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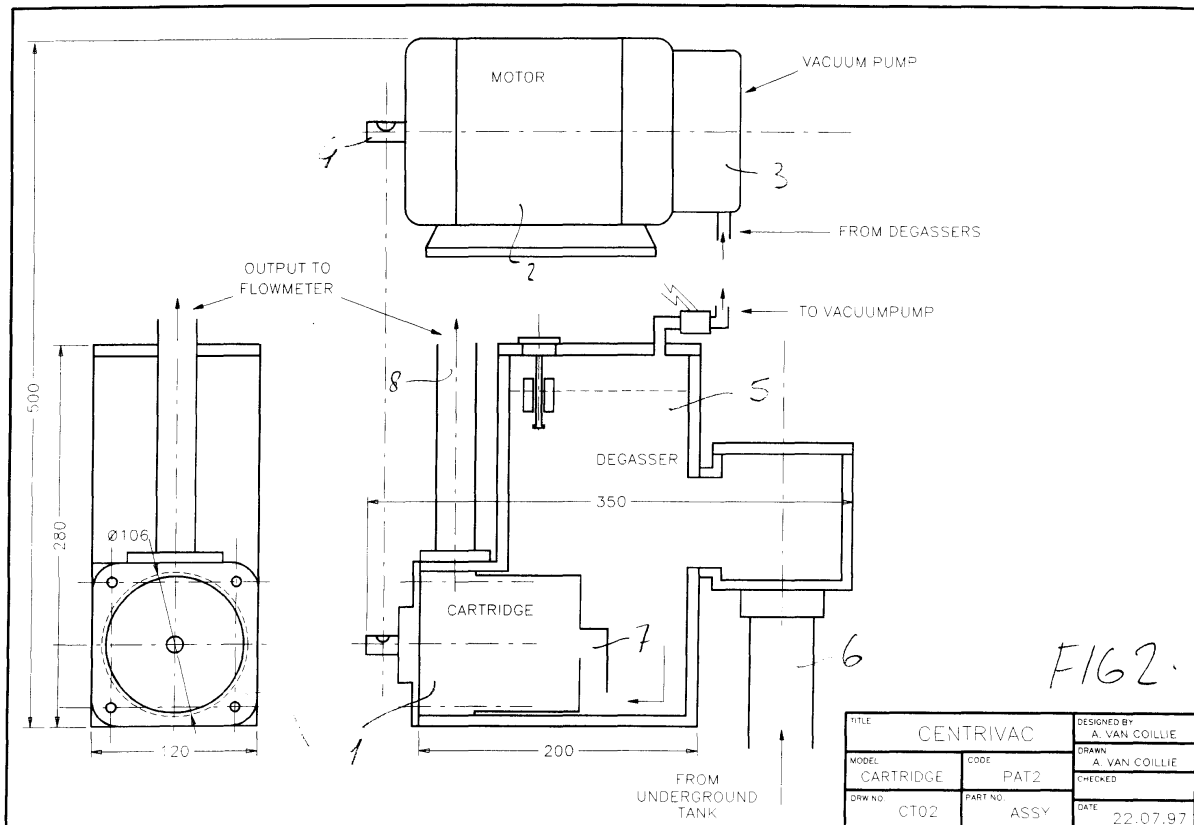
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(54) **Pumping device for several fuels**

(57) The invention relates to a pumping device for several different, relatively volatile vehicle fuels, comprising a number of pump units (1) each having a closed pump housing (5) with an intake (6) connected to a supply of one of the vehicle fuels, at least one discharge connected to a delivery means of a vehicle fuel station,

and a hydrodynamic fuel pump with a fuel inlet (7) drawing from the interior of the pump housing (5) and a pressure outlet connected to the discharge. The pump further comprises one single gas pump (3) with a gas inlet drawing from the pump housing (5) of each of the pump units.



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Description

[0001] The invention relates to a pumping device for several different, relatively volatile vehicle fuels. Such a pumping device is generally known as multiproduct dispenser (MPD) and contains generally 2, 3 or 4 pumping units, one per product. Examples of these products are leadfree petrol, normal petrol, super petrol and diesel. Generally each of the pump units feeds two dispensing nozzles.

[0002] The object of the invention is to improve a pumping device of this kind by applying teachings known from Dutch patent application 9 401 455. This last mentioned publication shows a pumping device for relatively volatile vehicle of fuel for a single product dispenser.

[0003] This object is achieved with the pumping device as characterized in claim 1. By using only one gas pump and several hydrodynamic fuel pumps, a very economic device is obtained, having only a few moving parts. Furthermore, the device according to the invention uses only a limited amount of energy for operation and is inherently very robust. Therefore the costs of investments and also of operation of a multiproduct dispenser according the invention are markedly reduced relative to the prior art devices.

[0004] As with a pumping device according to the invention at most two discharge nozzles are used at the same time, the pumping capacity of the gas pump can be limited to that maximum use. The gas pump will be of the same capacity as a single product dispenser with two dispensing nozzles.

[0005] A further favourable development of the pumping device according to the invention is characterized in claim 2. By using only one electric motor the manufacturing costs of the pumping device are very limited. As the work needed to run a hydrodynamic pump, more specifically a centrifugal pump depends on the delivered flow rate, the fluid pumps of the pump units not discharging fuel are in fact idling and do not take up more energy than to overcome friction losses. Therefore the power of the electric motor used according to this preferred embodiment is only slightly higher than the electric motor that would be necessary for driving one fuel pump.

[0006] A favourable embodiment of the pumping device according to the invention is characterized in claim 3.

[0007] For easy maintenance the characterizing feature of claim 4 is preferably applied. In case of malfunction of one the fuel pumps it can easily be replaced by a corresponding pump without fully disassembling the pumping device.

[0008] Proper control of the operation of the pumping device according to the invention is obtained with the characterizing features of claim 6. When starting the pumping device the gas pump will raise the fluid level in each of the pump housings to the required level and, as soon as this level is attained in each of the pump hous-

ings, the suction is shut off by the vacuum shut off valve. Should level drop i.e. due to air being sucked in, or due to degassing action, the vacuum shut off valve is momentarily opened, to bring the level again at the required position.

[0009] Should the fluid level drop too low, the discharge valve is closed, so as to prevent that gas is discharged with the fuel.

