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(54) Benævnelse: **Fremgangsmåde til fremstilling af læderpellets**

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Description

The invention relates to a method for producing leather pellets, in which shavings are obtained as a waste product in leather production and the shavings are comminuted to a ground leather stock containing leather fibres.

In the course of industrial leather production, the hides are shaved, i.e. planed off on the reverse by means of a spiral knife cylinder to a uniform thickness, e.g. 1.5 mm, in one of the process steps. The planed-off material is the so-called shavings, which are obtained in an amount of about 33 % of the hide weight. Depending on the tanning method, the shavings have been used hitherto either for leather fiber production (chrome shavings) or for composting (chrome-free shavings), and taken to waste dumps.

In a known method of the type specified at the outset (WO 2007/121497 A), leather waste in the form of shavings is comminuted to a ground leather stock containing leather fibres and sent in this form to further processing.

In all of these cases, the future routes for utilization and disposal of the leather waste are uncertain and associated with costs.

On the basis of this, the object of the present invention is to develop a method for utilizing shavings obtained in leather production.

To achieve the object, the combination of features described in claim 1 is proposed. Advantageous embodiments and further developments of the invention emerge from the dependent claims.

The invention is based above all on the concept that the shavings can be used appropriately and further processed industrially if it is first processed to an intermediate product. This intermediate product acquires the form of leather pellets which are produced by the following steps in the method according to the invention: Shavings are obtained as a waste product in leather production; the shavings are

comminuted to a ground leather stock containing leather fibers; the comminuted shavings are pressed to leather pellets; and the leather pellets are dried to a residual moisture content of a maximum of 30 wt.%. In this context, the shavings can be obtained both in a chrome tanning and in a tanning with glutardialdehyde.

The shavings are expediently first comminuted to a fiber or particle size of about 0.5 mm by fine grinding. Pressing of the pellets can be carried out in a conventional pelleting press. Depending on the requirements of the subsequent further processing processes, the pressed leather pellets can be dried to a residual moisture content of 5 - 30 wt.%. For processing in some machine types, a lower residual moisture content is necessary, since these machines would otherwise be exposed to the risk of corrosion by the moisture, while other machine types are less sensitive in this respect.

In contrast to the ground leather stock, the leather pellets are easy to handle as bulk goods, and when packed have a storage stability of months or even years.

The pressed leather pellets are an intermediate product which can be further processed in various ways. In a method according to the invention for further processing of the leather pellets, the pellets are mixed with a thermoplastic polymer material in the ratio of about 10 - 95 % and bonded into compound granules of leather fibers and polymer material. This is carried out in an extruding machine, to which the polymer material and the leather pellets are fed as a premix or separately. During the extruding operation, the mixture of leather pellets and polymer material is homogenized, so that the compound granules are a matrix of polymer material with embedded leather fibers. During the production of the compound granules, a dyestuff can be added to the polymer material, which is conventionally colorless per se, in order to give the granules a desired color. It is also possible in principle for the ground stock to be already colored with conventional leather dyestuffs during production of the leather pellets. However, it has been found that the color stability cannot always be controlled with the necessary precision due to the subsequent drying by heat and other influences. Coloring of the compound granules by addition of dyestuffs to the polymers during the extrusion operation, however, leads to reproducible results.

It is known per se to the person skilled in the art that the leather pellets produced from the ground leather stock as a rule cannot withstand exposure to heat at temperatures above 180 °C because of natural denaturing and, in the presence of oxygen, tend to burn and/or release combustion odors. On the other hand, there is a need for compound granules which can also withstand higher temperatures.

Experiments have shown that, surprisingly, thermoplastic polymer materials having a melting temperature above 180 °C can also be used in the production of the compound granules. In order to be able to employ thermoplastic polymer materials of this type, it is proposed according to the invention that the polymer material formed as a thermoplastic is heated in the molten or softened state to a temperature above 180 °C, and that the cold or preheated leather pellets are added to the heated polymer material and mixed with this, while cooling the mixture, before the finished mixture is shaped to form the granules.

