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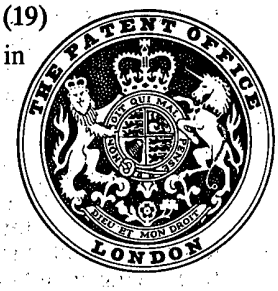

(54) IMPROVEMENTS IN AND RELATING TO MAGNETIC DRIVE COUPLINGS

(71) We, UHDE GMBH., a body corporate organised according to the laws of the Federal Republic of Germany, of 46 Dortmund 1, Deggingstr. 10-12, Federal Republic of Germany, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention relates to magnetic drive couplings and more especially to magnetic drive couplings for use in stirring devices for high-pressure autoclaves.

Magnetic drive couplings for use in stirring devices for high-pressure autoclaves are known in which the stirrer shaft is provided with permanent magnets on its periphery, the magnets being covered by a hood and a magnet bell, the bell being provided with permanent magnets on its inner surface.

Such a stirrer drive is described in GBM 1897029. The high-pressure autoclave is closed at the top by a tubular pressure housing in which the bearing for the stirrer shaft is arranged. In order to keep to a minimum the gap between the inner and outer magnets, the annular inner magnets are segmented on the stirrer shaft and closed by the tubular housing which is thin-walled construction. In this type of arrangement, the average ratio of the ring magnet diameter to the stirrer shaft diameter is less than or equal to 2.5, while the ratio of the total annular magnet width to the stirrer shaft diameter is larger than 8.

The annular magnets on the stirrer shaft constitute a long magnetic coupling. A bearing must necessarily be provided in the tubular housing for the upper end of the stirrer shaft since the shaft would otherwise come into contact with the tubular housing as a result of any unbalance and vibrations.

The drive motor is arranged above the magnetic coupling. Due to the length of the coupling, the tubular housing will not exhibit great rigidity. In order to avoid undesirable vibration, the motor housing must be attached to the cover of the high-pressure autoclave via suitable supports.

The present invention seeks to provide a magnetic coupling, especially for a stirrer drive in a high-pressure autoclave, which does not possess the above disadvantages.

The present invention provides a magnetic drive coupling including

a housing;

a shaft supporting at one end thereof a plurality of disk-shaped permanent magnets, the said end of the shaft being rotatably mounted within the housing;

and

a bell rotatably mounted over the housing and carrying on its inner surface a plurality of disk-shaped permanent magnets in registry with the permanent magnets supported at the said end of the shaft, the ratio of the external diameter of the magnets supported by the shaft to the diameter of the shaft being greater than or equal to 2.5 and the ratio of the axial width of the magnets to the diameter of the shaft being less than or equal to 2.0.

Most preferably, the said end of the shaft supports a bush upon which said first-mentioned permanent magnets are carried.

Alternatively, in the application of the coupling to the stirrer drive of a high pressure autoclave, the shaft supporting the magnets may take the form of a shaft stub attached to the stirrer shaft at a point outside the bearing, or the stirrer shaft may be enlarged in the area of the upper bearing to form a bush, the shaft supporting the magnets being provided with a shaft stub which is fixed in the bush on the end of the stirrer shaft. The shaft supporting the magnets is preferably of an overhung design and there is then no need for an additional bearing for the shaft at the top end of the

tubular pressure housing enclosing the shaft supporting the magnets.

The magnet bell is preferably also overhung on the shaft end of the driving mechanism. No additional bearing is then required for the magnet bell in the tubular pressure housing. The mechanism then has the advantage that the stirrer drive can be made much shorter and hence considerably more compact than hitherto. No special reinforcing members are thus required for mounting the driving motor above the magnetic coupling.

The provision of disk-shaped magnets on both parts of the magnetic coupling permits a short construction and high stability, since the shaft supporting the magnets and the magnet bell are overhung and two less bearings are required. In addition, the short construction obviates the need to provide supports for the motor housing, which supports are normally required to improve stability and to reduce vibrations.

In view of the characteristic mode of operation of such magnetic couplings, i.e. either synchronous coupling or no coupling at all, and in view of the fact that the magnetic stirrer drives are used for autoclaves and other pressure vessels, the provision of a tachometer is most advantageous.

To monitor the rotation of the stirrer shaft, the shaft is therefore provided not only with the coupling magnets, but also with a multi-pole annular magnet for speed indication. The rotating magnetic field induces a voltage in an external stationary induction coil, the voltage causing a deflection on an rpm scale of a moving coil meter or being amplified and used for control and/or alarm purposes. This ensures adequate operating safety for chemical reactions, including those that are difficult to control.

The present invention will now be described in greater detail by way of example only with reference to the accompanying drawings, in which

Figure 1 is a section through a first magnetic coupling for a stirrer in an autoclave; and

Figure 2 is a section of a second magnetic coupling.

Referring to Figure 1 of the drawings, the contents of a high-pressure autoclave 1 having a cover 2 are mixed by means of a stirrer 3. A stirrer shaft 4 with the stirrer at its lower end extends through the cover and is supported by a bearing in a pressure tube 5. At its upper end, the stirrer shaft 4 carries a bush 6 which surrounds the upper end of the stirrer shaft. The lower end of the bush constitutes the shaft within a bearing 7. The bush 6 is provided at its upper end with a plurality of disk shaped permanent magnets 8. A tubular pressure housing 9 encloses the bush so as to leave only a minimum clearance between bush and housing. The housing 9 and the pressure tube 5 are joined tightly or bolted together with a cage 10 that encloses the pressure housing. The cage 10 is supported by the pressure tube 5 and, in turn, supports a driving unit and variable speed gear 11, 12. A magnet bell 14 is attached to a shaft 13 of the driving unit 11. The magnet bell 14 encloses the pressure housing 9 and is provided on the inside with a ring of disk-shaped permanent magnets 15 at the level of the permanent magnets 8 of the bush 6. The shaft 4 also carries tachometer magnets 16 at the level of a pick-up coil 17. These magnets 16 induce a voltage in the coil 17, and this voltage may be displayed by a moving-coil meter or amplified for control and/or alarm purposes.

