(12) PATENT **(11)** Application No. **AU 199676334 B2**
(19) AUSTRALIAN PATENT OFFICE **(10)** Patent No. **716007**

(54) Title
Pigments admixed with lubricating agents

(51)[6] International Patent Classification(s)
C09C 001/00 **C09B 067/00**
B01J 002/30 **C09C 003/00**

(21) Application No: **199676334** (22) Application Date: **1996.11.21**

(87) WIPO No: **WO97/20892**

(30) Priority Data

(31) Number	(32) Date	(33) Country
9524009	**1995.11.23**	**GB**
9620570	**1996.10.02**	**GB**

(43) Publication Date : **1997.06.27**
(43) Publication Journal Date : **1997.08.21**
(44) Accepted Journal Date : **2000.02.17**

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(56) Related Art
EP 573150

OPI DATE 27/06/97 APPLN. ID 76334/96
AOJP DATE 21/08/97 PCT NUMBER PCT/GB96/02881
INTI
AU9676334

(51) International Patent Classification 6 :
C09C 1/00, C09B 67/00, B01J 2/30, C09C 3/00

A2

(11) International Publication Number: WO 97/20892

(43) International Publication Date: 12 June 1997 (12.06.97)

(21) International Application Number: PCT/GB96/02881

(22) International Filing Date: 21 November 1996 (21.11.96)

(30) Priority Data:

9524009.9	23 November 1995 (23.11.95)	GB
9620570.3	2 October 1996 (02.10.96)	GB

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(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published

Without international search report and to be republished upon receipt of that report.

(54) Title: PIGMENTS ADMIXED WITH LUBRICATING AGENTS

(57) Abstract

Pigment compositions containing one or more lubricating agents exhibit improved transport properties. The compositions can be mechanically conveyed by mechanical conveyors with minimal generation of dust.

Title: **PIGMENTS ADMIXED WITH LUBRICATING AGENTS**

This invention relates to improvements in pigments, and to improved apparatus for the handling of pigments.

Powdered pigments are widely used in many industries. An important class of pigments are iron oxide pigments which are extensively used in the manufacture of building materials and components, eg coloured tarmac, paving blocks etc. Such pigments are conventionally supplied in so-called "big bags" or 25kg bags, which are emptied into hoppers prior to use. The pigments are mixed with the other constituents of the material being manufactured in a mechanical mixing device to which weighed quantities of the pigment must be conveyed.

It is frequently difficult to convey the pigment of the mixing device, inter alia since the latter may be at a remote and/or inaccessible location in the plant. A further problem is that conveying of the fine powder pigment may result in the production of substantial quantities of dust. This may result in colour contamination of different products, as well as representing a considerable hazard to personnel operating the plant. One approach which has been tried in an attempt to solve this problem is granulation of the pigment (ie agglomeration of the pigment particles to form larger aggregates). However, this approach adds very significantly to the cost of the pigment.

There have now been devised an improvement to pigments, and an improvement to pigment handling apparatus, which overcome or substantially mitigate the disadvantages associated with the prior art.

According to a first aspect of the present invention, there is provided a pigment composition comprising a particulate pigment in admixture with a lubricating agent, wherein the lubricating agent comprises a particulate silica and a particulate aluminosilicate.

The composition according to the invention is advantageous primarily in that the lubricating agent improves the transport properties of the pigment, enabling it to be mechanically conveyed

without generating significant quantities of dust. Certain lubricating agents may also, when used with pigments for cementitious products, offer the advantage of enhancing the physical properties of the finished, concrete-like products.

The pigment is preferably an iron oxide pigment which, apart from the addition of the lubricating agent, may be conventional. Such pigments are available in a range of colours widely used in the manufacture of building materials.

Particularly when the pigment composition is intended for use with cementitious products, a particularly preferred class of lubricating agent are those capable of enhancing the formation of the finished, concrete or concrete-like product, or of improving the physical properties of the finished product. One such lubricating agent is particulate silica.

Particularly preferred lubricating agents are particulate modified microsilicas. Preferably, such lubricating agents are present in the pigment at about 2 to 4% by weight.

