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(54) Distributor device for viscous materials

(57) The device comprises a container 6 for said material, and a shaft 17 rotatably mounted through a bore 14 in the bottom of said container 6 and supporting a screw conveyor 25, said shaft 17 comprising a threaded portion 20 cooperating with said bore 14 to define a helical channel 21 providing communication between funnel 9 and a valve controlled duct 23 leading to an outlet nozzle 2.

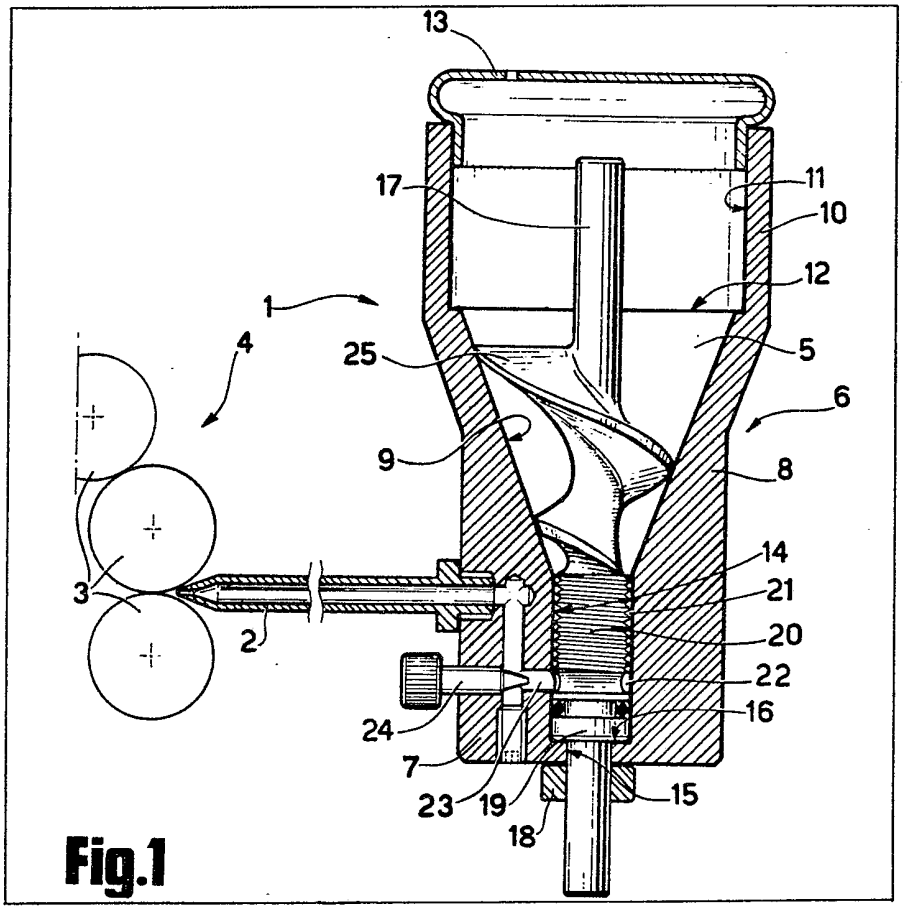

Fig.1

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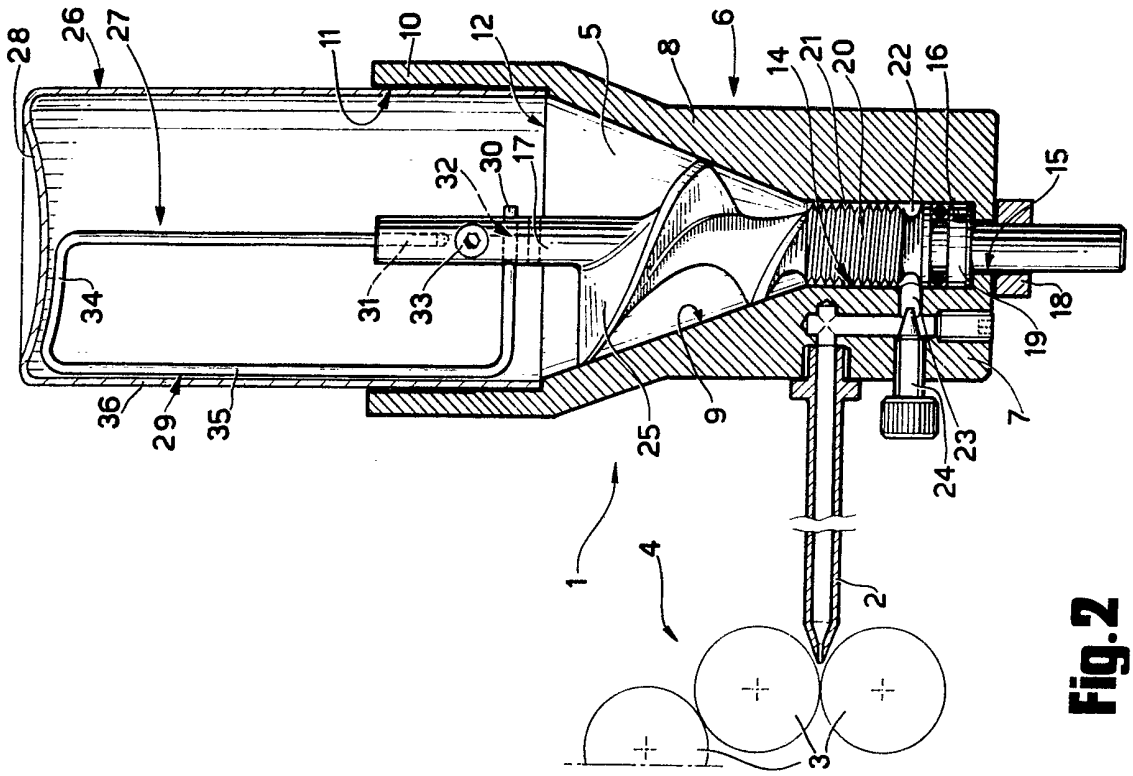
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Fig.2

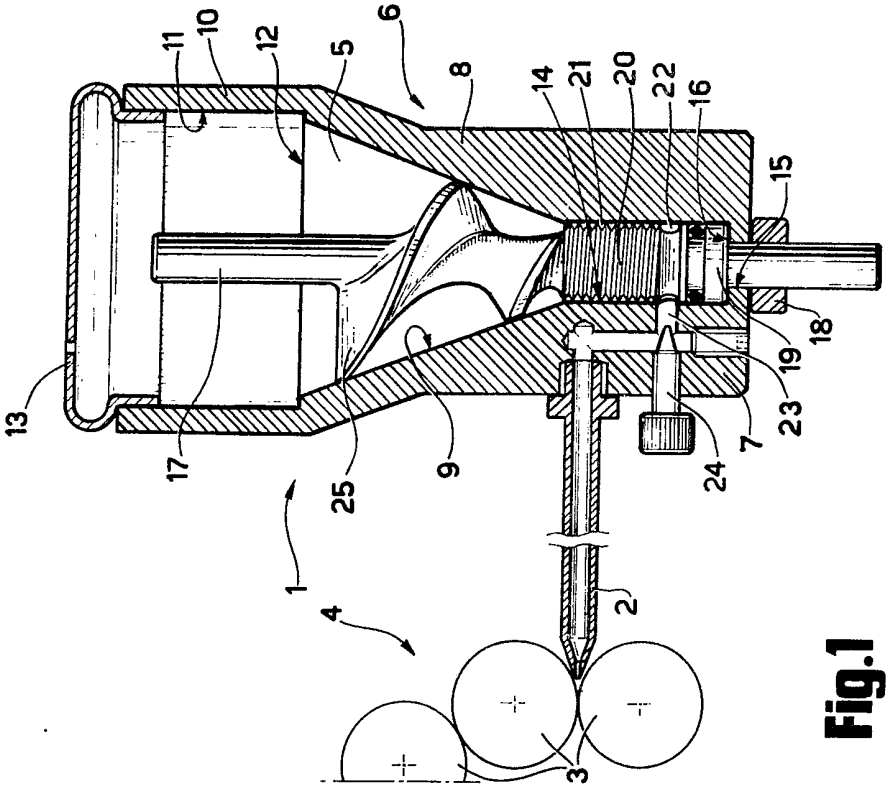
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Fig.1