[0010] A further improvement is characterized in claim 7. When it takes too much time to bring the level of the fuel in the pump housing to the required position, apparently too much gas is being sucked in or some other malfunction occurs, which calls for shutting off the discharge.

[0011] The invention will be further illustrated in the following description of several embodiments of pumping devices according to the invention shown in the accompanying drawings.

20 Fig. 1-4 show schematic views of a pumping device according to the invention, in which the hydrodynamic fuel pump is embodied as a cartridge.

25 Fig. 5-8 show in schematic views an embodiment with a separate pump housing and fuel pumps.

30 Fig. 9-10 show schematically hydrodynamic fuel pumps of an embodiment of the pumping device according the invention, in which these pumps are assembled as one unit.

[0012] The pump cartridge 1 becomes a simple centrifugal pump with, for instance, a diameter of 100 mm if it is a three stage pump. A two stage pump would need a diameter 130 mm. The pump cartridges 1 can easily be exchanged if necessary.

[0013] The total size of the four pumps can be reduced to a space of only 480 x 310 x 280 mm so that the dispenser becomes considerably smaller than the prior art.

[0014] As mentioned before, the four centrifugal pumps are driven with one motor 2, on one side of which a vacuum pump 3 is mounted and on the other shaft side 4 the pulley (not shown) to drive the four centrifugal fuel pumps is mounted.

[0015] If vapour recovery is desired, the vacuum pump 3 will be chosen such that it has a sufficient capacity to provide for degassing and for vapour recovery.

[0016] The pump housing 5 has an intake 6 which is connected to a supply of a specific fuel.

[0017] The fuel pump 1 has a fuel inlet 7 that draws in fuel from the interior of the pump housing 5.

[0018] A pressure outlet of the pump 1 is connected to a discharge 8 which leads to a dispenser nozzle via a flow meter.

[0019] Fig. 4 shows the arrangement of the driving gear for the pumping device. The motor 2 drives a double pulley 10 which drivingly engages pulleys 11 and 12

by means of the V-belts. Each of the pulleys 11 and 12 is connected with a gear that is in meshing engagement with gears 13 on the shafts of the pump cartridges.

[0020] In the embodiment of fig. 5-8 the centrifugal pump 15 is separated from the degasser or pump housing which allows a very economic degasser design.

[0021] A non return valve 17 prevents the liquid to flow back to the underground reservoir, as soon as the pump is switched off. This non return valve is not really necessary. Two electric valves 25 and 26 in figure 8 close when the motor stops running, making any flow back of the liquid impossible and keeping at the same time the pump under underpressure. The vertical shaft position of motor 18 and centrifugal pumps 15 and the relative positioning of the components as shown in fig. 5, result in a two stage centrifugal pump having its shaft sealings exposed to the suction side in a favourable manner. This has the advantage that the pressure drop over the shaft sealings is never higher than about 0,5 bar and enables the use of simple lip seals. The pressure side of the pump has no shaft sealings.

[0022] The central motor 18 as shown in fig. 8 drives the, in this case four centrifugal pumps 15 by a set of gear wheels indicated in fig. 6 with one side of its shaft 21 while with the other shaft extremity 22 a vacuum pump is driven. It will be clear that instead of 4 pumping units also 3 or 2 pumping units can be used.

[0023] At the moment that a dispensing nozzle is lifted out of the nozzle boot the motor 18 starts to run driving the vacuum pump and the 4 centrifugal pumps 15. The centrifugal pumps 15 do not have to deliver immediately liquid because it takes a few seconds before the nozzle is taken to the tank of the vehicle and opened.

[0024] The vacuum pump however creates immediately an underpressure in the suction pipes 23 with which it is connected to the four pump housings.

[0025] If the level of the liquid in the four pump housings is on its highest, the float switches by means of their upper read relay keep the four electric vacuum shut off valves 25 closed and the vacuum pump evacuates only the gas in the suction pipes 23.

[0026] If, however, the level in one or more of the pump housings is lower than maximum, but higher then its minimum, the upper read relay of the corresponding float switch 24 deactivates the electric vacuum shut off valve 25 which opens and enable the vacuum pump to restore the level of the liquid at its maximum value by evacuating the gas on top of the liquid in the corresponding pump housing.

[0027] If the level in one or more of pump housings was reaching its minimum (empty underground reservoir, excessive degassing, leak etc.) the lower read relay of the corresponding float switch 24 closes the corresponding electric discharge shut off valve 6 in the discharge pipe of the centrifugal pump, the flow rate of which drops to zero, while the vacuum pump evacuates the gas in the pump housing and tries to restore the maximum liquid level.

[0028] Should this not occur within a preset time, control means would then close the electric shut off valves in the output of the centrifugal pump 26 and the vacuum shut off valve 25 on top of the pump housing, isolating in that way the problematic pumping unit from the others which, however, continue to function. At the same time an error signal can be generated warning an operator of the faulty situation.

[0029] In case a vapour recovery system is also used, the capacity of the vacuum pump is of course adapted for both degassing and vapour recovery.

[0030] In the embodiment of the figures 9 and 10, the pumps are separated from the pump housings, in the same way as the embodiment of figures 1-4. The pump housings of this embodiment therefore can have the same embodiment as that of the pumping device of these figures 1-4.

[0031] The hydrodynamic liquid pump 30 is here designed as a single stage centrifugal pump. It is designed with a through-going shaft, such that two, three or more pumps can be assembled as shown in figure 10. The advantage described for the embodiment of fig. 1-4 concerning the low pressure drop on the shaft sealings is also valid here. The two different lengths of grooved shafts 31, 32 shown in figure 10 connect the respective shafts 33 of the pumps 30 in such a way that the units can be assembled one against the other.

30 Claims

1. Pumping device for several different, relatively volatile vehicle fuels, comprising a number of pump units each having a closed pump housing with an intake connected to a supply of one of the vehicle fuels, at least one discharge connected to a delivery means of a vehicle fuel station, and a hydrodynamic fuel pump with a fuel inlet drawing from the interior of the pump housing and a pressure outlet connected to the discharge, and further comprising one single gas pump with a gas inlet drawing from the pump housing of each of the pump units.
2. Pumping device according to claim 1, comprising one electric motor, drivingly connected to the hydrodynamic pumps of each of the pump units and to the gas pump.
3. Pumping device according to claim 2, wherein the electric motor is of the kind having two engageable shaft ends, one of these ends being connected to the gas pump and the other end being connected to drive means connecting each of the hydrodynamic pumps.
4. Pumping device according to one of the preceding claims, wherein the hydrodynamic pumps are embodied as replaceable cartridges.

