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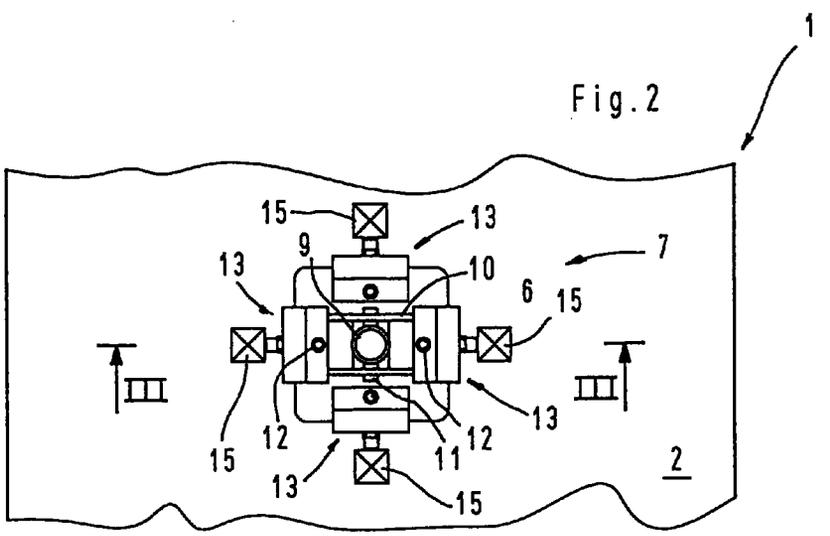
(54) A machine for painting ceramic tiles

(57) A machine for decorating ceramic tiles (4), comprises a dispensing device (7) for dispensing a decorating fluid provided with a feed chamber (16) communicating with at least one supply duct (12) for said fluid via a respective valve (13); said valve (13) being provided with a control chamber divided by an elastically deformable membrane (18) in a front semi-chamber (19) and a rear semi-chamber (20), said front semi-chamber (19) communicating with an inlet opening (23) and said rear semi-chamber (20) communicating with a supply passage (25) for supplying a pressurized fluid to said rear semi-chamber (20).

Fig.2



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Description

The invention concerns a machine for decorating ceramic tiles, that is, a set of devices for applying a layer of liquid or powdery glaze to decorate the top face of ceramic items.

The prior art comprises spray gun, or aerograph, painting machines in which, inside a painting enclosure through which passes a conveyor line, the paint is sprayed directly onto the top face of said tiles, whereupon the decorated items are sent to the ovens to be fired.

When multicoloured designs are required, with areas having well defined, or even shaded, outlines, these machines have to be set up with a plurality of paint spraying devices in order to deposit a corresponding plurality of different coloured paints on the transiting tiles: this entailing an unacceptably high level of complexity and cost.

Furthermore, particularly with roller printing machines for decorating ceramic tiles, comprising a cascade of rollers between which the liquid paint is introduced upstream of the printing roller, when multicoloured designs are required on the top face of the item, anomalies can arise that are associated with the change in the colour of the paint; such anomalies arising mainly due to the difficulty in achieving a sharp change in the colour, and of avoiding undesirable mixing of two or more types of paint where this is not required.

Such prior art may be subject to considerable improvements with a view to eliminating the said drawbacks.

From the foregoing emerges the need to resolve the technical problem of inventing a painting machine that is able to dispense liquid ceramic paint, in a direct or indirect manner, on the top face of the items using a single dispensing device, avoiding undesirable mixing of different kinds of paint.

The invention resolves the said technical problem by adopting a painting machine comprising a dispensing device for liquid paint connected with a feed chamber into which lead a plurality of supply ducts for various kinds of paint; immediately upstream of the said feed chamber, on each paint supply duct there being, advantageously, a pneumatic valve to control the flow of the paint.

This enables the liquid paint to be dispensed optimally, particularly as regards polychromatic decorations, with the possibility of keeping paints of various colours, or kinds, completely separate, dispensed in successive time intervals, without undesirable chromatic contamination, or alterations.

In a particularly advantageous version, each pneumatic valve is provided with a chamber divided into two semi-chambers, one front semi-chamber and one rear semi-chamber, between which there is an elastically deformable sealing membrane: the front semi-chamber having an inlet opening and an outlet opening for the ceramic paint, the rear semi-chamber having a passage for a pressurised working fluid that moves the sealing membrane from a neutral position, to allow the flow of the paint in the chamber from the said inlet opening to the said outlet opening, to an active position, in contact with the inlet opening for the paint to block its flow.

