also provided in order to buffer the impact produced on the

nozzles 4 when the liquid arrives at great speed inside the boxes 3, in response to opening of the valve 10. This accumulator II is therefore also mobile, jointly with the boxes 3 for washing.

Sealing of the boxes is achieved by means of two metal sheet cover 12 which are mounted on the boxes 3. One of the covers 12 has a rubber-foam joint 13 applied in its edge, which is pressed by the edge of the opposite cover. This pressing action is performed at the end of the closing run of the boxes 3 and with it, the liquid can neither leak from the top, or the front, or the sides, but is directed downwards, where it is collected in the gutter 14. The dirty liquid is taken from this gutter 14 to the filtering station.

The washing circuit also includes a vacuum tank 15 where the clean liquid arrives from the filtering station. This filtering station can be unique for each machine, or can be arranged to serve several machines, hence reference is made to the vacuum tank 15 of clean liquid from a filtering station, in which normally the degree of filtering achieved should be from twenty to ten microns.

From the vacuum tank 15, the liquid is sucked by the main washing pump 16, after passing through the safety filter 20, and is taken from there to the collector 18 which feeds the hoses 19, which terminate the valve 10, described above, and from here to the washing boxes 3.

On the other hand, a second accumulator 17 is provided, to take advantage of the general output

from the pump 16 during the part of the work cycle in which the boxes 3 are not working, i.e. they are not washing. As this idle time can represent up to seventy per cent of the whole of the cycle, the use of the accumulator 17 is obvious. On the one hand it enable the energy supplied by the pump 16 during the whole of the cycle to be stored, and on the other hand for this energy to be discharged in a very short time when the valve 10 opens.

Likewise, necessary safety valves must be fitted into the circuit, according to the regulations in each country, as well also as an automatic relief valve 12, which acts when the accumulator 17 is already full.

It is also to be understood that the advantage of the accumulator 17 is to enable a smaller pump 16 to be used (at least 50% smaller) than that which would have to be used if the accumulator 17 did not exist.

After the washing station 22 (Fig. 4), there is provided a blowing station 23 equipped with compressed air. The blowing station 23 is the same as the washing station 22, in all the aspects described, with the exception that the collector 18 is fed direct with compressed air and that the accumulator II is replaced by a sucker, which quickly removes the aerosols produced around the part 2 when blowing occurs with the boxes 3 closed on the said part 2. Naturally, this sucker is connected to a free space remaining between the part 2 and the nozzles 4, i.e. it is completely disconnected from the inside of the boxes 3.

Hence, the sucker is mounted on the boxes 3 for convenience, but crosses them in order to link the space between the nozzles 4 and the part 2 with the outer side of the boxes 3, without having any communication with the inside of the boxes 3. Furthermore, the sucker communicates with a suction device as such through some flexible pipes similar to those numbered 19. It is to be understood that the suction device, which can comprise a fan or a Venturi system, is mounted on a fixed bedframe and on the other hand, but that the Sucker is mobile, together with the boxes 3.

After the washing station 22, and the effect of the compressed air at the blowing station 23 to facilitate drainage,,we have a clean and drained part which only remains to be dried. This is done at high speed with air from a fan by means of some blowing nozzles 28, at a drying station 24.

These nozzles 28 are uncovered and are not enclosed in a cabin as normally occurs in a classic washing machine. There are only some loose panels for sound-proofing purposes.

In Figure 4 a plan view of the complete machine with all the stations is illustrated. In Figure 4 the parts 2 for washing are loaded at station 26, station 22 is the washing centre, numeral 23 indicates the blowing station with compressed air, already described as identical to the washing station, and numeral 24 indicates the general drying station with air from a fan. Stations 25 are the intermediate waiting stations and numeral 27 indicates the unloading station of parts 2 which have already been washed.