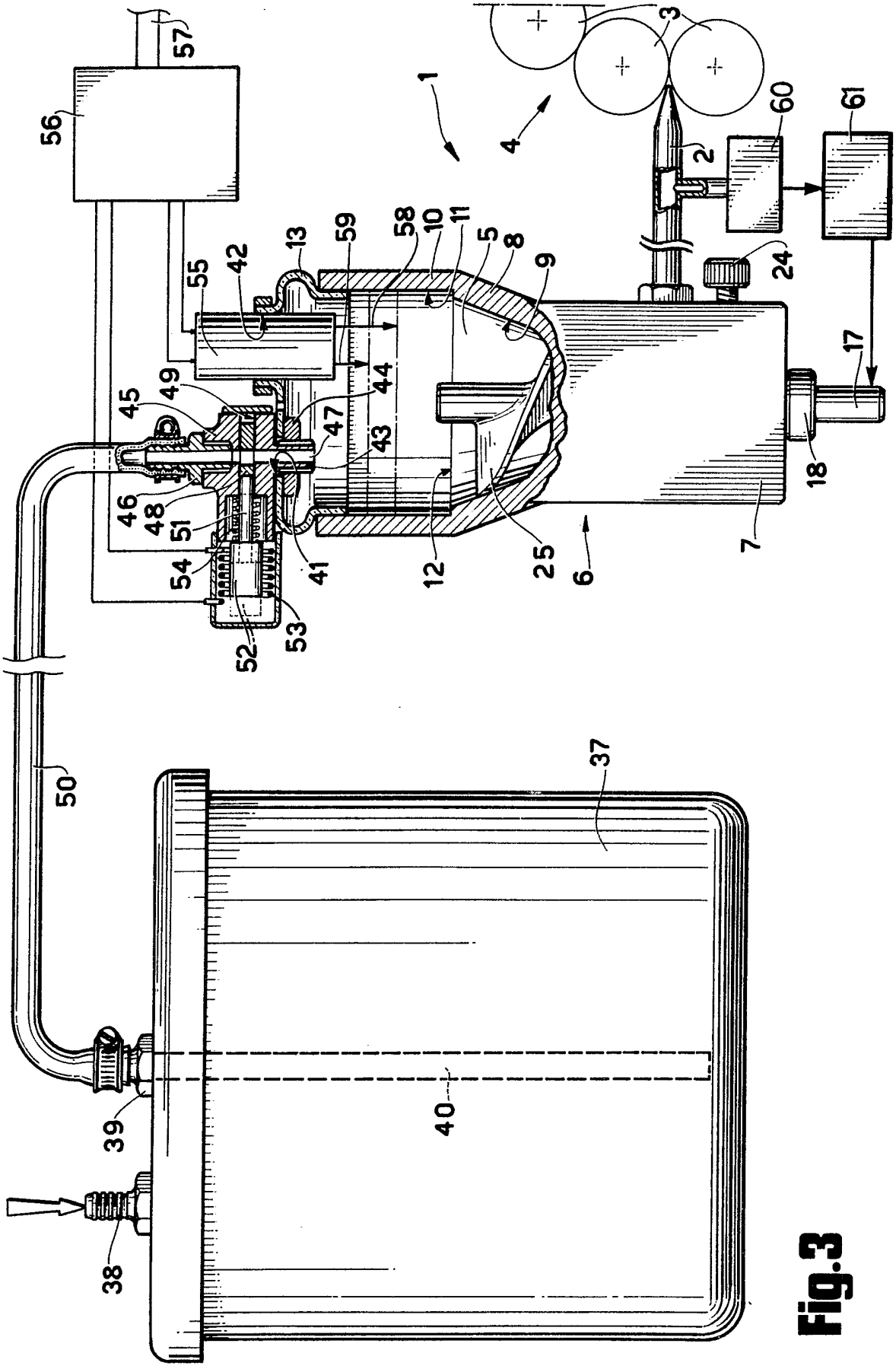
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Fig.3

SPECIFICATION

Distributor device for viscous materials

This invention relates to a distributor device for viscous materials such as glue, printing ink etc., which are required to be fed in determined quantities on to surfaces in order to form thin films thereon.

The description given hereinafter relates particularly but not exclusively to devices for distributing printing ink to printing units used for forming labels, borders and/or repetitive inscriptions on packing paper and/or wrapping tissues etc., and using inks of such a concentration as to be pasty.