Most preferably, the pigment composition contains a combination of lubricating agents. Particularly where the pigment composition is to be vacuum- or air-conveyed (as, for example, is described below) the combination of lubricating agents may include a particulate silica and a particulate aluminosilicate. Preferably, the silica is present in a major proportion, typically 2% to 5% by weight of the pigment composition as a whole, and the aluminosilicate is present in a minor proportion, say 0.1% to 1.0% by weight.

A particularly preferred particulate silica is that sold under the trade mark name NEOSYL AC by Crosfield Limited of Warrington, Cheshire, England. A particularly preferred aluminosilicate is the hydrated amorphous sodium aluminosilicate sold by the same company under the trade mark ALUSIL ET.

Where the pigment composition contains a combination of lubricating agents, the lubricating agents may be mixed with the pigment simultaneously or sequentially. In the preferred case of a combination of a particulate silica and a particulate aluminosilicate, the pigment is preferably

first mixed with the silica and then with the aluminosilicate.

Another class of lubricating agent which may be used in the invention is a metal ion salt of a long chain fatty acid. Suitable fatty acids include C_{14}-C_{18} fatty acids, which may be saturated or unsaturated. Examples of such fatty acids are stearic acid, palmitic acid and oleic acid. The preferred fatty acid lubricating agent is a metal ion salt of stearic acid, in particular sodium stearate, aluminium stearate or calcium stearate. Such materials exhibit a beneficial degree of hydrophobicity.

Another class of lubricating agent which may be used in the invention are those capable of eliminating or discharging static electric charge on the pigment particles. One example of such a lubricating agent is particulate alumina.

Combinations of the above classes of lubricating agents may be used. For example, in a pigment composition for use with cementitious products, one blend of lubricating agents comprises a major proportion of silica particles (eg about 40% to 60% by weight), a major proportion of a stearate (eg about 40% to 60% by weight), and a minor proportion of particulate alumina (eg 1% to 10% by weight).

Particulate lubricating agents used in the invention preferably have mean particle sizes of the order of, or less than, 100μm.

Preferably, the pigment composition contains less than 5% by weight of lubricating agent, preferably about 2% to 5% by weight, eg about 3% to 4% by weight.

As described above, the pigment compositions according to the invention are advantageous in that they may be conveyed without the generation of substantial quantities of dust. Further aspects of the invention relate to apparatus for conveying such pigment compositions from bulk containers to the point of use.

Thus according to another aspect of the present invention, there is provided a conveying device

for a pigment composition as described above, the conveying device comprising a flexible tube arranged, in use, to be connected to or disposed within a bulk container of such a pigment composition, and means for drawing the pigment composition along the flexible tube.

The apparatus is advantageous in that the particulate materials are conveyed rapidly and easily from the bulk container without the generation of large quantities of dust. Also, the flexibility of the tube enables it to be used to convey pigment from the bulk container to a variety of remote and relatively inaccessible locations.

The flexible tube is preferably of plastics material and conveniently has a diameter of 50-100mm, eg 75mm.

In a first embodiment of the apparatus, the means for drawing the pigment composition along the flexible tube comprises means for applying reduced pressure to the tube.

The tube is preferably arranged to empty into a dispensing device. The reduced pressure is preferably applied to the tube by a vacuum pump, via the dispensing device. The dispensing device preferably includes suitable filter means to prevent material being drawn out of the dispensing device.

The dispensing device is preferably provided with means for monitoring the weight of material conveyed into the dispensing device. For example, the dispensing device may be suspended from a weight-sensitive device. Such a weight-sensitive device may be operably linked to a control means which cuts off the reduced pressure applied to the conduit when a pre-determined quantity of material is received within the dispensing device.

The apparatus is particularly useful for conveying aliquots of particulate material to the dispensing device so that the measured quantity of material can be dispensed into a vessel containing other material. For example, the particulate material may be a pigment which is mixed with a building material such as concrete to confer a colour on the material. For such applications, the dispensing device is preferably positioned above a mixing device into which the

contents of the dispensing device may be discharged, for example via a suitable valve.

In a second embodiment of the apparatus, the means for drawing the pigment composition along the flexible tube comprises a flexible shaft-less auger mounted within the tube.

The auger is preferably a metal band or ribbon eg of steel, which is formed into a helix, the diameter of the helix being slightly less than the internal diameter of the tube.