5. Pumping device according to one of the preceding claims, wherein the gas pump is separate from the pump units and connected to the pump housings by conduits.

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6. Pumping device according to one of the preceding claims, comprising in the pump housing of each of the pump units a float switch, a vacuum shut off valve in the connection with the gas pump and a discharge shut off valve in the connection with the discharge, said float switch and valves being connected to control means, closing the vacuum shut off valve with a high end position of the float and closing the discharge shut off valve with a low end position of the float.

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7. Pumping device according to claim 6, wherein the control means include a timer closing the discharge shut off valve when the vacuum shut off valve has been open during a set period.

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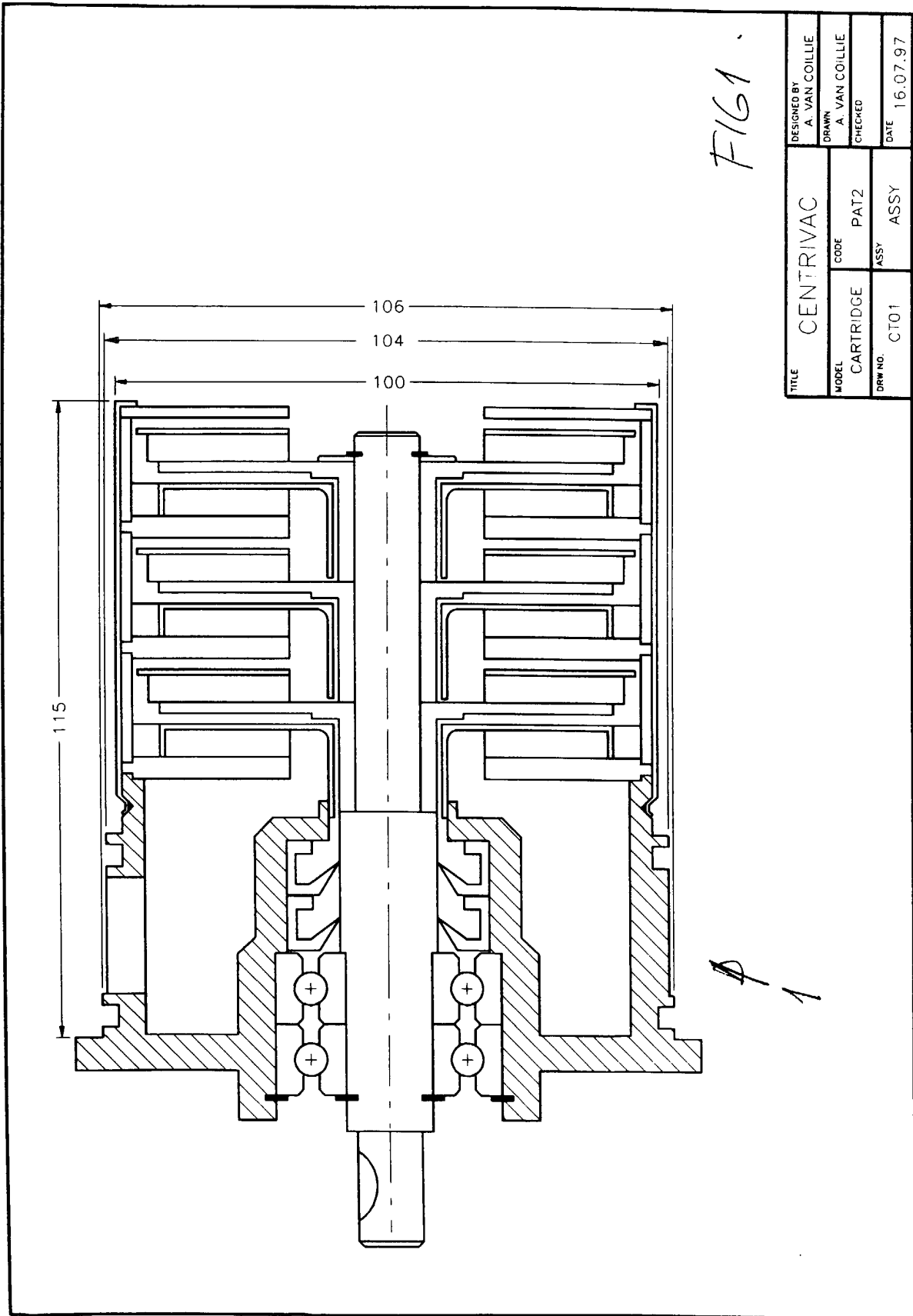
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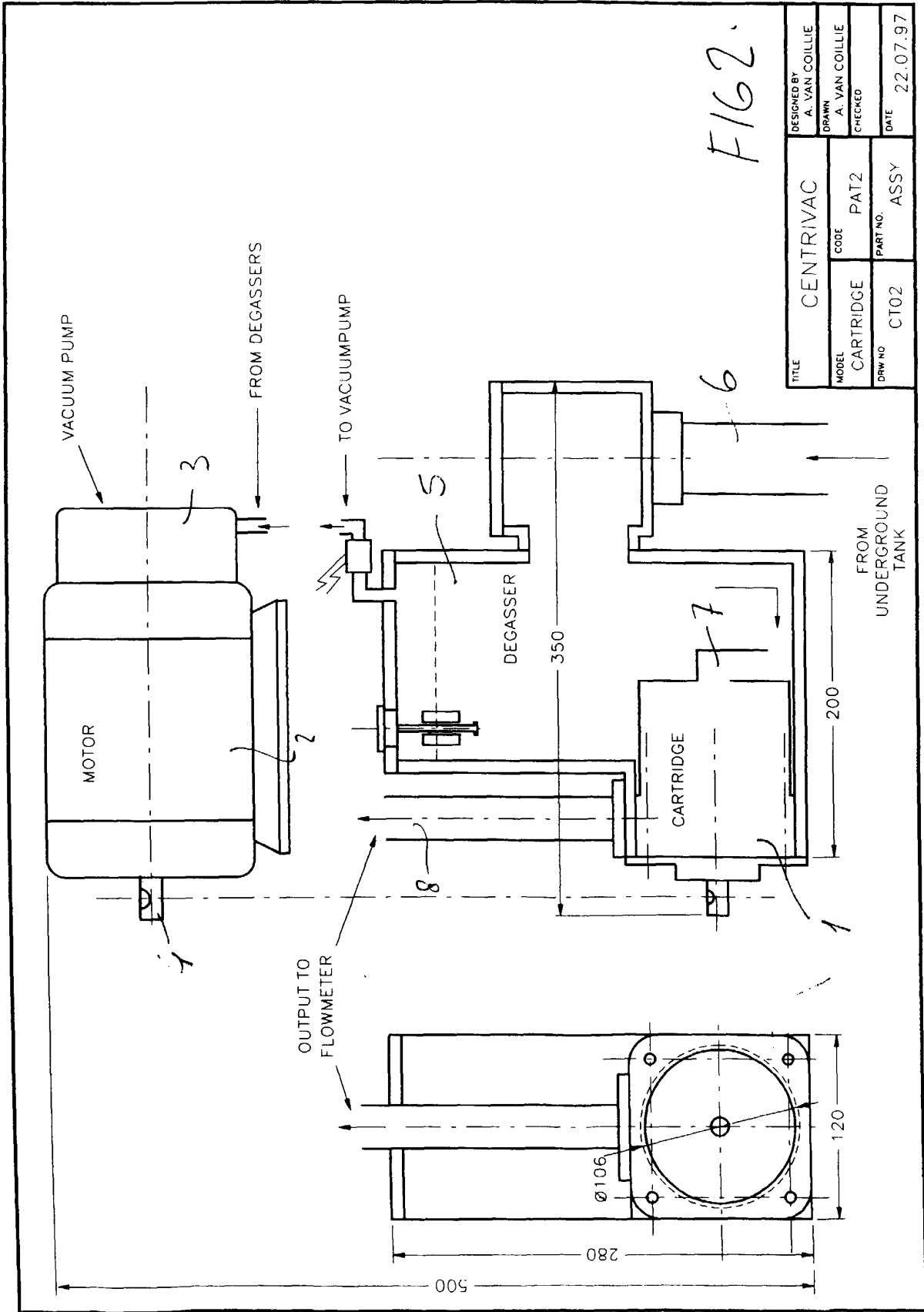
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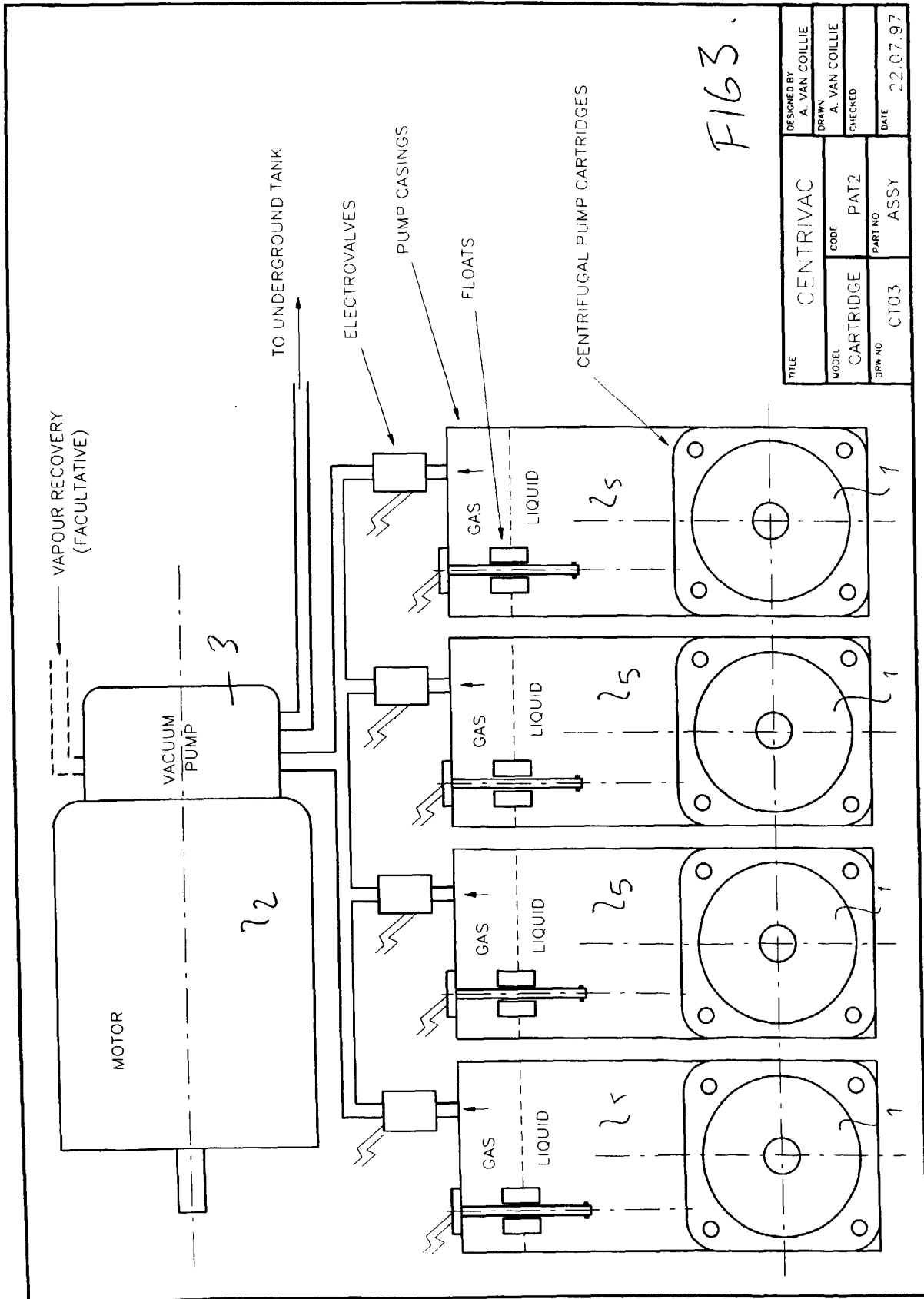
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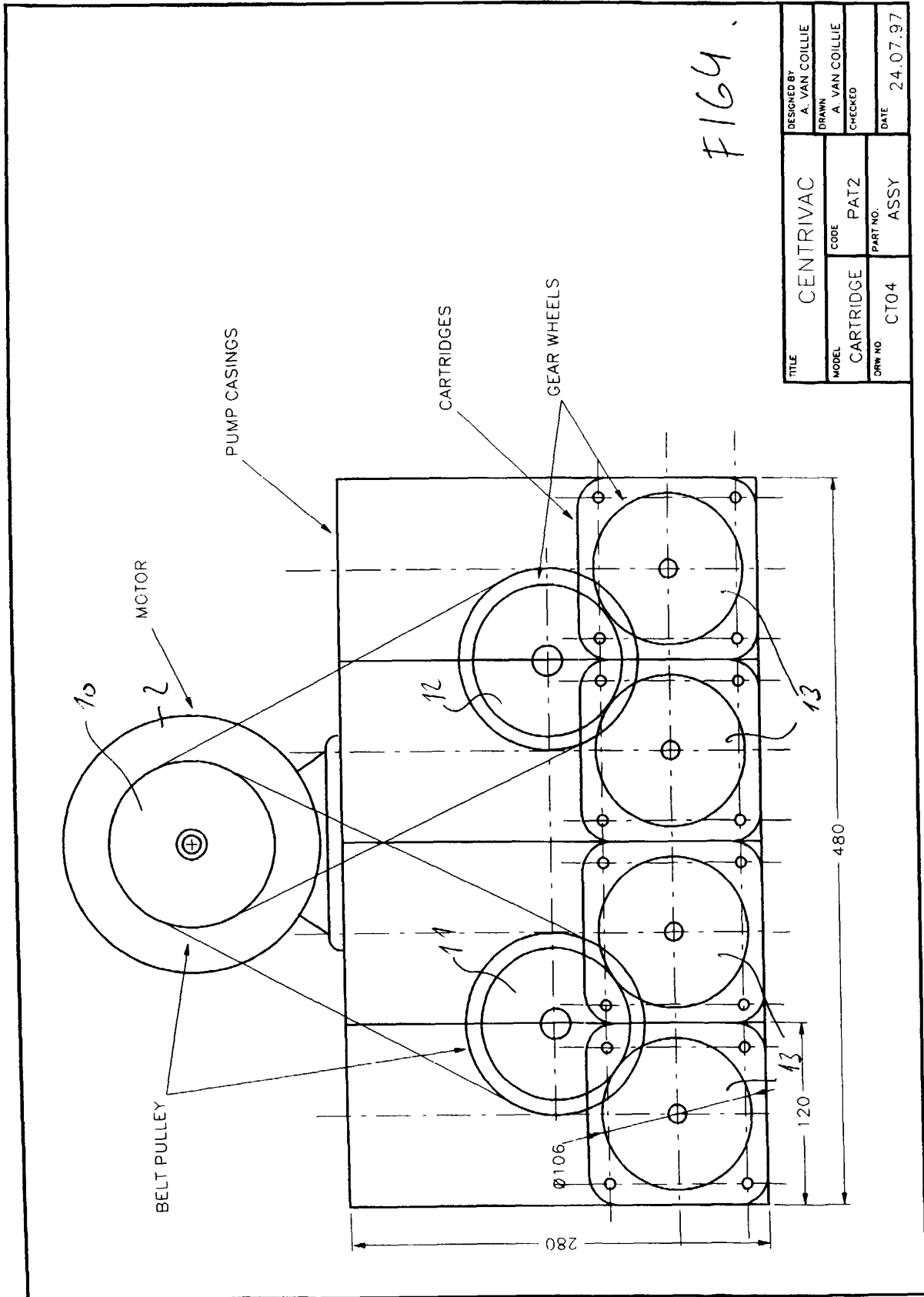