This enables the supply of the paint to the dispensing device to be controlled in a precise and reliable manner, ensuring a rapid response to the commands stopping or starting the flow of the paint.

In a further advantageous version, the said inlet opening of the paint is located in a central position in the paint feed front semi-chamber, whereas the said outlet opening is made in a position corresponding with that of an annular cavity in the bottom of the said semi-chamber.

This enables a rapid response to the commands to stop the flow to be achieved, ensuring optimal cut-off of the flow of paint, mainly obtained with the exploitation of the maximum deflection of the central portion of the sealing membrane.

The present invention can be applied advantageously to all types of painting machines for ceramic tiles that use liquid paint, for example, in aerograph painting machines, where the nebulized paint is sprayed directly onto the underlying items transiting on the conveyor line, or also in roller printing machines, with the projection of the paint onto a feeder roller in tangential contact with a printing roller.

In this last version, the dispensing device for the ceramic paint can be fixed, or supported so that it may oscillate, or else, so that it may slide in a transverse direction with respect to the said feeder roller.

In the version with the fixed, or oscillating, dispenser device it is preferable for the paint to be supplied in the form of tiny drops, for example, by means of a nebulizing aerograph, whereas, in the version with mobile dispenser, the paint can be dispensed in the form of a jet.

With the painting machine as described it is also possible to obtain, inside the feed chamber, a mixture of two or more different kinds of paint, in predetermined proportions, without undesirable variations in the desired chromatic effect due to uncontrolled tainting, or random mixing.

Further advantages of the present invention are: simple construction and modest costs.

Some embodiments of the invention are illustrated, purely by way of example, in the five tables of drawings attached in which Figure 1 is a schematic side view of a painting machine with a spray painting device; Figure 2 is a partial, interrupted top view of Figure 1; Figure 3 is cross section III-III, greatly enlarged and interrupted, of Figure 2; Figure 4 is a schematic side view of a painting machine with the paint spray directed onto a dosing roller in a cascade of rollers of a roller printing machine for tiles; Figure 5 is the front view of Figure 4, showing a trolley supporting the spraying unit; Figure 6 is a side view as in Figure 4, but relative to a painting machine for the roller printing of ceramic articles with the paint being dispensed in the form of a non nebulized jet.

A painting machine 1, as described in the present invention, comprises a casing 2, in the form of a tunnel defining a painting enclosure, provided, in its lower part,

with a pair of conveyor belts 3 for the ceramic objects 4, generally tiles, and with openings at the ends to allow the entry and exit of the tiles 4, respectively, into and out of the painting enclosure 2.

At the top end of the enclosure 2 an opening 6 is made for the coupling in it of an aerographic nebulizer dispensing device 7 for a decorating fluid, such as a ceramic paint, in particular a pneumatic nebulizer, having a nebulizer nozzle 8 attached to the lower part of the body of a manifold 9 coupled to a cross-beam 10 fixed to the sides of the opening 6, the said manifold body being coupled to the said cross-beam by hinging devices, comprising a pin 11, that co-operate with a oscillator unit not shown, that enable the dispensing device 7 to oscillate in the direction indicated by the arrow F between end positions indicated with dotted lines in Figure 1, so as to decorate the entire width of the tile.

Supply ducts 12 for a plurality of ceramic paints are coupled to the manifold 9 via respective pneumatic control valves 13: the various ceramic paints being fed through the ducts 12 under pressure by feeder devices not shown.

Each pneumatic control valve 13 has a compressed air supply line 14, on which there is a relative solenoid cut-off valve 15.

As shown in Figure 3, the manifold body 9 has inside it a feed chamber 16 communicating, through passages 16a, with the control valves 13 via connecting ducts 12a: the said feed chamber enables the liquid paint to flow towards the nozzle 8 and, possibly, to be mixed with the paint flowing out of at least one other duct 12a in predetermined proportions, so as to create a plurality of chromatic effects on the tile 4.

Each said control valve 13 comprises a valve body 17 subdivided in two parts by a sealing membrane 18, held between them so that it is floating inside a control chamber divided in a front semi-chamber 19 and a rear semi-chamber 20: the front semi-chamber 19 having an annular cavity 21, the rear semi-chamber 20 being preferably defined by a recess 22.

The supply duct 12 joins to the front semi-chamber 19 through an inlet opening 23 located in a central position in the front semi-chamber, the annular cavity 21 communicating with an outlet opening 24 for the paint.

The rear semi-chamber 20 has a hole 25 for the passage through it of compressed air, whose flow is controlled by valve 15 upstream of the pneumatic supply line 14.