The auger is preferably operably connected to electric motor(s) at one or both ends of the tube so that the auger can be rotated. Most preferably, the tube discharges pigment into an automated weighing device for metering of predetermined quantities of pigment. Operation of the electric motor(s) is preferably under the control of a suitable microprocessor device linked to the weighing device.

In all cases, it is preferred that the pigment composition should be filled into the bulk container in a manner which minimises the generation of dust. It is therefore preferred that the pigment composition be supplied in rigid containers which interlock with the bulk container so that any dust generated in the filling process is contained.

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

Figure 1 is a schematic view of a first embodiment of a pigment transport and dispensing apparatus according to the invention;

Figure 2 is an exploded view of a dispenser forming part of the apparatus of Figure 1;

Figure 3 is a schematic view of a second embodiment of a pigment transport and dispensing apparatus according to the invention;

Figure 4 is an exploded view of the portion of Figure 3 indicated by the circle IV; and

Figure 5 is a side view of a pigment composition supply container for use with the apparatus similar to that shown in the preceding Figures.

Referring first to Figure 1, apparatus for transporting iron oxide pigment to a metering device from which the pigment is discharged into a measured quantity of building material comprises a flexible pipe 1 provided at its free end with a take up ball 2 and connected at the other end to a dispenser 3. The pipe 2 has a diameter of 50mm and a length of approximately 5m.

The dispenser 3 has a body 31 (see Figure 2) which defines a chamber for receiving pigment from the pipe 1. A vacuum pump 4 is connected to the dispenser 3 via a flexible vacuum hose 5. In operation, the vacuum pump 4 applies reduced pressure to the body 31 of the dispenser 3, via a filter 32 housed in the upper part of the dispenser 3.

As can be seen in Figure 2, the dispenser 3 comprises, in addition to the body 31 and the filter 32, a discharge valve 33 below the body 31 and a top cover 34 and exhaust unit 35. The top cover 34 has a port 36 (visible in Figure 1) to which the vacuum hose 5 is connected. A control box 37 is fixed to the body 31, which also has an inlet 38 to which the pipe 1 is connected.

The dispenser 3 is suspended from three weight-sensitive load cells 6 which are linked via control circuitry (not shown) to the vacuum pump 4. The dispenser 3 is positioned over a mixer (not shown) into which the contents of the dispenser 3 can be discharged for mixing with a larger quantity of building material.

In use, the take up ball 2 is inserted into a bulk quantity of pigment held within a suitable container such as a so-called "big bag" or a pallet box. When vacuum is applied to the dispenser 3 by the vacuum pump 4, pigment is drawn up the pipe 1 into the body 31 of the dispenser 3. When a predetermined weight of pigment is received within the dispenser 3 (as detected by the load cells 6) the vacuum is released. The measured quantity of pigment may then be discharged into the mixer through the discharge valve 33. The vacuum may then be reapplied to draw a further aliquot of pigment into the dispenser.

The pipe 1 is provided with a waste return branch 11 fitted at its free end with a one-way valve for discharge of any waste pigment within the pipe 1.

The arrangement depicted in Figure 1 is provided with only one pipe 1. However, the inlet to the dispenser body 31 may have a suitable manifold for connection to a plurality of pipes leading to a corresponding number of boxes of pigment, eg pigments of different colours.

Referring now to Figures 3 and 4, a second embodiment of a pigment composition transport and dispensing apparatus for use in a manufacturing plant for coloured paving blocks again comprises a flexible tube 50.

The flexible tube 50 is connected at one end to a charge hopper 51 and at the other end to a discharge unit 52 which empties into a dispensing unit (not shown), again suspended from load cells and positioned over a mixer.

As can be seen from Figure 4, the flexible tube 50 houses a shaft-less auger 53. The auger 53 comprises a single steel ribbon formed into a helix.

The auger 53 extends the full length of the tube 50 and is driven by an electric motor 54. The motor 54 is controlled by a microprocessor unit (not shown) such that the motor 54 is switched off once a predetermined quantity of pigment has been delivered to the dispensing unit.