Figures 5 and 6 illustrate another form of embodiment of the mobile housing, which is constructed from a single part, i.e. by a single box 3 for washing which runs along some guides placed on a vertical table, in turn maintained by a bed-frame.

Figure 7 shows a form of special modified construction of the washing boxes 3, which is provided with a high pressure washing circuit, and another medium pressure washing circuit, through whose respective nozzles 4' and 4, the washing liquid is discharged simultaneously. In this construction the pressure washing is performed with the washing liquid being distributed from the hoses 19 through the washing box 3 and the nozzles 4 connected to it, whereas the high pressure washing circuit, independent of that of the medium pressure circuit, crosses the hollow washing box 3, whereby washing liquid from the hoses 19' is connected directly to the high pressure washing nozzles 4'.

This form of embodiment illustrated in Figure 7, enables the medium and high pressure washing operations to be performed simultaneously. Furthermore, thanks to this system, the mist created by the high pressure aspersion, is partially reduced by the current of liquid created by the medium-pressure nozzles 4.

CLAIMS

1. A machine for washing machined parts incorporating a washing station which includes a washing device provided with washing nozzles for directing a washing liquid under pressure onto a part to be washed, characterised in that the washing device is movable between an inoperative loading and unloading position in which a part to be washed can be placed in or removed from the washing device and an operative washing position in which walls of washing device define an enclosure surrounding at least the top, ends and sides of the part to be washed, and automatic valve means 10 for controlling the supply of washing liquid to the washing nozzles 4, 4' is operable in response to the position of the washing device to permit washing liquid to be supplied to the nozzles 4, 4' only when the washing device is in its operative position and otherwise to cut-off the supply of washing liquid to the nozzles 4, 4'.

2. A machine according to Claim 1, characterised in that the nozzles 4, 4' are adapted to be supplied with liquid at medium and high pressures from two independent circuits 19, 19'.

3. A machine according to Claim 1 or 2, characterized in that the washing device comprises a mobile housing 3 comprised of two parts which are adapted to be fitted together with a sealed joint 3 and can shift along respective guides 8 arranged on respective horizontal tables 7.

4. A machine according to Claim 1 or Claim 2, devise comprises a mobile housing 3 of one piece construction, which shifts along a guide 9 provided on a vertical table 8.

5. A machine according to Claim 3 or Claim 4, characterized in that the mobile housing 3 is provided with a pressure accumulator 11, adapted to buffer the impact produced on the nozzles 4', 4' when the washing liquid arrives at high speed, the valve means 10 opens.

6. A machine according to any preceding Claim, characterized in that the washing device is also movable into a third idle position, spaced from the washing station, for inspecting and maintenance of the washing devices.

7. A machine according to any preceding Claim, characterized in that the washing liquid is supplied by means of a pump, which takes the washing liquid from a vacuum tank, having an intermediate accumulator in order to reduce the power of the pump.

8. A machine according to Claim 3 or Claim 4, characterized in that the mobile housing 3, or each part of the housing 3, is provided with the high pressure washing liquid circuit 19 and the medium pressure washing liquid circuit 19', through whose respective nozzles 4, 4', the washing liquid is discharged simultaneously.

9. A machine according any preceding claim, characterized by a blowing station 23 to which a part is transferred after leaving the washing

station 22, a source of compressed air at the blowing station 23, and nozzles for directing the compressed air to the part to facilitate drainage, and a drying station 24 to which a part is transferred after leaving the blowing station 23, and blowing nozzles 28 for directing drying air to the part at the drying station.

10. A machine according to Claim 9, characterized in that the nozzles at the blowing station are disposed within a mobile housing which is movable between an inoperative position at which a part can be placed in or removed from the housing and an operative position in which the housing defines an enclosure surrounding at least major portion of the part.

11. A machine according to Claim 9, characterized in that air is supplied to the nozzles 28 at the drying station 24 from the fan, and the part to be dried is otherwise wholly exposed to the air without the presence of an enclosure.