In the magnetic coupling shown in Figure 2, a shaft stub 20 is mounted on a bell 19, the shaft stub being supported by a bearing in a cage 21 to permit, for example, coupling of an infinitely variable speed stirrer driving gear, which is available in most laboratories, to serve as the drive unit for the stirrer assembly.

In both of these drive coupling assemblies, the dimensions of the magnets 8 and 15 and of the stirrer shaft 4 are such that the ratio of the external diameter of the magnets 8 (which, in the assemblies shown in the drawings, corresponds to the external diameter of the bush 6) to the diameter of the stirrer shaft 4 is ≥ 2.5 and the ratio of the axial width of the magnets 8 and 15 to the diameter of the stirrer shaft 4 is ≤ 2.0.

WHAT WE CLAIM IS:

1. A magnetic drive coupling including a housing;

a shaft supporting at one end thereof a plurality of disk-shaped permanent magnets, the said end of the shaft being rotatably mounted within the housing; and

a bell rotatably mounted over the housing and carrying on its inner surface a plurality of disk-shaped permanent magnets in registry with the permanent magnets supported at the said end of the shaft, the ratio of the external diameter of the magnets supported by the shaft to the diameter of the shaft being greater than or equal to 2.5 and the ratio of the axial width of the magnets to the diameter of the shaft being less than or equal to 2.0.

2. A magnetic drive coupling according to claim 1, wherein the said end of the shaft supports a bush upon which said first-mentioned permanent magnets are carried.

3. A magnetic drive coupling according to claim 2, wherein the bush is attached to the shaft in an overhung manner.

4. A magnetic drive coupling according to claim 2 or claim 3, wherein the shaft is

disposed within a pressure tube, the housing being attached to the pressure tube to enclose the bush and said end of the shaft.

5. A magnetic drive coupling according to claim 4, wherein the bell is supported by a cage attached to the housing and the pressure tube.

6. A magnetic drive coupling according to any one of claims 1 to 5, wherein the bell is attached to an output shaft of a drive unit in an overhung manner.

7. A magnetic drive coupling according to claim 6, wherein the cage supports the drive unit.

8. A magnetic drive coupling according to claim 1 substantially as hereinbefore described with reference to and as shown in Figure 1 or Figure 2 of the accompanying drawings.

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1591327 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

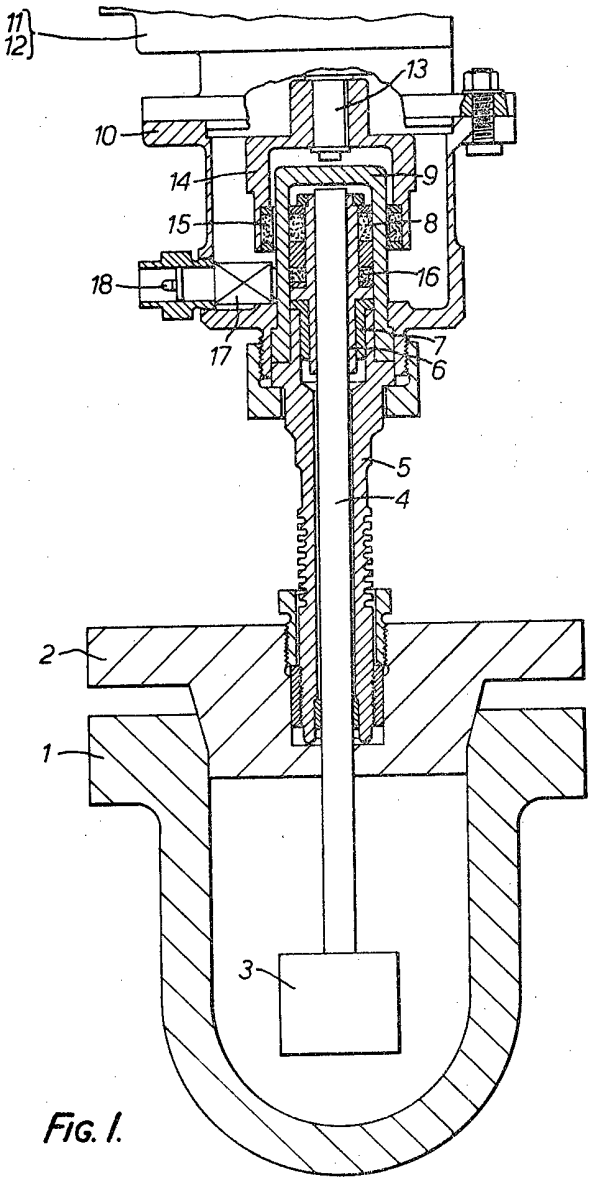

FIG. 1.

1591327 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 2

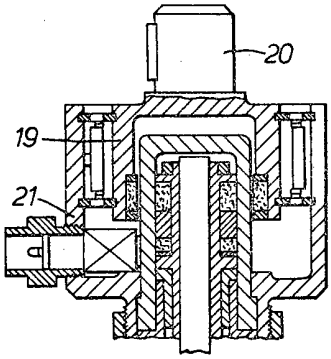

FIG. 2.