In a preferred embodiment of the method according to the invention, the polymer material is heated along a heating zone of an extruder to a peak temperature above 180 °C, while melting or softening, the leather pellets are admixed in the cold or preheated state to the polymer material downstream of the heating zone and the finished mixture produced in this way is discharged via an exit die or a die plate at a temperature which is lowered with respect to the heating zone, and is shaped into the compound granules. A thermoplastic polymer material with a melting or softening point above 180 °C, preferably above 220 °C, is advantageously used for this.

The compound granules produced in this way are a further intermediate product. It comprises granules of a thermoplastic and leather fibers, in which the thermoplastic has a softening point above 150 °C, preferably above 180 °C.

According to the invention, the compound granules as the intermediate product are preferably used for producing moulded parts by means of an injection moulding process. Experiments have shown that the compound granules in principle can also be heated to temperatures above 180 °C in the injection moulding machine before they are injected into the cavity of the injection moulding machine. The relatively high heat

stability is presumably to be attributed to the fact that the leather fibers within the compound granules are surrounded by a protective layer which counteracts denaturing of the leather fibers. In addition, the oxygen, which would promote combustion of the leather fibers, is displaced or shielded by the polymer material. An improvement in this respect can also be achieved by a suitable process procedure in which the dwell time in a heating zone of the injection moulding machine is minimized.

Moulded parts can be produced from the compound granules by means of the injection moulding process. Due to the leather content, such moulded parts have optical and haptic properties of leather, which make a use for producing moulded parts, such as hand grips for tools, Nordic walking sticks, bicycle handlebars, grips on sports equipment and many others of the like, particularly advantageous. This method is likewise particularly suitable for sheathing vehicle steering wheel rims. For such uses where the grip friendliness of leather material was desired, an expensive application of genuine leather hitherto had to be effected. The procedure according to the invention provides an inexpensive and therefore widely applicable alternative here. The compound granules according to the invention are likewise suitable for producing moulded parts such as toy figures, since optical and haptic properties which make the figures look more realistic also arise here.

The compound granules are moreover suitable for producing films by calendering. Such films can be employed in all instances where films purely of plastic or genuine leather have hitherto been used.

The invention is explained in more detail in the following with the aid of the drawing. The figures show

Fig. 1 a block diagram for a method for producing leather pellets, compound granules and injection moulded parts using shavings obtained in leather production;

Fig. 2 a section through an extruder for producing compound granules;

Fig. 3 a section through an injection moulding machine for producing injection moulded parts using compound granules as an intermediate product.

On the basis of the block diagram according to Fig. 1, the shavings obtained in leather production, which have an initial moisture content of 15 - 60 wt.%, are introduced via a feeding station 10 into a fine mill 12 and ground there to a fiber or particle size of approx. 0.5 mm. After this process step, the shavings can optionally be colored in a universal mixer 14 by addition of a dyestuff. After the grinding, the material has a moisture content of about 15 - 50 wt.%. The ground shavings are now pressed in a press 16 to give leather pellets. During this procedure, the moisture content decreases further to about 10 - 40 wt.%. If necessary, this can be followed by a drying operation in a drier 18, until the leather pellets have a residual moisture content of < 9 wt.%. The leather pellets produced in this way are transferred as bulk goods into a drum of any desired size. The storage life of such leather pellets is months to years, so that immediate further processing is not necessary.