12. A machine according to any of Claims 9 to 11, characterized in that a loading station 26 for parts for washing is disposed adjacent to the inlet to the washing station 22, and waiting stations 25 are disposed between the blowing station 23 and the drying station 24.

FIG. 4

FIG. 4 is a schematic diagram of a multi-channel device. It shows a central horizontal assembly with multiple parallel channels. On the left, a component labeled 1 is connected to a series of coils labeled 2. This is followed by a vertical assembly labeled 22. Then, another series of coils labeled 25 is shown. This is followed by another vertical assembly labeled 23. Then, another series of coils labeled 25 is shown. Finally, on the right, there is a large rectangular component labeled 29, and below it, two trapezoidal components labeled 28, which are connected to a series of coils labeled 27. The entire assembly is shown in a cross-sectional view.

FIG. 5

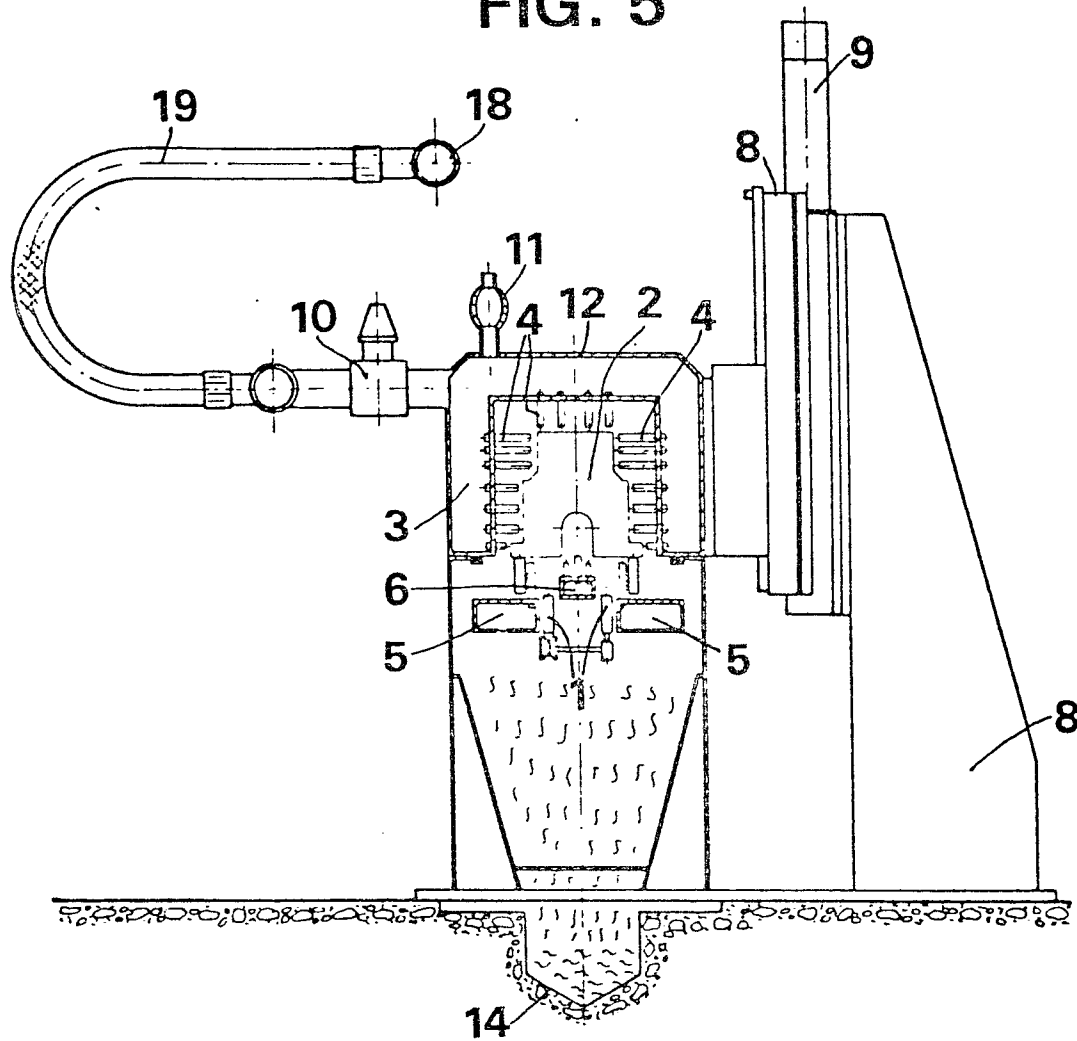


FIG. 6

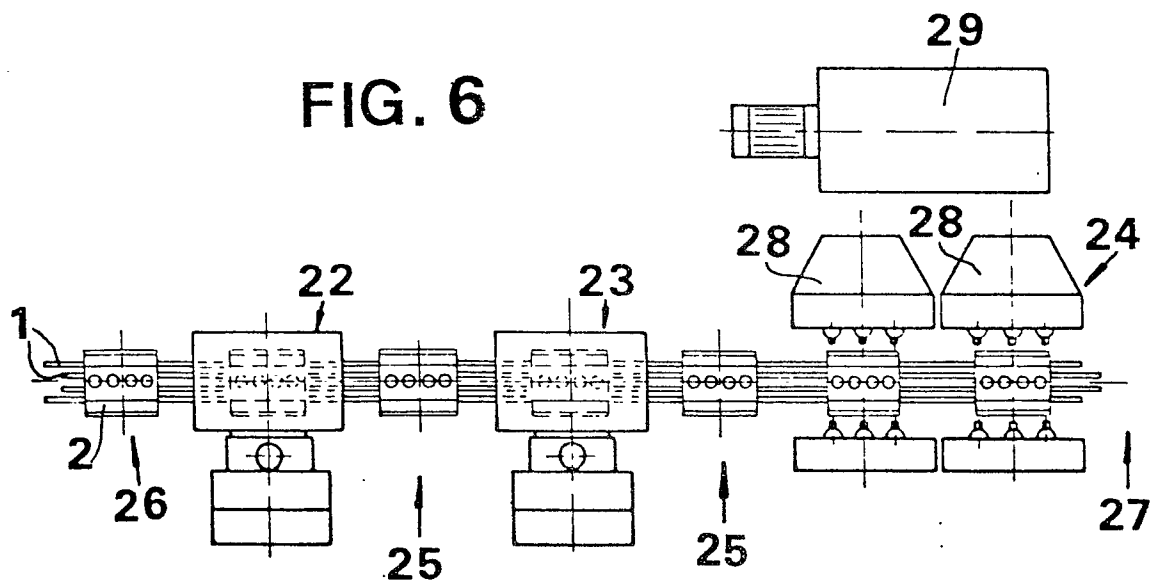
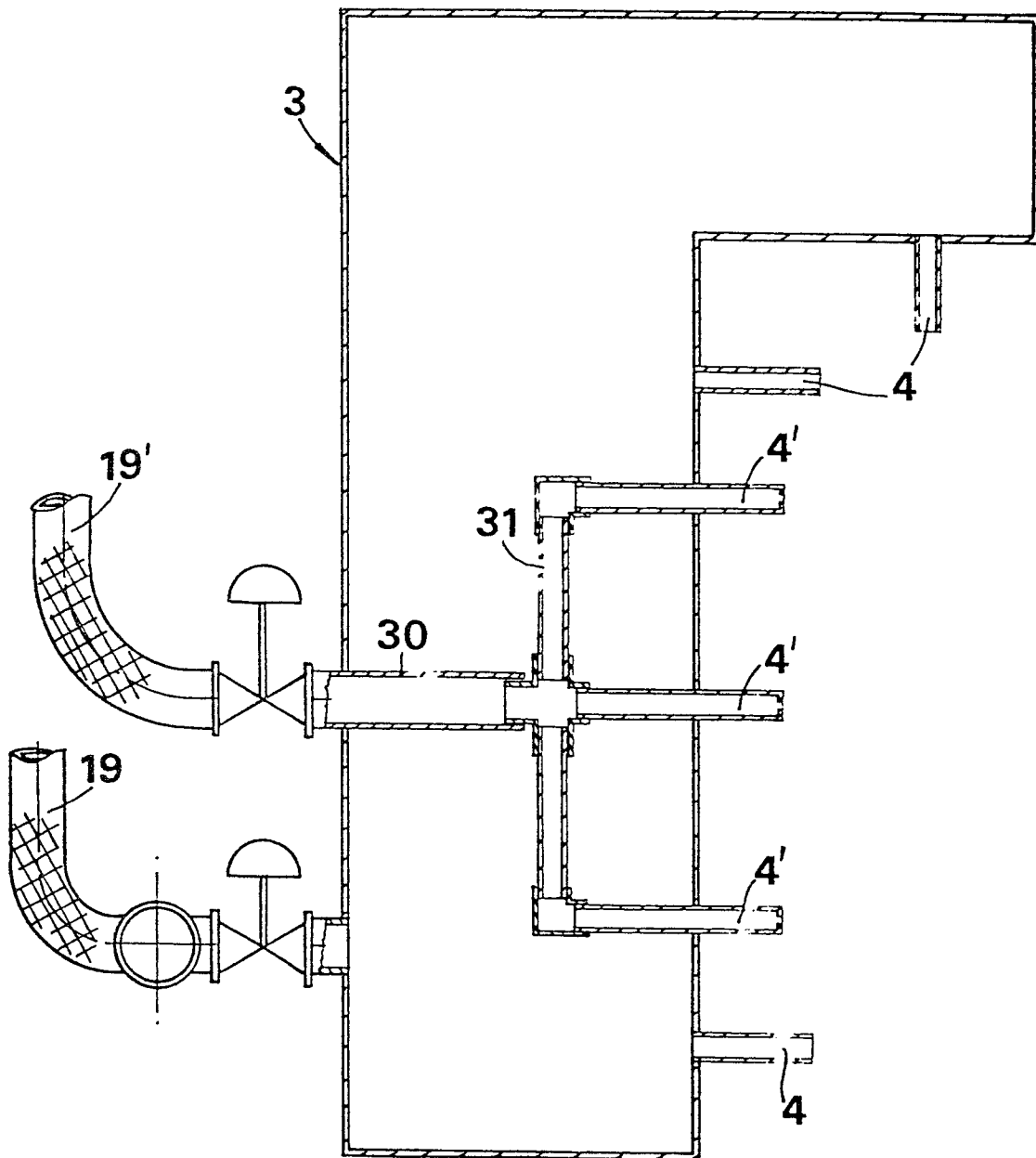


FIG. 7





European Patent
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EUROPEAN SEARCH REPORT

0022307

Application number

EP 80 30 0294

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	
X	<u>US - A - 2 393 215 (AREY)</u> * Page 1, column 2, line 37 - page 2, column 1, line 21; page 3, column 1, line 27 - page 4, column 1, line 3; figures 1-6 *	1, 9, 10, 12	B 08 B 3/02
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	<u>US - A - 4 039 350 (BUCY)</u> * Column 2, line 46 - column 3, line 19; figure 1 *	1, 4	
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	<u>FR - A - 1 479 939 (WERNER & PFLEIDERER)</u> * Page 2, column 2, paragraph 9; figure 1 *	2	

			TECHNICAL FIELDS SEARCHED (Int. Cl.)
			B 08 B C 23 G
			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
			&: member of the same patent family, corresponding document
<input checked="" type="checkbox"/> The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
The Hague	14-10-1980	CLAEYS	