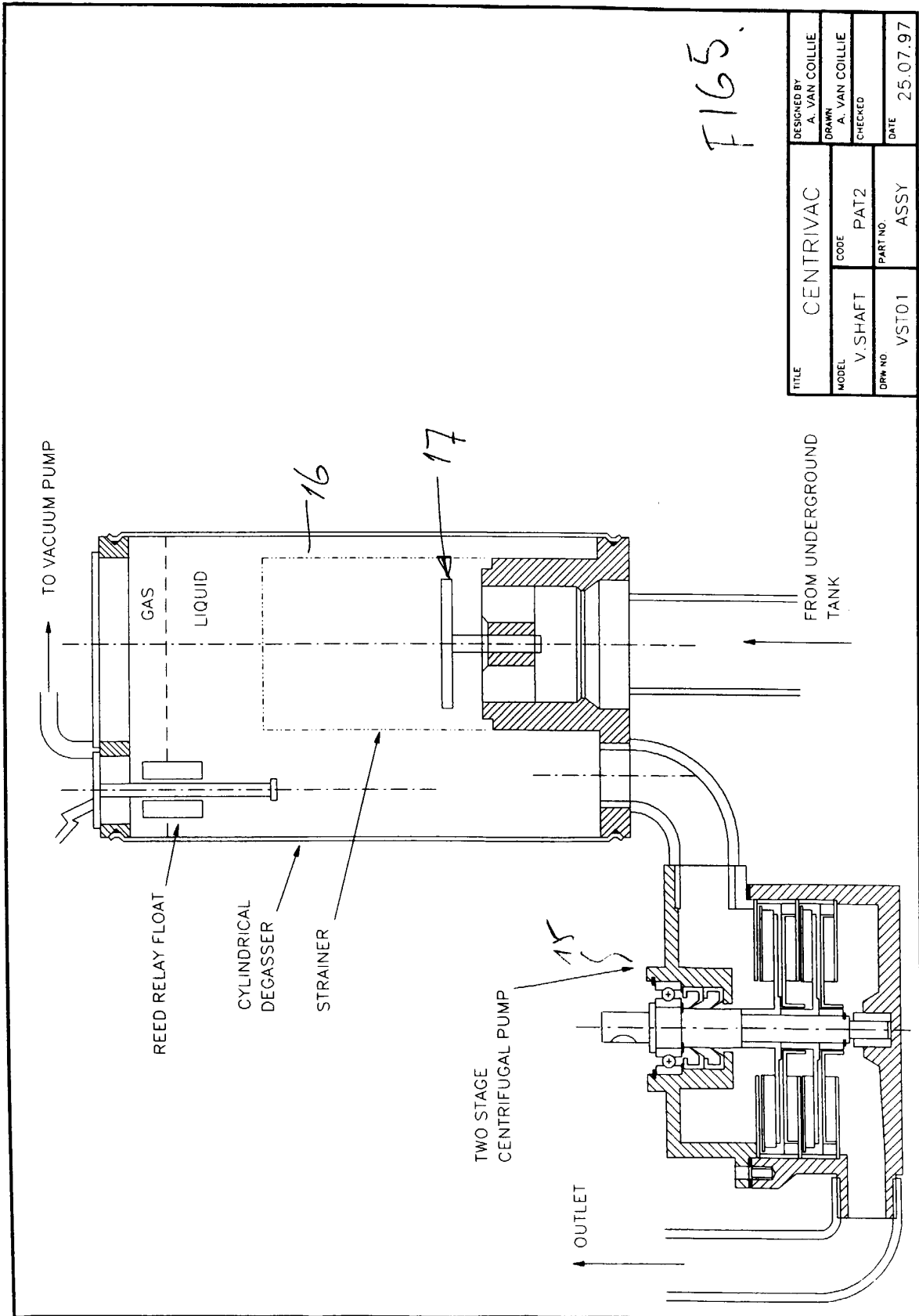
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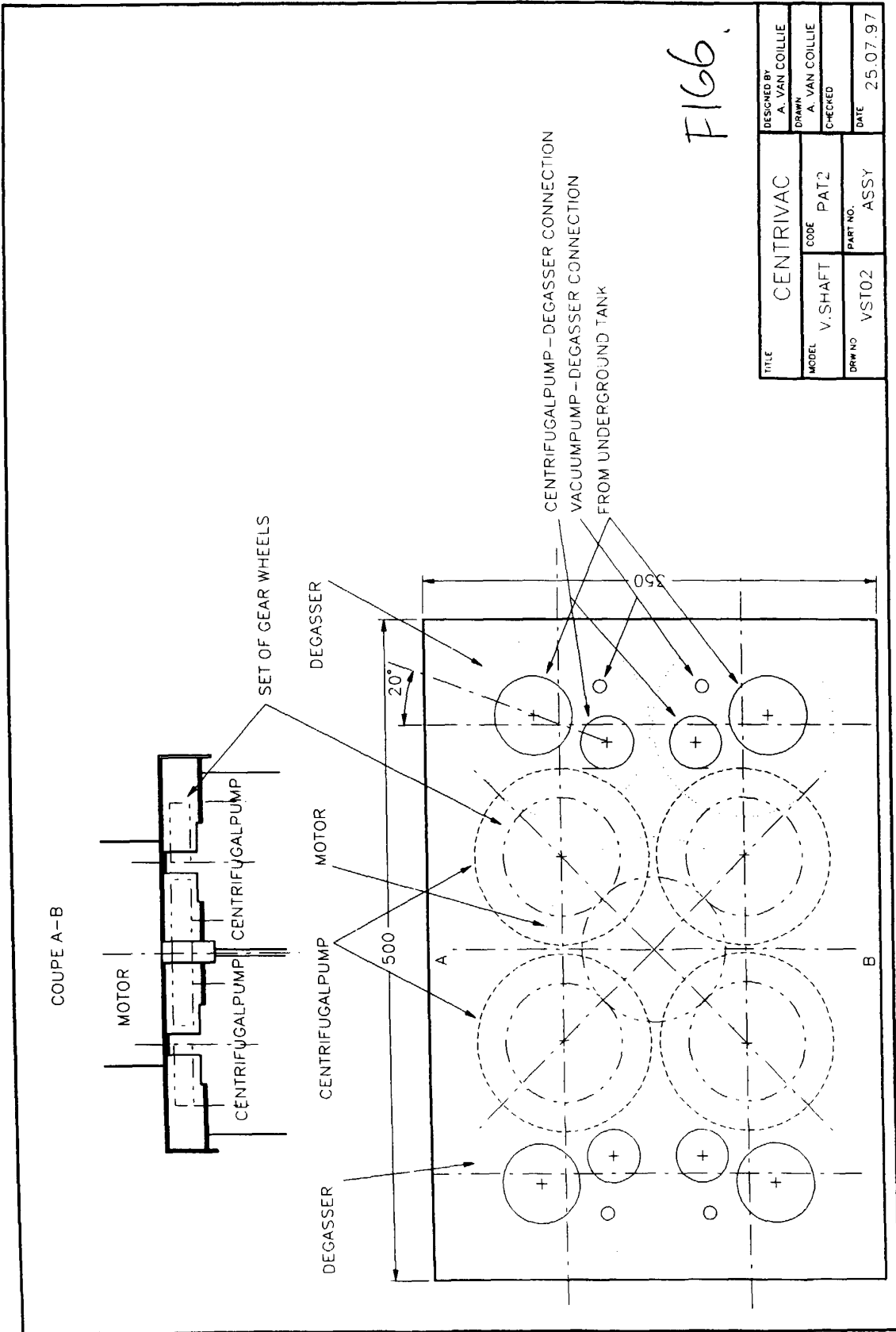