When the cut-off valve 15, for example operated by a programmed data processor, not shown, is made to open to enable the passage of compressed air towards control valve 13, the membrane 18 is pushed against the opening of the inlet duct 23 for the ceramic paint and prevents it from flowing towards the manifold 9; when the flow of compressed air is cut off by the compressed air flow cut-off valve 15, the paint can enter into the semi-chamber 19, elastically deforming the membrane 18, and exit through opening 24 to arrive at the feed chamber 16 and to flow out of the nozzle 8.

Two compressed air supply ducts 26, 27 are also coupled to the nozzle 8, to nebulize the jet 28 of paint by means of converging streams of air 29.

Instead of projecting the paint spray directly onto the ceramic tiles 4, it may be preferable to spray the paint onto one of the rollers in a roller printing machine for decorating tiles, for example, intermediate roller 30, inserted with tangential contact between a dosing roller 30a, upstream, and a distributing roller 30b to transfer the paint to a printing roller 30c in contact with the tiles 4. In this case the nebulizer device 7 can be supported on a sliding trolley 32, guided, by bilateral rolling elements 33, on a transverse runner 34 supported by the frame 35 of the painting machine 30: the trolley being coupled to driving devices 36 supported by the frame 35.

In a version shown in Figure 6, instead of the nebulizer device 7, there is a distributor 37 supplying the ceramic paint by means of a dispensing nozzle 38 in the form of a jet, analogous to the nebulizing device 7, shown previously, but without the streams of compressed air 28, 29 for nebulizing the jet of paint.

As regards the arrangement of the cascade of rollers, the distributing roller 30b can even be coupled directly to the printing roller 30c, this last one possibly being coupled to a uniforming roller 30e for the paint on the printing roller.

In practice the materials, dimensions and details of execution may be different from, but technically equivalent to those described without departing from the juridical domain of the present invention.

For example, the number of supply ducts for the ceramic paint leading to each feed chamber of the manifold body can be chosen in function of the number of colours, or kinds of paint, required by the type of design envisaged for the tile.

Claims

1. A machine for decorating ceramic tiles (4), comprising a dispensing device for dispensing a decorating fluid, characterised in that said dispensing device (7) is provided with a feed chamber (16) communicating with at least one supply duct (12) for said fluid via a respective valve (13).

2. A machine, as in claim 1, wherein said valve (13) comprises a movable member (18) controlling an inlet opening (23) of the respective supply duct (12), said movable member being subjected to an external source of energy for closing said inlet opening (23) and to the action of said fluid for opening said outlet opening (23)

3. A machine, as in claim 3, wherein said movable member (18) is an elastically deformable membrane and said external source of energy is a pressurized fluid.

4. A machine, as in claim 3, wherein said valve (13) is provided with a control chamber divided by said elastically deformable membrane (18) in a front semi-chamber (19) and a rear semi-chamber (20), said front semi-chamber (19) communicating with said inlet opening (23) and said rear semi-chamber (20) communicating with a supply passage (25) for supplying said pressurized fluid to said rear semi-chamber.

5. A machine, as claimed in one of claims 1 to 4, wherein said inlet opening (23) is located in a central position in said front semi-chamber (19).

6. A machine, as claimed in anyone of claims 1 to 5, wherein said front semi-chamber is provided with an outlet opening (24) communicating with said feed chamber (16).

7. A machine, as claimed in claim 6, wherein said outlet opening (24) is made in a position corresponding with that of an annular cavity in the bottom of the front semi-chamber (19).

8. A machine, as in claim 4, wherein said feed chamber (16) constitutes the front semi-chamber of said valve (13).

9. A machine, as claimed in one of the preceding claims, wherein said dispensing device (7) is an aerographic nebulizer.

10. A machine, as claimed in one of claims 1 to 8, characterised in that said dispensing device (7) is an injector for injecting said decorating fluid in the form of a jet.

11. A machine, as claimed in one of the previous claims, wherein said dispensing device (7) is supported in a fixed position above a conveyor line (3) for the ceramic tiles (4).

12. A machine, as claimed in one of claims 1 to 10, wherein the said dispensing device (7) is supported so that it may oscillate, by means of pin (11) above the conveyor line (3) for the ceramic tiles (4).

13. A machine, as claimed in one of the previous claims, wherein said dispensing device (7) is supported on a trolley that may move in a transverse direction above the conveyor line (3) for the ceramic tiles (4).

14. A machine, as claimed in claim 13, wherein said decorating fluid is projected onto a roller (30) in a cascade of rollers (30, 30a, 30b) for the decoration of ceramic items by printing.