For further processing, the leather pellets can be further processed to compound granules in plants specifically equipped for this, so-called compounders. For this, the leather pellets are mixed and extruded with a thermoplastic polymer material in an extruder 20 corresponding to Fig. 2. During the extrusion, the polymer material, which is conventionally present as granules, and the leather pellets are led together along a mixing and conveying zone within the extruder by means of conveying screws 22 under the action of pressure and heat. The polymer material fed into the intake zone 24 in the form of granules is first heated along several heating zones 26, and thereby melted. The leather pellets are fed in downstream of the intake zone 24 via a side feed 28 and admixed with the molten polymer material. The compounding takes place along the further conveying zone 30. The leather pellets are finely ground there, so that the extrusion product has an approximately homogeneous distribution of leather fibers in a matrix of plastic. Excess moisture is removed from the melt via the devolatilization opening 32 by means of a vacuum pump. The material mixture ejected in the form of a strand from the extruder 20 through a die plate 34 is in its turn cut off in the desired length and forms the compound granules as the process product.

A dyestuff which determines the color of the compound granules and of the moulded parts or films subsequently produced therefrom can be added to the polymer material if this has not already been colored beforehand.

Possible thermoplastic polymer materials are, preferably, polypropylene, polyethylene or thermoplastic elastomers. It has been found that those polymer materials having a melting temperature above 180 °C can also be used in a suitable process procedure. This is surprising inasmuch as according to conventional knowledge, the maximum temperature to which leather can be exposed is about 180 °C.

The compound granules produced in this way can in turn be transferred into drums of any desired size and delivered to the end processor, for example the injection moulding plant or the film manufacturer.

Processing of the compound granules to moulded parts by means of an injection moulding process is particularly advantageous, the moulded parts produced in this way having optical and haptic properties typical of leather. For this purpose, with an injection moulding machine 40 according to Fig. 3, the compound granules are fed via a hopper 42 and an intake 44 to an injection unit 46 in which the granules are ground along a conveying zone 48 by means of a screw 50, heated to the melting temperature in several heating zones 52 and injected via a nozzle 54 into an injection mould 56. The cavity 58 of the injection mould 56 determines the shape and the surface structure of the finished moulded part.

Mass products can be produced with a high accuracy in a short time by the injection moulding. In this context, the surface of the component can be virtually freely chosen. Smooth surfaces, grain for contact-friendly areas, patterns and engravings can be introduced in the course of the production operation. Parts which are to meet decorative requirements or are intended for manual use, such as grips for tools, tennis racquets, Nordic walking sticks, steering wheel rims for vehicles and the like, are possible for the leather-plastic compound.

On the other hand, the compound granules can be processed by calendering, in which molten compound granules are led through as a rule several successive heated roll nips and thereby brought to the desired thickness, to give films with a use spectrum which covers that of conventional films of plastic.

Summarizing, the following is to be said: The invention relates to a method for producing leather pellets, a method for producing compound granules of leather pellets and a polymer material and the use of such compound granules for producing moulded parts or films. The leather pellets are produced by the following steps: Shavings are obtained as waste products in leather production; the shavings are comminuted to a ground leather stock containing leather fibers; the comminuted stock is pressed to leather pellets; and the leather pellets are dried to a residual moisture content of a maximum of 30 wt.%. The leather pellets can be mixed with a polymer material in a ratio of 10 - 95 wt.% and bonded to one another to form compound granules as a further intermediate product, and shaped. These compound granules can be used for producing moulded parts by means of injection moulding or films by means of calendering.

List of reference symbols:

10	Feeding station
12	Fine mill
14	Universal mixer
16	Press
18	Drier
20	Extruder
22	Conveying screw
24	Intake zone
26	Heating zones
28	Side feed
30	Conveying zone
32	Devolatilization opening
34	Die plate
40	Injection moulding machine
42	Hopper
44	Intake
46	Injection unit
48	Conveying zone
50	Screw
52	Heating zones
54	Nozzle
56	Injection mould
58	Cavity

Patentkrav

1. Fremgangsmåde til fremstilling af læderpellets, ved hvilken:
- der udvindes spåner som affaldsprodukt ved læderfremstillingen,
- spånerne formindskes til et læderformalingsmateriale, der indeholder læderfibre,

kendetegnet ved,
- at spånerne har et udgangsfugtindhold på 15-60 vægt-%,
- læderformalingsmaterialet presses til læderpellets,
- de nævnte læderpellets tørres, indtil de har et restfugtindhold på max. 30 vægt-%.