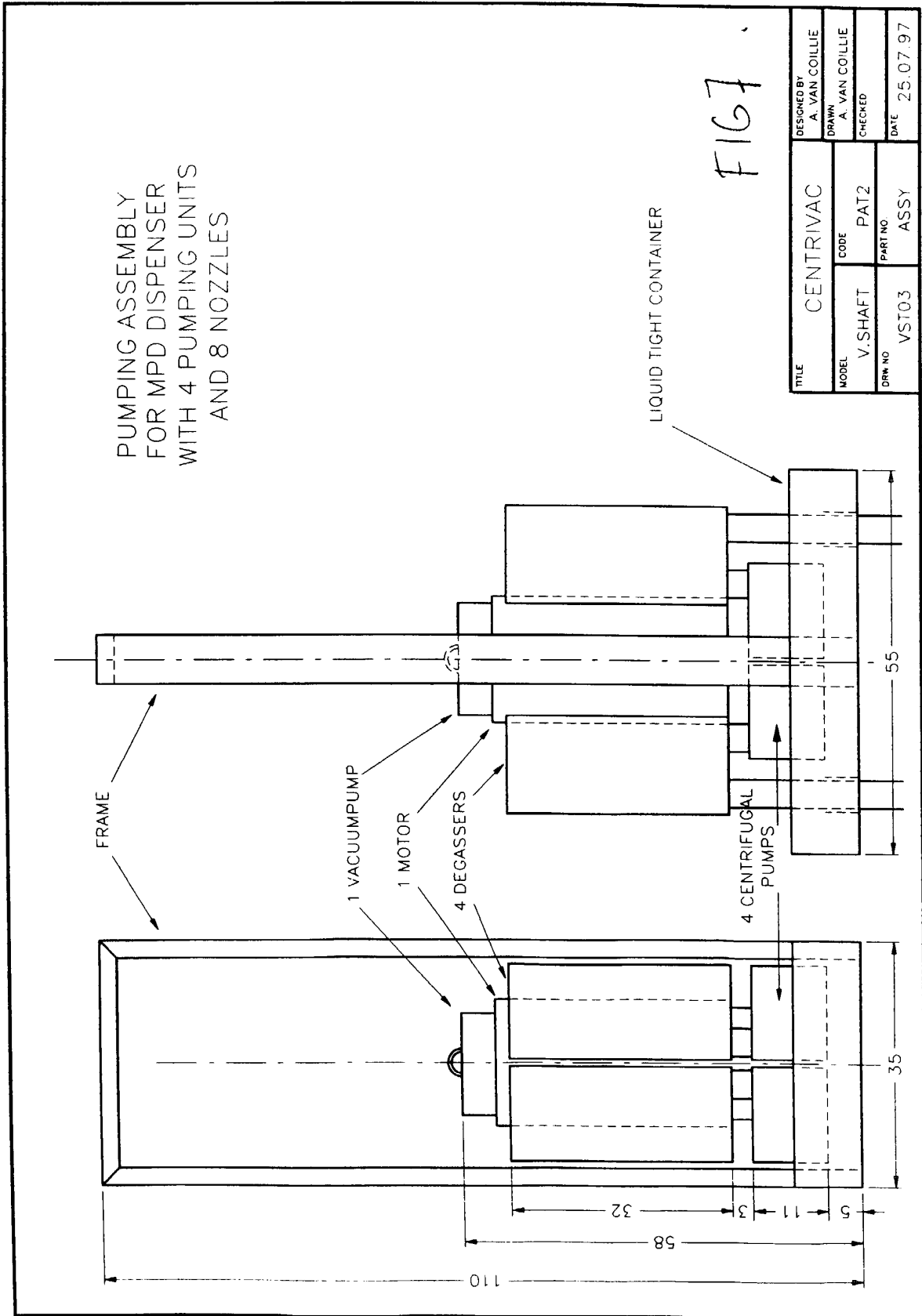
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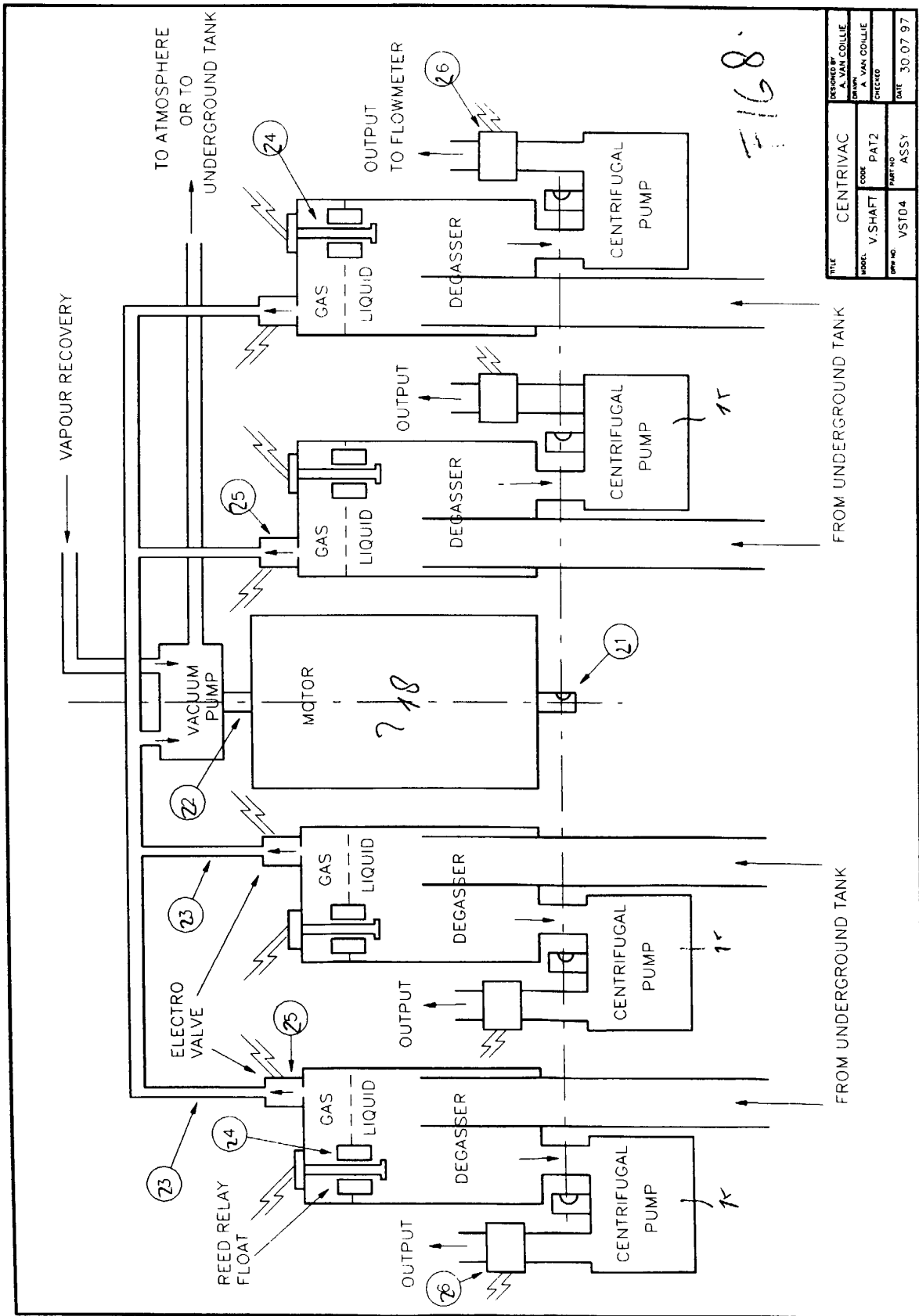