Distributor devices known at the present time can be divided into two main categories according to the method by which the viscous material is fed to an outlet nozzle.

A first category comprises distributor devices in which the viscous material is disposed in an open top tray.

In these devices, one of which is described for example in British Patent No. 1,476,376, the viscous material is normally loaded by hand using a spatula, into said tray.

A partly immersed rotating roller withdraws a thin layer of viscous material from this tray and transfers it by means of a series of intermediate adjacent rollers to the actual printing unit.

The described manual operation frequently leads to spillage of the viscous material from the tray, with consequences which can be extremely unpleasant, particularly if the viscous material is ink of high concentration.

A second category comprises distributor devices in which the viscous material, as described for example in British Patent No. 1,117,235, is squeezed from prefilled containers, in particular prepacked syringes or cartridges.

In this case, any manual operation is obviated, but other drawbacks arise of which the main one is due to the fact that the delivery of the viscous material is accompanied by a non-negligible elastic deformation of the container, of which, if delivery is interrupted, the walls act resiliently on the viscous material still to be delivered, so as to cause a further unrequired portion to emerge.

Furthermore, both considered types of distributor device are affected negatively by the inevitable presence of air bubbles in the bulk of viscous material, these causing irregularity in the material delivery.

The object of the present invention is to provide a simple and economical distributor device for viscous materials, which is free from all the aforesaid drawbacks.

Said object is attained according to the present invention by a distributor device for viscous materials comprising a cup container for said material, an outlet nozzle, a connection duct between said container and said nozzle, and thrust means for forcing the viscous material present in said container towards said nozzle, characterised in that said thrust means comprise a screw conveyor mounted rotatably in said container and in contact with its inner surface, and a threaded core mounted rotatably through a through bore in the bottom of said container and defining a helical channel connecting said container to said nozzle; closure means being provided for closing said container, and flow control means being disposed in said duct to regulate the flow of said material towards said nozzle.

Further characteristics and advantages of the present invention will be apparent from the description given hereinafter with reference to the accompanying drawings, which illustrate some non-limiting embodiments thereof, and in which:

Figure 1 is a diagrammatic axial section through a distributor device for viscous materials, in particular printing ink, constructed in accordance with the present invention;

Figure 2 is a diagrammatic axial section through a first modification of the device of Figure 1; and

Figure 3 is a partly sectional diagrammatic illustration of a second modification of the device of Figure 1.

Figure 1 illustrates a distributor device 1 for viscous materials, particularly suitable for use as an inking device for feeding concentrated ink through a nozzle 2 to inking rollers 3 of a printing unit 4, the ink being in a pasty state and contained in a chamber 5 of a container 6 preferably of metal construction.

The container 6 is substantially of cup configuration and comprises a bottom wall or base 7 and a side wall, a first portion 8 of which is bounded internally by a cone-frustum surface 9 and is disposed between the base 7 and a second cylindrical end portion 10 having an inner cylindrical surface 11 connected to the surface 9 by means of an annular shoulder 12, and cooperating at its free end with closure means for the chamber 5 comprising a cover 13 removably inserted into the container 6.

A through bore 14 coaxial to the surfaces 9 and 11 is formed through the base 7, and is provided at its outer end with a reduced-section portion 15 defining an annular shoulder 16 facing the chamber 5. Through this latter, the bore 14 and portion 15 there is rotatably mounted a cylindrical shaft 17, of which an end portion emerges from the base 7, with respect to which it is fixed axially by means of a locking element 18, and can be connected to drive means (not shown) for rotating the shaft 17.

The shaft 17 is provided with a disc 19 cooperating with the annular shoulder 16, and with an externally threaded cylindrical core 20 which cooperates with the cylindrical surface of the bore 14 to define a helical channel 21 communicating at one end with the base of the chamber 5 and at the other end with an annular chamber 22 defined, in the bore 14, by an annular groove provided on the core 20 in proximity to the disc 19. The annular chamber 22 communicates with the nozzle 2 by way of a duct 23 provided in a substantially radial direction through the base 7

and controlled by flow control means comprising a needle valve 24 which can be operated from the outside.

That part of the shaft 17 which extends through the chamber 5 carries externally a screw conveyor 25 of constant or variable pitch, which is substantially tangential to the cone-frustum surface 9.

