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71 Applicant: **NETZSCH MASTERMIX LIMITED**
Vigo Place
Walsall West Midlands WS9 8UG(GB)

72 Inventor: **Bow, Colin Frederick**
The Paddocks Newcastle Road
Loggerheads Shropshire(GB)
Inventor: **English, Robert William**
8 Cloister Walk
Whittington Lichfield, WS14 9LN(GB)

74 Representative: **Hands, Horace Geoffrey et al**
LEWIS W. GOOLD & CO. Whitehall Chambers
23, Colmore Row
Birmingham B3 2BL(GB)

54 **Mixing and dispersing apparatus.**

57 Mixing and dispersing apparatus has a rotor shaft (40) which extends through a wall (28) of the mixing vessel and comprises a non-rotatable sleeve (42) with journal bearings between the sleeve and the shaft, the journal bearings being widely spaced on the shaft. This allows a relatively small diameter shaft to be used without fear of whip because the unsupported length is minimal. The complete assembly of sleeve and shaft may be slidable through the vessel wall for example to raise and lower the rotor in the vessel.

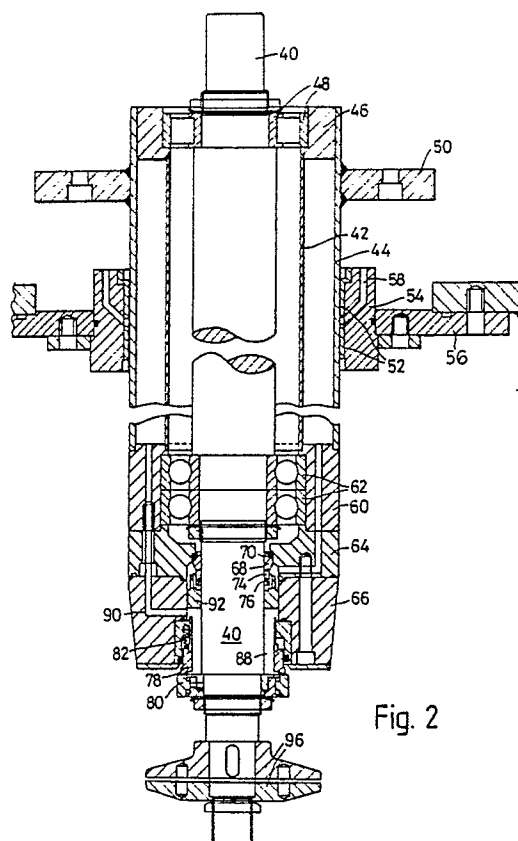


Fig. 2

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MIXING AND DISPERSING APPARATUS

This invention relates to mixing and dispersing apparatus of the kind comprising a rotor shaft which extends into a vessel through a wall of the same. Frequently the shaft is long so that the rotor can be displaced to take the rotor which is at the end of the shaft for example in a vertical movement between the top and bottom of the vessel. This necessitates a substantial unsupported length of shaft which creates the need to use relatively massive shafts to avoid whip.

The object of the invention is to provide an improved design.

According to the invention, a mixing and dispersing apparatus comprises a vessel and at least one rotor mounted on mixing and dispersing apparatus comprising a vessel and a rotor mounted on a rotatable shaft extending into a vessel, said shaft extending concentrically within a tubular non-rotatable sleeve with journal bearings between the sleeve and the shaft at widely spaced axial positions, and said sleeve being axially slidable in the vessel wall to carry the rotor between a range of different axially related positions.

By these means, the shaft can be journaled close to the rotor even when the same is near the base of the vessel, and the unsupported length will be minimal.

Conveniently the sleeve is circular in cross-section in order to use commercially available seals and relatively simple bushes guiding the sleeve for its sliding movement through the vessel wall and the interior of the sleeve may be for example filled with lubricant for the shaft bearings and/or used for conduits e.g. to carry coolant to desired locations in the vessel.

According to a feature of the invention, two concentric sleeves are provided: the inner sleeve is used to carry the bearings and forms a conduit for lubricant, and the outer sleeve is used to carry a seal between it and the shaft to prevent lubricant leakage from the bearings causing contamination of the product being manufactured in the vessel. The seal may comprise relative rotatable rubbing faces which are wetted by a film of sealing fluid, using the outer sleeve as a conduit for that fluid, and the sealing fluid may be the same solvent which is being used to disperse the powders etc. in the manufacture of the product, or one which is compatible therewith, so that small leakage of the sealing fluid into the product is unimportant.