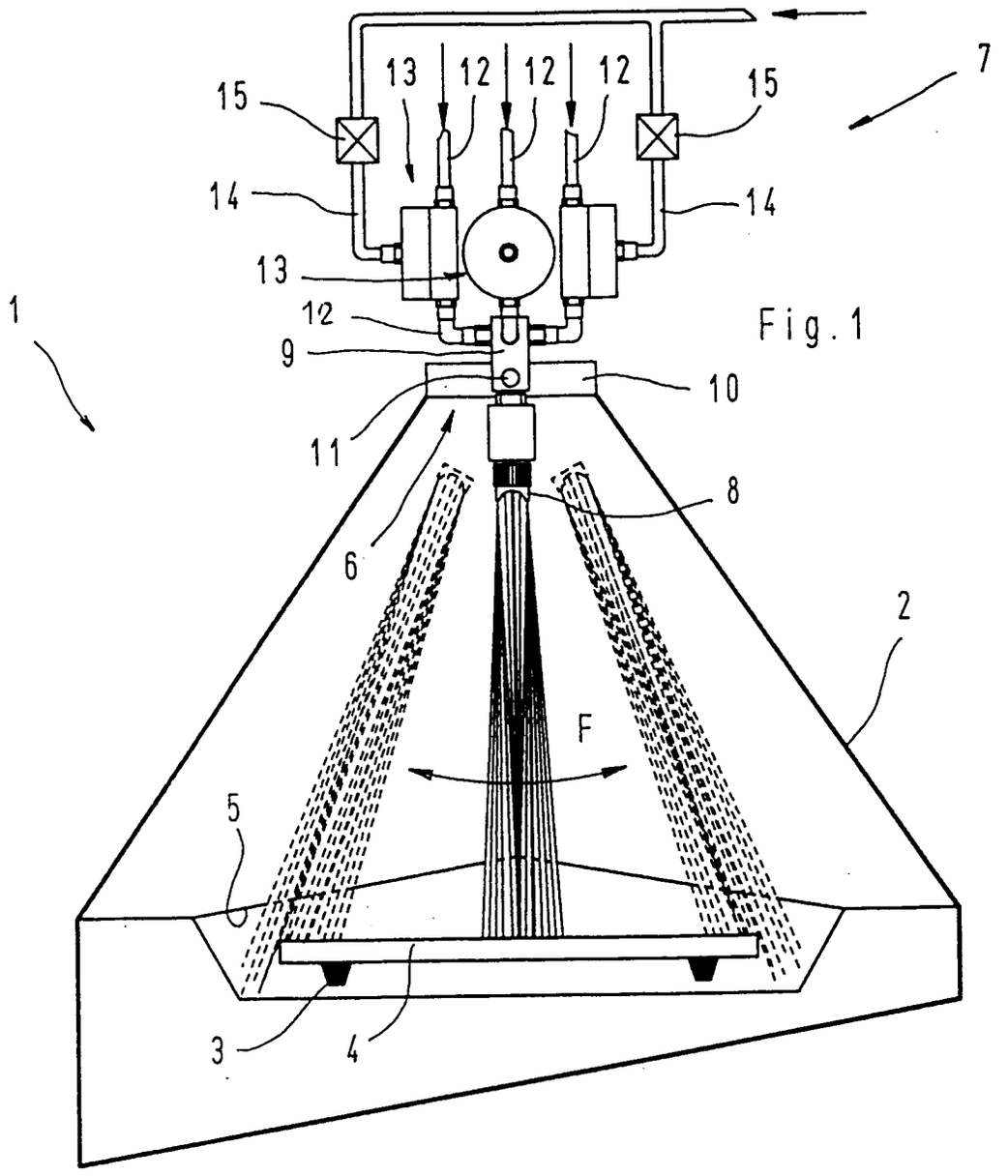
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Fig.1