When in operation, after removing the cover 13, an operator feeds ink (not shown) in a pasty state into the chamber 5 preferably by means of a spatula, not shown, the ink being normally taken from a larger container and, when the shaft 17 is rotated (in a clockwise direction in Figure 1 when observing the device from above), is compressed by the thrust means comprising the screw conveyor 25 and the funnel defined by the cone-frustum surface 9, towards the bore 15 until it enters the helical channel 21 to reach the nozzle 2 through the annular chamber 22 and duct 23.

As the aforesaid pasty inks generally have a very high concentration, because of which only a very small quantity thereof has to be normally fed to the rollers 3 per unit of time, it is nearly always necessary to regulate the needle valve 24 in order to reduce the free opening of the duct 23 to a minimum.

Because of the obviously slow speed rotation of the shaft 17 and of the relative screw conveyor 25, the ink contained in the bottom of the chamber 5 is not only compressed towards the inlet of the channel 21 but it also kept continuously in a stirred condition. Because of the continuous movements to which it is subjected and of the possible increase in temperature due both to compression and to friction against the screw conveyor 25, the air bubbles are eliminated and the fluidity of the ink increases to the advantage of flow uniformity through the channel 21 and nozzle 2.

With respect to this, it should be noted that the cover 13 prevents the inlet of dust or other foreign bodies into the chamber 5, and the pressure applied by the screw conveyor 25 to the ink is immediately nullified on stopping the shaft 17. Consequently, in the described device 1, not only is the frequent clogging of the nozzle 2 because of the presence of foreign bodies in the ink prevented, but the danger of the ink continuing to drip from the nozzle 2 when the rollers 3 are at rest is obviated.

The only drawback of the described device 1 is that it requires manual transfer of the ink from a larger vessel to the chamber 5. This drawback is obviated in the modification shown in Figure 2, in which the ink is fed to the chamber 5 from a can 26 in which the ink is sold commercially.

As shown in Figure 2, the cover 13 of the device 1 is removed and is replaced by the can 26. This latter is firstly opened and then mounted inverted into the cylindrical portion 10 until its open end comes into contact with the shoulder 12.

In a modification, not shown, the cylindrical portion 10 can be separated from the remainder of the container 6 so that it can be replaced by other portions of cylindrical or funnel shape of different diameters, to enable the container 6 to be adapted to cans 26 of various dimensions.

Before mounting the can 26, the shaft 17 is suitably modified by adding stirring means comprising a spatual 27 extending into the can 26 until it comes substantially into contact with a base wall 28 thereof.

The spatula 27 is constituted by a substantially rectangular ring 29 of metal wire, of which two opposing end portions 30 and 31, which are orthogonal to each other, engage a diametrical axial recess 32 provided in the end of the shaft 17 and fitted with a diametrical locking screw 33.

An upper portion 34 and a side portion 35 of the ring 29 move in contact with the inner surface of the wall 28 and, respectively, of a side wall 36 of the can 26 in order to detach the ink and facilitate its descent into the funnel defined by the cone-frustum surface 9. If the ink is available commercially in vessels 37 (Figure 3) which are of such dimensions as not to be able to be mounted directly on the container 6 by the method described with reference to Figure 2, the ink can be automatically transferred from the vessel 37 to the chamber 5, for example, by making two holes in the lid of the vessel 37 and mounting through them, in a sealed manner, two tubular connectors indicated respectively by 38 and 39, and of which the first is arranged to be connected to a first source (not shown) of compressed air, and the second carries a dip pipe 40, which extends inside the vessel 39 until it comes into proximity with the base thereof.

Two through bores 41 and 42 are provided in the cover 13 of the device 1, through the first of which there is mounted an externally threaded conduit 43 which is fixed to the cover 13 by means of a ring nut 44. The conduit 43 constitutes the outlet of a valve or valve means 45 provided with an inlet connector 46 and a through bore 47 controlled by a perforated plate 48 mobile in a seat 49 provided in the valve 45 transversely to the bore 47. The inlet connector 46 is connected by means of a conduit 50 to the connector 39, and the plate 48 is provided with a steam 51 connected to a magnetic core 52, the position of which is controlled by a solenoid 53 in order to displace the plate 48 against the thrust of a spring 54 from a normal rest position (illustrated by dashed lines) in which the 48 closes the bore 47, to a working position in which plate 48 leaves the bore 47 free.