The mixing and dispersing apparatus may have two or more shafts according to the invention.

The invention is more particularly described with reference to the accompanying drawings wherein:

Figure 1 is an elevation, partly broken away, showing the principle components of a mixing and dispersing apparatus; and

Figure 2 is a fragmentary enlarged scale elevation partly in section, of the shaft construction.

Referring first to Figure 1, the vessel comprises a cylindrical upper portion 10 and frusto-conical lower portion 12 and the base is a very shallow frusto-cone 14. Below the vessel a motor 16 drives a stub shaft 18 carrying a slow speed rotor 20 of a shape which closely corresponds to the internal configuration of the vessel so that the rotor sweeps the walls and maintains a general circulation of vessel contents.

High speed rotor 24 is mounted at the bottom end of a shaft construction generally indicated by the reference numeral 26 and which extends through the lid 28. The shaft is carried by a head structure 30 mounted on a column 32 which includes a ram moveable in the direction of the arrows A-A so as to raise and the lower the rotor 24 between the illustrated position and one closely approximate the lid 28. This is needed for dispersion of powders which may tend to float on the surface of the solvent in the vessel, or may sink to the bottom, according to their nature and the extent to which they are dispersed and mixed.

Turning now to Figure 2, the shaft assembly comprises the shaft 40 itself and a pair of concentric sleeves 42,44. An upper bearing set 48 is located between the shaft and a head ring carrying the sleeves. Lower bearing set 62 is between the shaft and the uppermost of a set of housing parts at the lower end of the shaft. Flange 50 is welded to the outer sleeve and used to lift and lower the complete assembly and also as a travel limiting abutment.

The shaft extends through the vessel cover or lid and Figure 2 shows the parts providing the sliding seal between the shaft and lid including bushes 52, carrier block 54 and carrier plate 56. A channel 58 is for the supply of lubricant to the bore of the bush 52.

The said housing parts at the bottom end of the shaft include parts 60, 64 and 66. All of these parts are bolted together and used to mount components of a pair of axially spaced rotary seals between the shaft and the housing.

The upper one of the rotary seals comprises rings 68,74 which have abutting faces contained in a plane normal to the shaft axis. Those faces may rub on one and another with an interposed film of sealing fluid. Ring 68 may be of carbon and ring 74 of steel. One is sealed by 'O' ring 70 to the housing part 64 and the other by 'O' ring 76 to the

shaft itself. Rings 68,74 may be urged together by springs (not shown).

The lower rotary seal comprises a pair of for example silicon carbide rings 78,80 which are similarly urged together by springs 82, so as to rub on one and another with an interposed film of sealing fluid. The two rings are sealed to the housing and shaft respectively by further 'O' rings.

Surrounding the shaft and between the seals 74,80 is a chamber 88 connected by passages 90 to the space between the two sleeves, to be charged with sealing fluid which can then find its way to the two sets of rubbing faces. To assist flow to the upper rotary seal a pumping screw-thread formation may be provided on the shaft or for example on the intermediate ring 92 so that when the shaft is turning the sealing fluid is conveyed by that screw-thread from below the ring 92 to above the ring 92. The pressure could be used to urge the ring faces towards one and another, instead of using springs.

The sealing fluid is supplied to the space between the sleeves through an appropriate pipe extending from a header tank (not shown). Lubricant may be fed to the space between the shaft and inner of the sleeves from similar but separate systems.

The high speed rotor is clamped between the hub parts 96 at the bottom end of the shaft.

It will be appreciated that in use, the whole assembly shown in Figure 2 (other than the sliding seal lid parts) is lifted and lowered as a complete unit.

Claims

1. Mixing and dispersing apparatus comprises a vessel and at least one rotor mounted on mixing and dispersing apparatus comprising a vessel and a rotor mounted on a rotatable shaft extending into a vessel, said shaft extending concentrically within a tubular non-rotatable sleeve with journal bearings between the sleeve and the shaft at widely spaced axial positions, and said sleeve being axially slidable in the vessel wall to carry the rotor between a range of different axially related positions.