The flexibility of the tube 50 enables it easily to convey pigment from the charge hopper 51 to different locations in the plant. This, together with the presence of the lubricating agent in the pigment facilitates the transport of measured quantities of pigment without the generation of substantial quantities of dust.

Figure 5 shows a side view of a pigment composition supply container (generally designated 60) which, when utilised with apparatus similar to that described above, further minimises generation of dust. The container 60 is of rigid plastics construction and is provided with an internally threaded outlet 61 and an externally threaded inlet 62. A screw plug (not shown) is used to close

the outlet 61, and a screw cap (not shown) to close the inlet 62.

The outlet 61 is further closed by a conical plug 63. In use with screw plug in place to close and seal the outlet 61, the container 60 is filled with pigment composition through the inlet 62. The crew cap is then used to seal the inlet 62. The filled container 60 may then be transported and stored prior to use.

For discharge of the contents of the container 60 into the charge hopper of apparatus such as it shown in Figure 1 or Figure 3 the screw plug is removed from the outlet 61. The top of the charge hopper is formed in such a manner that it receives the container 60 and, in particular, the charge hopper is formed with a projection which engages and raises the conical plug 63, enabling pigment composition to escape through the outlet 61. The internal walls 64 of the container 60 are funnel-shaped to facilitate dispensing of the powder composition, which is further facilitated by removal of the screw cap from the inlet 62.

The following Examples are of pigment compositions suitable for use with apparatus such as that described above. The composition of Example 1 is particularly suitable for vacuum- or air-conveying using the apparatus of Figure 1. Examples 2 and 3 are more suitable for use with apparatus of Figure 3.

Example 1

Particulate amorphous silica (NEOSYL AC)	0.5%
Hydrated amorphous sodium aluminosilicate (ALUSIL ET)	3.0%
Ion oxide pigment	96.5%

Example 2

Particulate silica	2% w/w
Particulate alumina	0.2%
Calcium stearate	2%

Iron oxide pigment	95.8%

Example 3

Particulate silica	2.5% w/w
Particulate alumina	0.2%
Sodium stearate	2%
Iron oxide pigment	96.3%

Claims

1. A pigment composition comprising a particulate pigment in admixture with a lubricating agent, wherein the lubricating agent comprises a particulate silica and a particulate aluminosilicate.

2. A pigment composition as claimed in claim 1, wherein the pigment is an iron oxide pigment.

3. A pigment composition as claimed in claim 1 or claim 2, wherein the lubricating agent comprises particulate modified microsilica.

4. A pigment composition as claimed in any preceding claim, which contains 0.5% by weight silica and 3.0% by weight aluminosilicate.

5. A pigment composition as claimed in any preceding claim, wherein the lubricating agent has a mean particle size of the order of, or less than, 100μm.

6. A pigment composition as claimed in any preceding claim, wherein the pigment composition contains less than 5% by weight of lubricating agent.

7. A method of manufacturing a pigment composition as claimed in any preceding claim, which method comprises mixing the particulate pigment with the particulate silica and then with the particulate aluminosilicate.