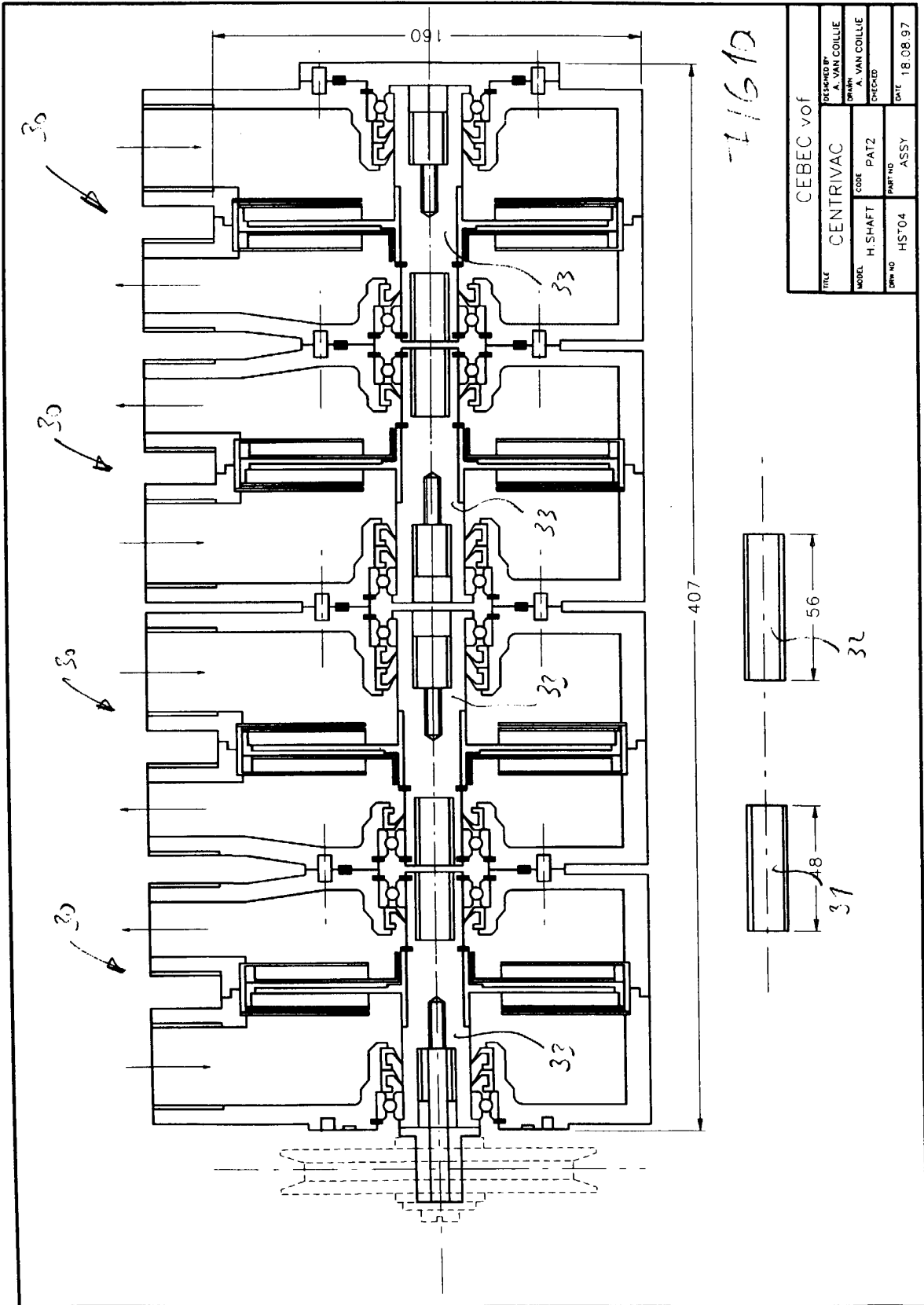




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		PART NO.	ASSY.
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EUROPEAN SEARCH REPORT

Application Number
EP 99 20 2093

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.7)
A	DE 295 12 158 U (MORETTI BRUNO) 19 October 1995 (1995-10-19) * claims 1,2; figures * ---	1	F04D13/02 B67D5/04 B67D5/58 F04D9/04
A	FR 875 245 A (RATEAU) 16 September 1942 (1942-09-16) * page 1, line 1 - line 12 * * page 2, line 14 - line 32; figures * ---	1-3	
A	US 1 549 608 A (RAYNES) 11 August 1925 (1925-08-11) * page 1, line 53 - line 85; figures * ---	1	
A	US 5 323 817 A (SPALDING ROBERT G) 28 June 1994 (1994-06-28) ---		
A	GB 350 551 A (DRYSDALE) 9 July 1931 (1931-07-09) -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			F04D B67D
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		28 October 1999	Zidi, K
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
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ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 99 20 2093

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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28-10-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 29512158 U	19-10-1995	IT PV940006 U US 5690254 A	08-02-1996 25-11-1997
FR 875245 A	16-09-1942	NONE	
US 1549608 A	11-08-1925	NONE	
US 5323817 A	28-06-1994	US 5195564 A AT 149146 T CA 2067310 A DE 69217571 D DE 69217571 T EP 0511599 A US 5332011 A	23-03-1993 15-03-1997 31-10-1992 03-04-1997 12-06-1997 04-11-1992 26-07-1994
GB 350551 A		NONE	