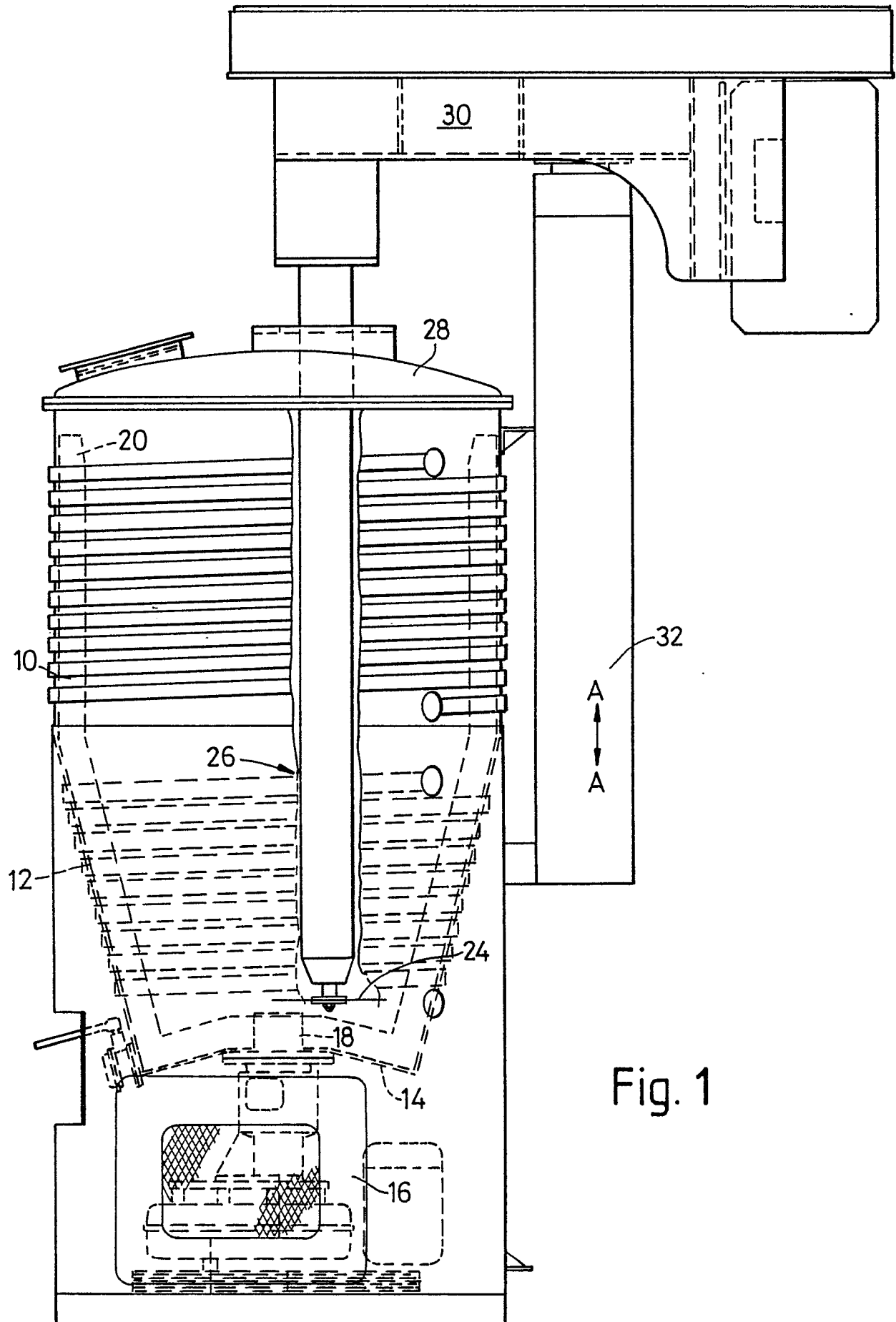
2. Apparatus as claimed in Claim 1 wherein two non-rotatable concentric sleeves are provided, the journal bearings are between the inner sleeve and the shaft, and a seal is provided between the shaft and the outer sleeve.

3. Apparatus as claimed in Claim 2 in which the seal comprises relatively rotatable surfaces on the sleeve and shaft and a sealing liquid supply system is provided including the space between the said sleeves.

4. Apparatus as claimed in Claim 2 comprising upper and lower seals located axially between the

rotor and the adjacent bearing.

5. Apparatus as claimed in any of claims 2-4 wherein each seal comprises a pair of ring parts, an 'O' ring between one ring part and the sleeve and an 'O' ring between the second ring part and the shaft, said ring parts having planar surfaces urged into abutment, and means being provided to deliver sealing fluid between the abutting surfaces.