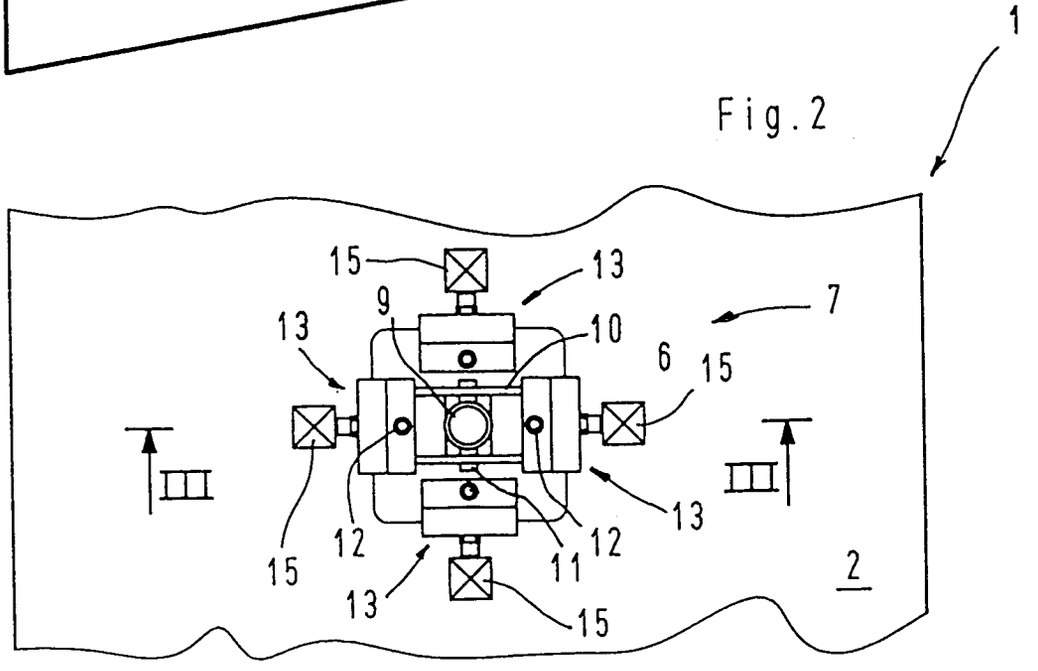
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Fig.2