The energisation of the solenoid 53 is controlled by a circuit sensitive to the level of ink in the container 6, and constituted by example by a capacitive sensor 55 mounted in an adjustable position through the bore 42 and connected to a threshold comparator 56 with hysteresis, by which the solenoid 53 can be connected to a mains supply 57.

When in use, compressed air is fed through the connector 38 into the vessel 37 in order to compel the ink contained therein to rise along the dip pipe

40 and the conduit 50 until it reaches the valve 45, and to stop against the plate 48, which is in its normal position for closing the bore 47.

During the operation of the device 1, the level of ink in the container 6 is determined by the sensor 55 which, when the distance of its lower face from the surface of the ink exceeds a determined value represented graphically by an arrow 58, determines the energisation of the solenoid 53 and the movement of the plate 48 into the opening position shown in the figure. Consequently, the ink arriving from the conduit 50 pours into the container 6 through the conduit 43, and the level of ink in the container 6 rises until it reaches a minimum distance from the sensor 55 indicated graphically by an arrow 59. At this point, by means of the comparator 56, the sensor 55 halts the supply of current to the solenoid 53, so enabling the plate 48 to return into its normal closure position under the thrust of the spring 54.

The cycle heretofore described is repeated until the ink contained in the vessel 37 is totally used up.

Sometimes it is necessary for the viscous material to leave the distributor device 1 at a rigorously constant pressure.

To satisfy this requirement, in proximity to the mouth of the nozzle 2 there is provided a device 60 for measuring pressure and for controlling the speed of rotation of the shaft 17 as a function of said pressure, by means of a variable speed motor 61.

Within the principle of the invention, numerous modifications can be made to the distributor device which has been described by way of non-limiting example, without leaving the scope of the present invention.

CLAIMS

1. A distributor device for viscous materials, comprising a cup container (6) for said material, an outlet nozzle (2), a connection duct (23) between said container (6) and said nozzle (2), and thrust means (9, 25) for forcing the viscous material present in said container (6) towards said nozzle (2), characterised in that said thrust means comprise a screw conveyor (25) mounted rotatably in said container (6) and in contact with its inner surface, and a threaded core (20) mounted rotatably through a through bore (14) in the bottom of said container (6) and defining a helical channel (21) connecting said container (6) to said nozzle; closure means (13) being provided for closing said container, and flow control means (24) being disposed in said duct (23) to regulate the flow of said material towards said nozzle (2).

2. A device as claimed in claim 1, characterised in that the inner surface of said container in contact with said screw conveyor is of cone-frustum form.

3. A device as claimed in claim 1 or 2, characterised in that said threaded core (20) and said screw conveyor (25) are carried by a shaft (17) which is mounted rotatable but in an axially fixed position through said container (6).

4. A device as claimed in any one of the preceding claims, characterised in that an annular chamber (22) surrounds said core (20) in order to connect said helical channel (21) to said duct (23).

5. A device as claimed in any one of the preceding claims, characterised in that said flow control means comprise an adjustable needle valve (24) mounted in said duct (23).

6. A device as claimed in any one of the preceding claims, characterised in that said closure means comprise a cover (13) removably inserted into said container.

7. A device as claimed in any one of claims 1 to 5, characterised in that said closure means comprise a cam (26) containing said viscous material and mounted inverted on said container (6), stirrer means (27) carried by said screw conveyor (25) and mobile therewith extending outside said container (6) and inside said can.

8. A device as claimed in claim 7, characterised in that said stirrer means comprise a spatula (26) constituted by an annular metal wire element.

9. A device as claimed in any one of claims 1 to 6, characterised in that said container (6) communicates by way of a feed conduit (50) with an external pressurised vessel (37) for said viscous material; valve means (45) being disposed in said feed conduit (50) to close and open this latter in response to increases and, respectively, decreases in the level of said viscous material in said container (6) and within a determined range of variation.

10. A device as claimed in one or more of the preceding claims, characterised by comprising a device (60) for measuring the pressure of the material flowing through said nozzle (20), and for controlling the speed of the motor (61) for said shaft (17) as a function of the pressure determined thereby.

11. Distributor devices for viscous materials having their parts constructed, arranged and adapted to operate substantially as herein described with reference to Figure 1, Figure 2 or Figure 3 of the accompanying drawings.

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