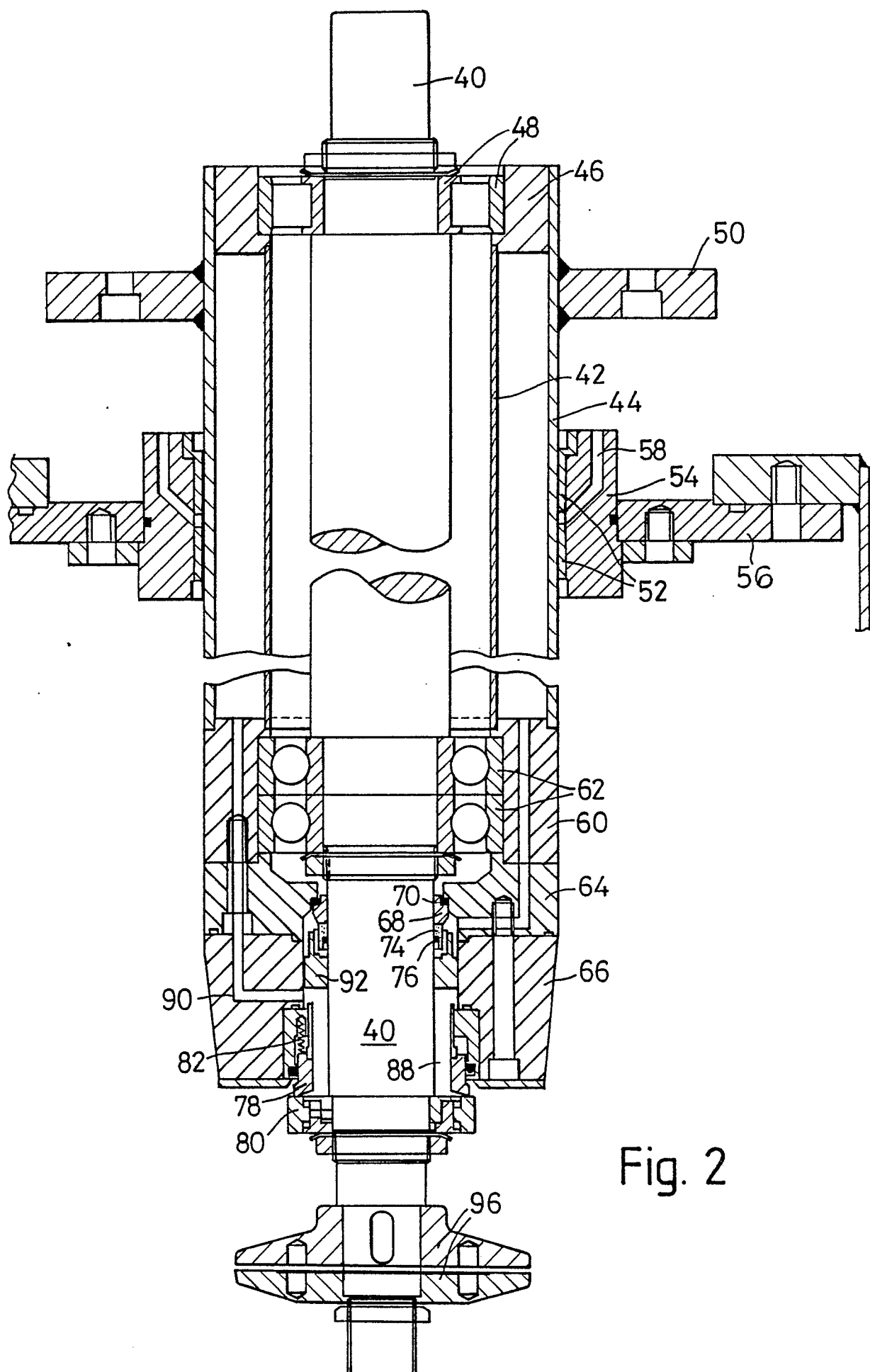


Fig. 2



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	US-A-2 684 273 (FEARS) * Whole document *	1,2	B 01 F 15/00
Y	GB-A- 926 864 (ANDERSON) * Page 3, claim 1; figure *	1,2	
A	GB-A-1 111 657 (SILVERSON) * Figures *	1	
A	US-A-3 606 260 (RUBIN) * Column 8, lines 27-64; column 9, lines 39-42; figure 2 *	3-5	
A	CH-A- 558 202 (TEMEC) * Column 3, lines 5-28; figure 2 *	5	
A	GB-A-1 088 037 (EASTMAN)		
A	FR-A-2 099 152 (VON ROLL)		
A	DE-A-3 534 452 (GOETZE)		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 01 F A 47 J
Place of search		Date of completion of the search	Examiner
THE HAGUE		26-09-1989	PEETERS S.
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