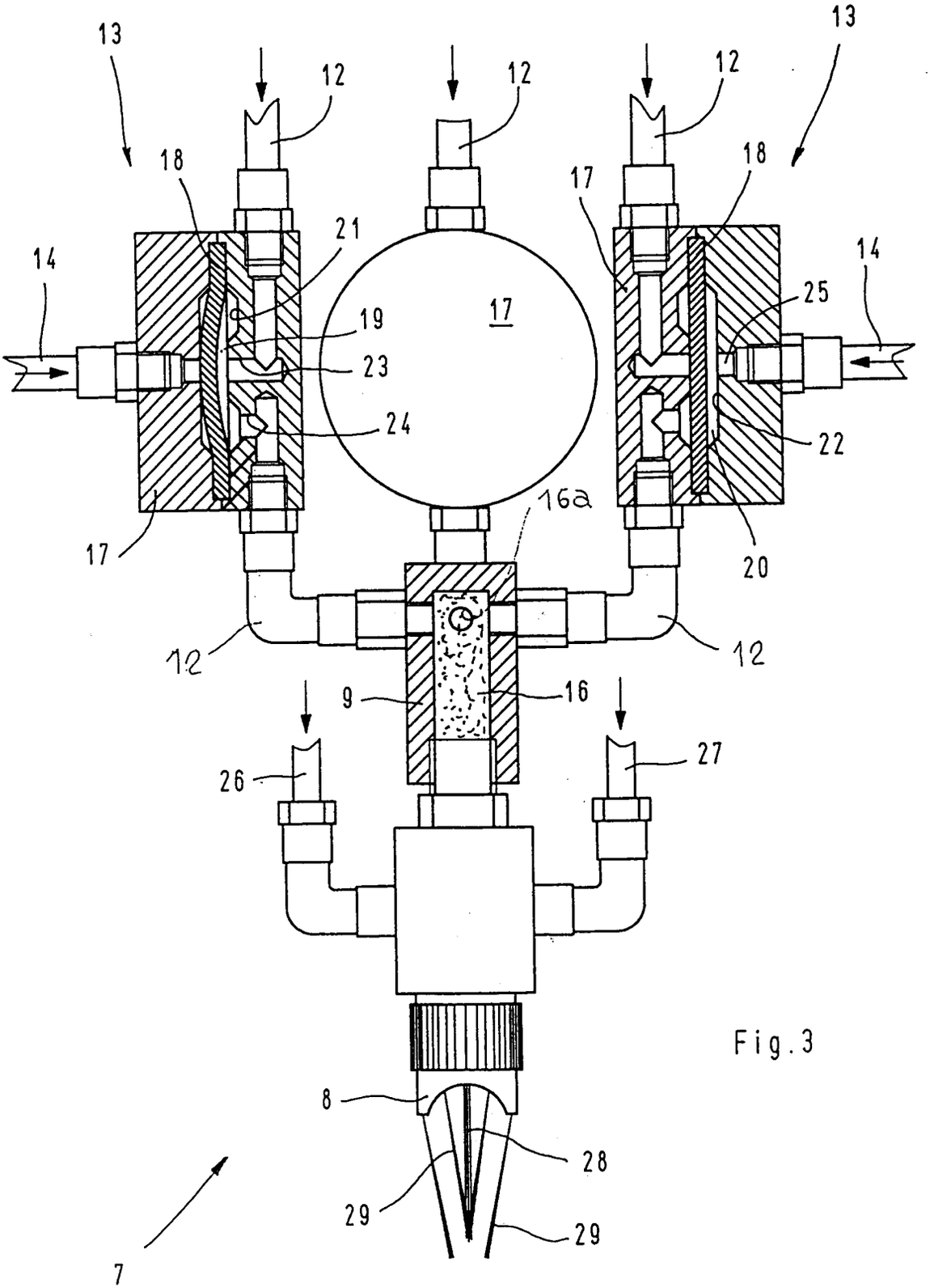
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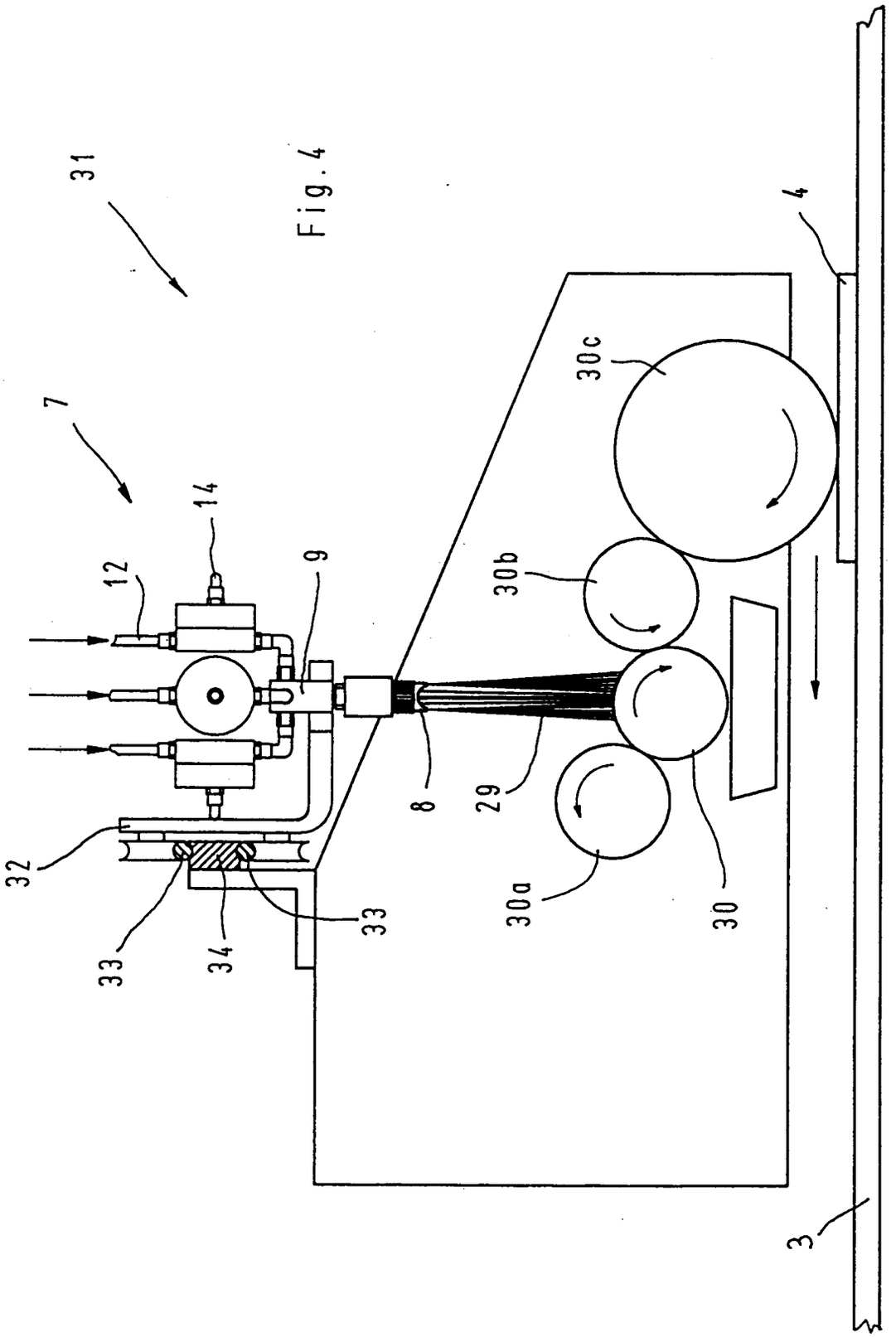
Fig.3