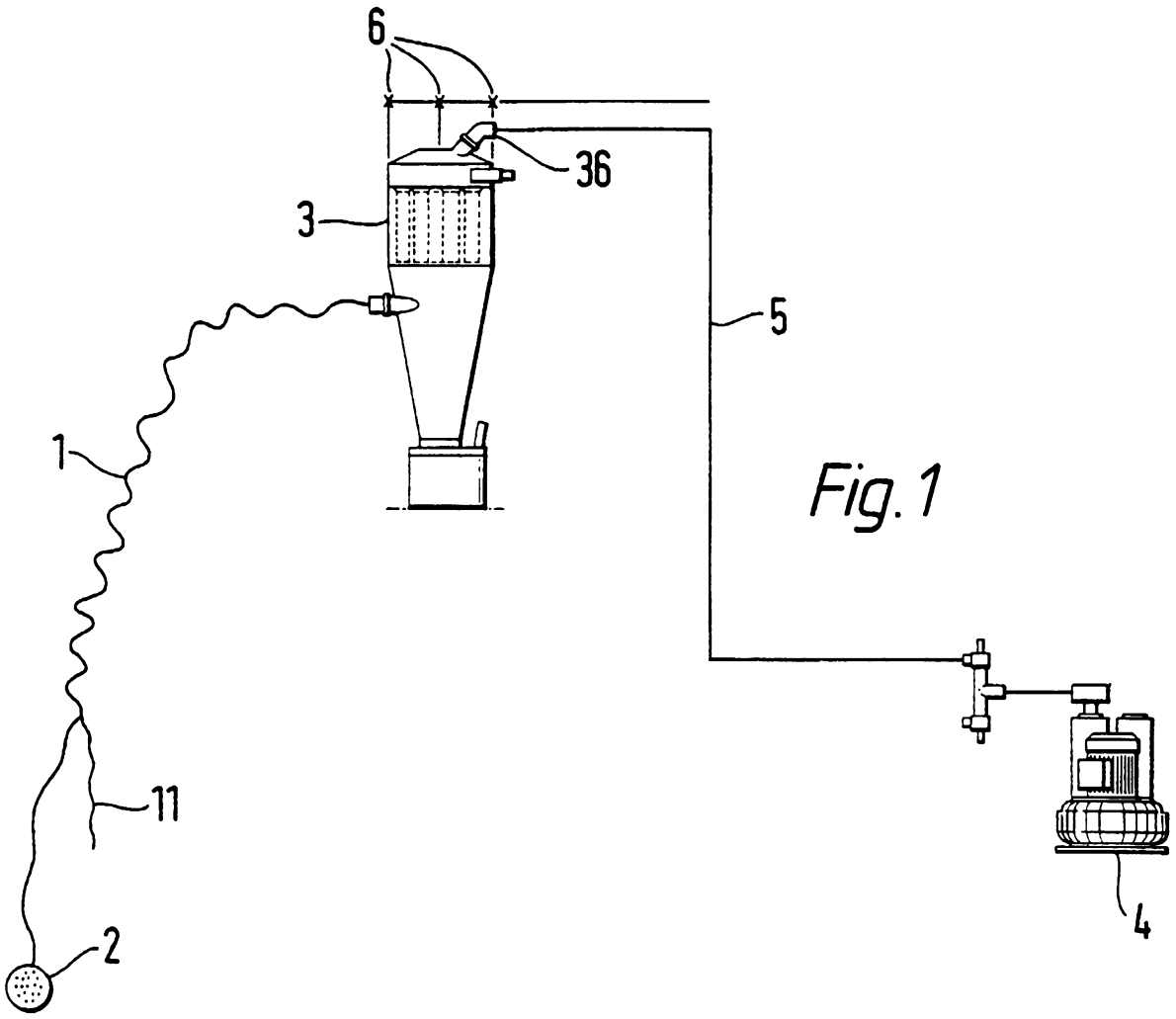

Fig. 1

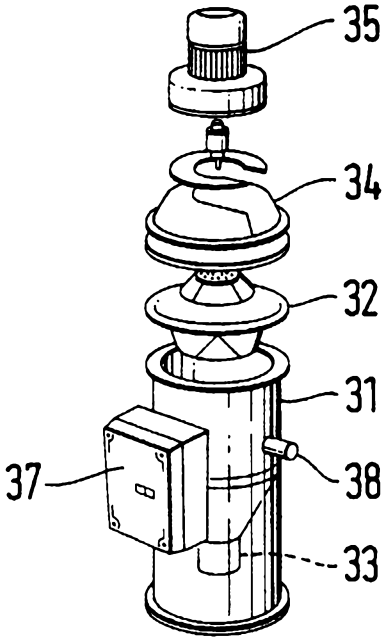

Fig. 2

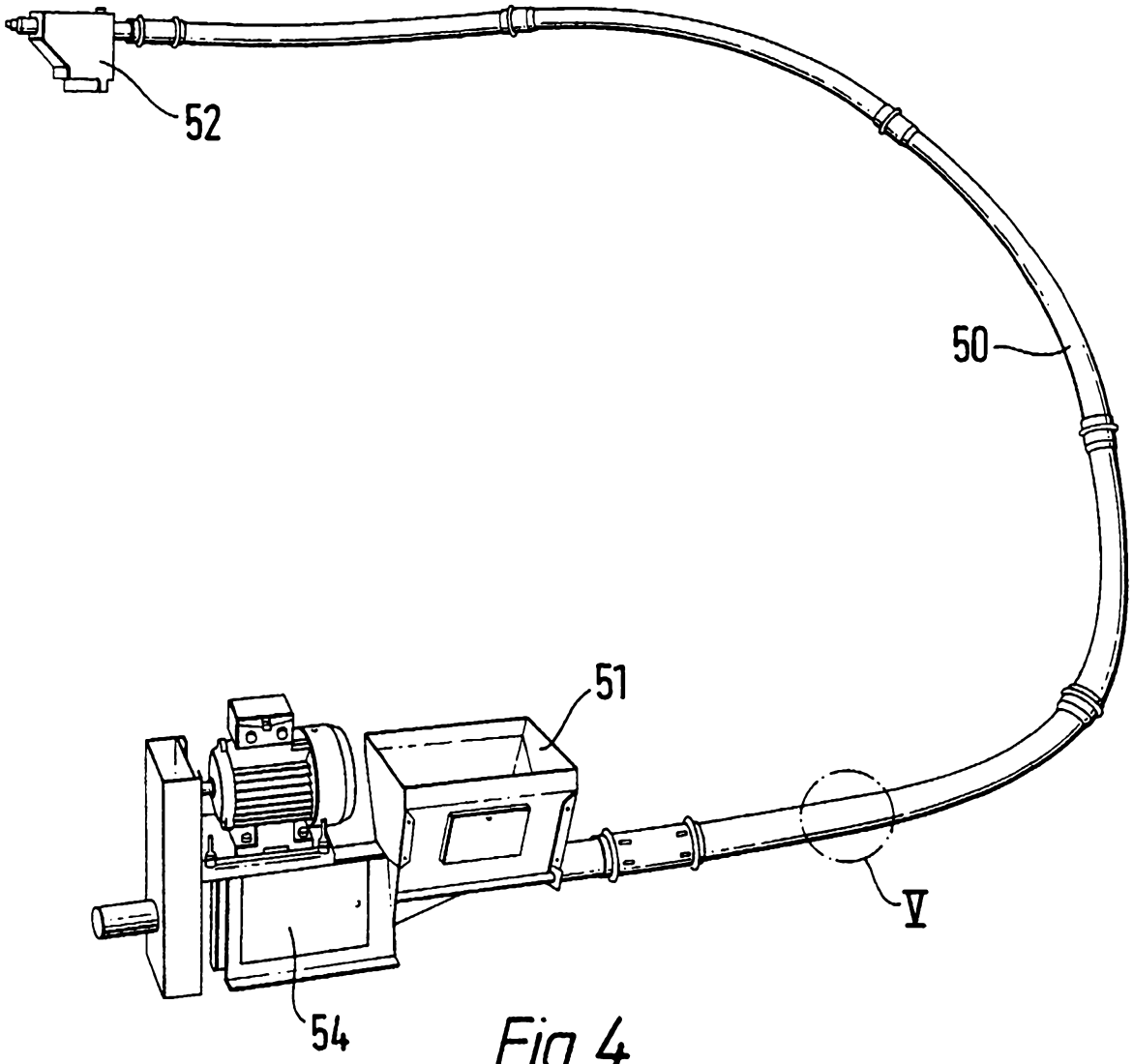

Fig. 4

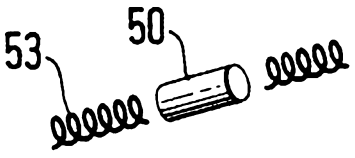

Fig. 5

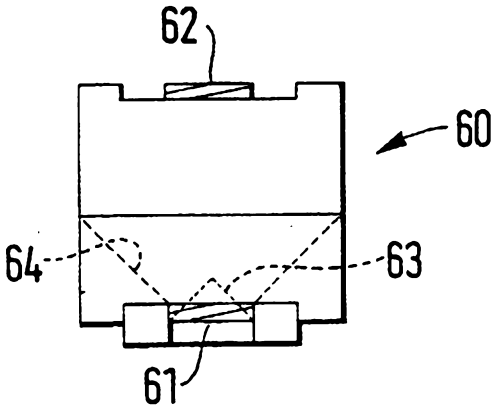

Fig. 6