Fig.4



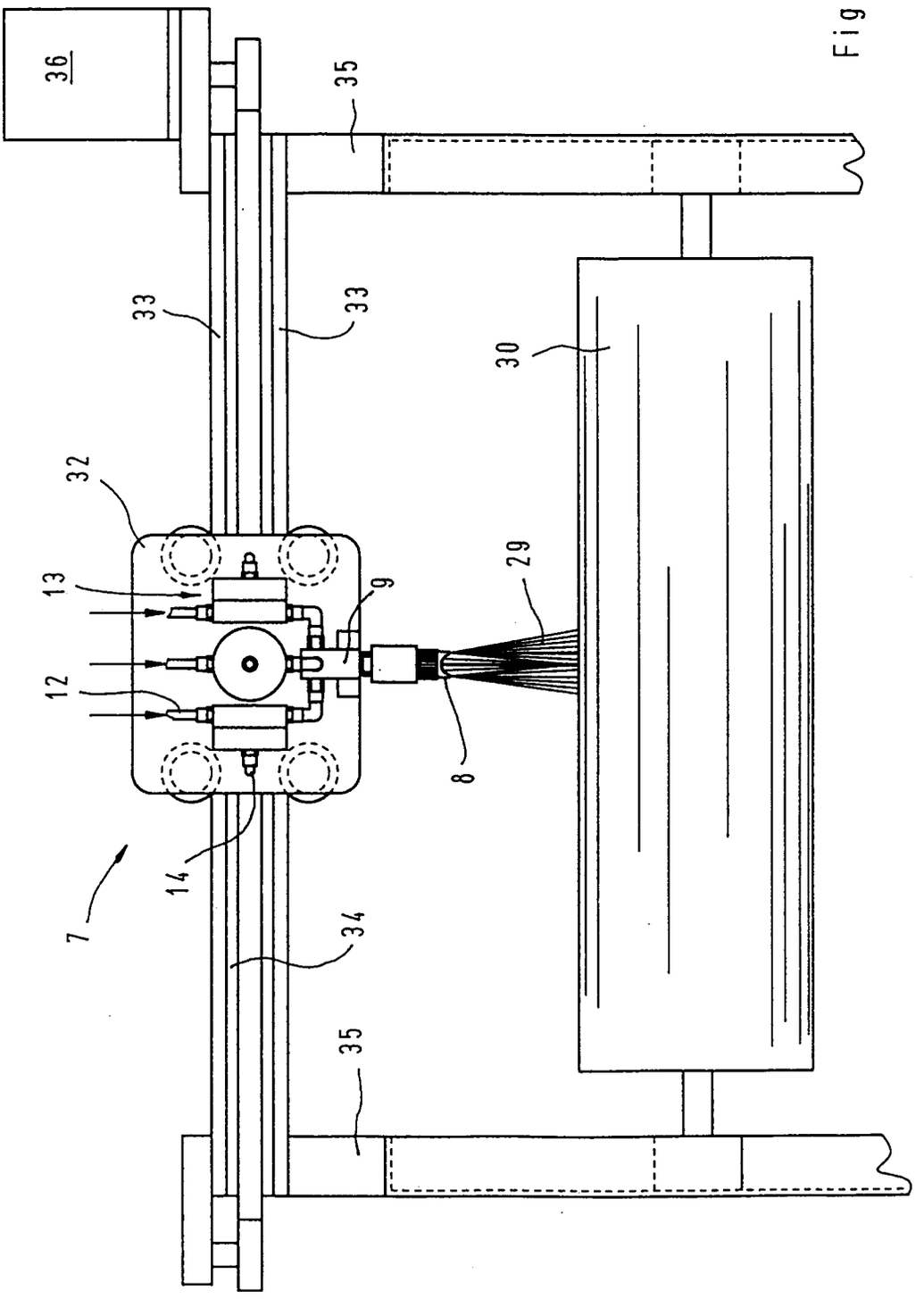
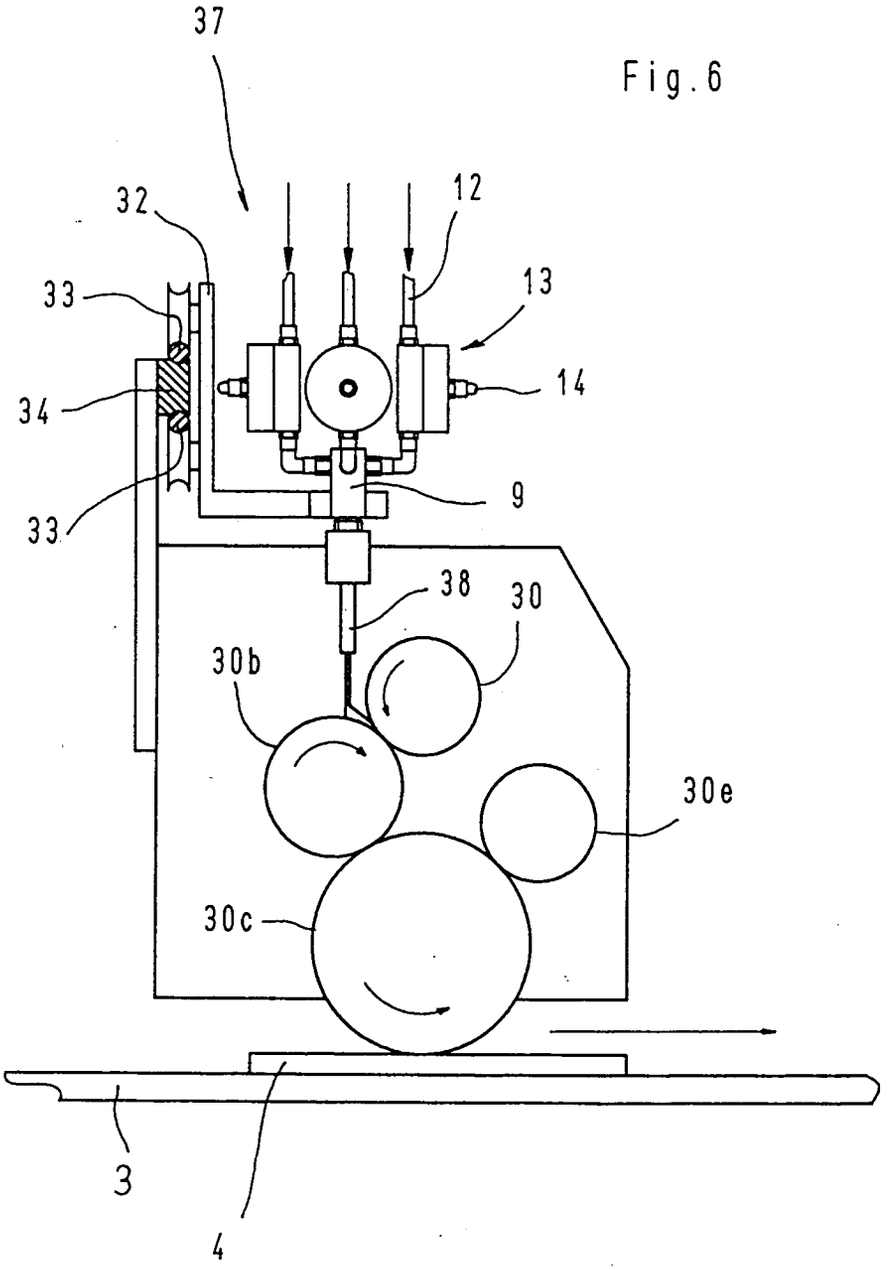


Fig.5

Fig.6



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EUROPEAN SEARCH REPORT

Application Number
EP 95 20 3294

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.6)
X	FR-A-2 666 052 (BRAULT BENOIT) 28 February 1992 * the whole document *	1,2,10, 13	B05B7/24 B05B12/14 B05C1/08 B28B11/00
X	US-A-3 799 716 (SALTS T) 26 March 1974 * column 4, line 53 - column 5, line 45; figures 8-10 *	1-8,11	
A	FR-A-2 334 427 (RENAULT) 8 July 1977 * page 4, line 40 - page 5, line 7; figure 2 *	5-9	
A	US-A-3 703 880 (WAMPLER DAVID M) 28 November 1972 * abstract *	12	
A	EP-A-0 248 985 (BILLHOFER MASCHINENFABRIK GMBH) 16 December 1987 * figure 1 *	14	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
B05B B05C B28B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 March 1996	Juguet, J

CATEGORY OF CITED DOCUMENTS

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