2. Fremgangsmåde ifølge krav 1 **kendetegnet ved, at** spånerne udvindes ved en kromgarvning eller garvning med glutardialdehyd.

3. Fremgangsmåde ifølge et af kravene 1 eller 2, **kendetegnet ved, at** spånerne eller færdiglæderaffaldsprodukterne formindskes til en fiber- eller kornstørrelse på ca. 0,5 mm.

4. Fremgangsmåde ifølge et af kravene 1 til 3, **kendetegnet ved, at** der tilsættes pulverformigt farvestof til læderformalingsmaterialet i et blandeapparat.

5. Fremgangsmåde ifølge et af kravene 1 til 4, **kendetegnet ved, at** de nævnte læderpellets tørres ved en temperatur på op til 110 °C, indtil de har et restfugtindhold på < 9 vægt-%.

6. Fremgangsmåde ifølge et af kravene 1 til 5, **kendetegnet ved, at** de nævnte læderpellets blandes med et polymermateriale i forholdet 10-95 vægt-% og pulveriseres og under dannelse af et compound-granulat forbindes med hinanden og formes.

7. Fremgangsmåde ifølge krav 6, **kendetegnet ved, at** der tilsættes et farvestof til polymermaterialet, inden det blandes med de nævnte læderpellets.

8. Fremgangsmåde ifølge krav 6 eller 7, **kendetegnet ved, at** blandingen af læderpellets og polymermateriale ekstruderes til compound-granulatet i en ekstruderingsmaskine.

9. Fremgangsmåde ifølge et af kravene 6 til 8, **kendetegnet ved, at** polymermaterialet, der er udformet som termoplast, i smeltet eller blødgjort tilstand opvarmes til en temperatur på over 150 °C, og at de nævnte læderpellets i kold eller foropvarmet tilstand tilsættes til det opvarmede polymermateriale og blandes med dette under afkøling af blandingen, inden de formes under dannelse af granulatet.

10. Fremgangsmåde ifølge krav 9, **kendetegnet ved, at** det termoplastiske polymermateriale opvarmes til en temperatur på over 180 °C, fortrinsvis over 220 °C, inden de nævnte læderpellets tilsættes til det opvarmede polymermateriale.

11. Fremgangsmåde ifølge et af kravene 6 til 10, **kendetegnet ved, at** polymermaterialet, der består af et termoplastmateriale, langs med en ekstruders opvarmningsstrækning opvarmes til en temperatur på over 180 °C, fortrinsvis 220 °C under opsmeltning eller blødgøring, og at de nævnte læderpellets i kold eller foropvarmet tilstand blandes i polymermaterialet opstrøms for opvarmningsstrækningen, og at den således frembragte compound-blanding hældes ud via en udgangsdyse og formes til compound-granulatet.

12. Fremgangsmåde ifølge et af kravene 9 til 11, **kendetegnet ved, at** der anvendes et termoplastisk polymermateriale med et smelte- eller blødgøringspunkt på over 180 °C, fortrinsvis over 220 °C.

13. Anvendelse af det ifølge et af kravene 6 til 12 fremstillede compound-granulat til fremstilling af formdele ved hjælp af en sprøjtestøbningsmetode.

14. Anvendelse ifølge krav 13, **kendetegnet ved, at** compound-granulatet opvarmes i en sprøjtestøbningsmaskine til en temperatur på over 180 °C, inden det sprøjtes ind i en sprøjtestøbningsform.

15. Anvendelse af det ifølge et af kravene 6 til 12 fremstillede compound-granulat til fremstilling af folier ved hjælp af en kalandreringsmetode.

16. Anvendelse ifølge krav 15, **kendetegnet ved, at** compound-granulatet opvarmes til en temperatur på over 180 °C, inden det tilføres til en kalandreringsstrækning.

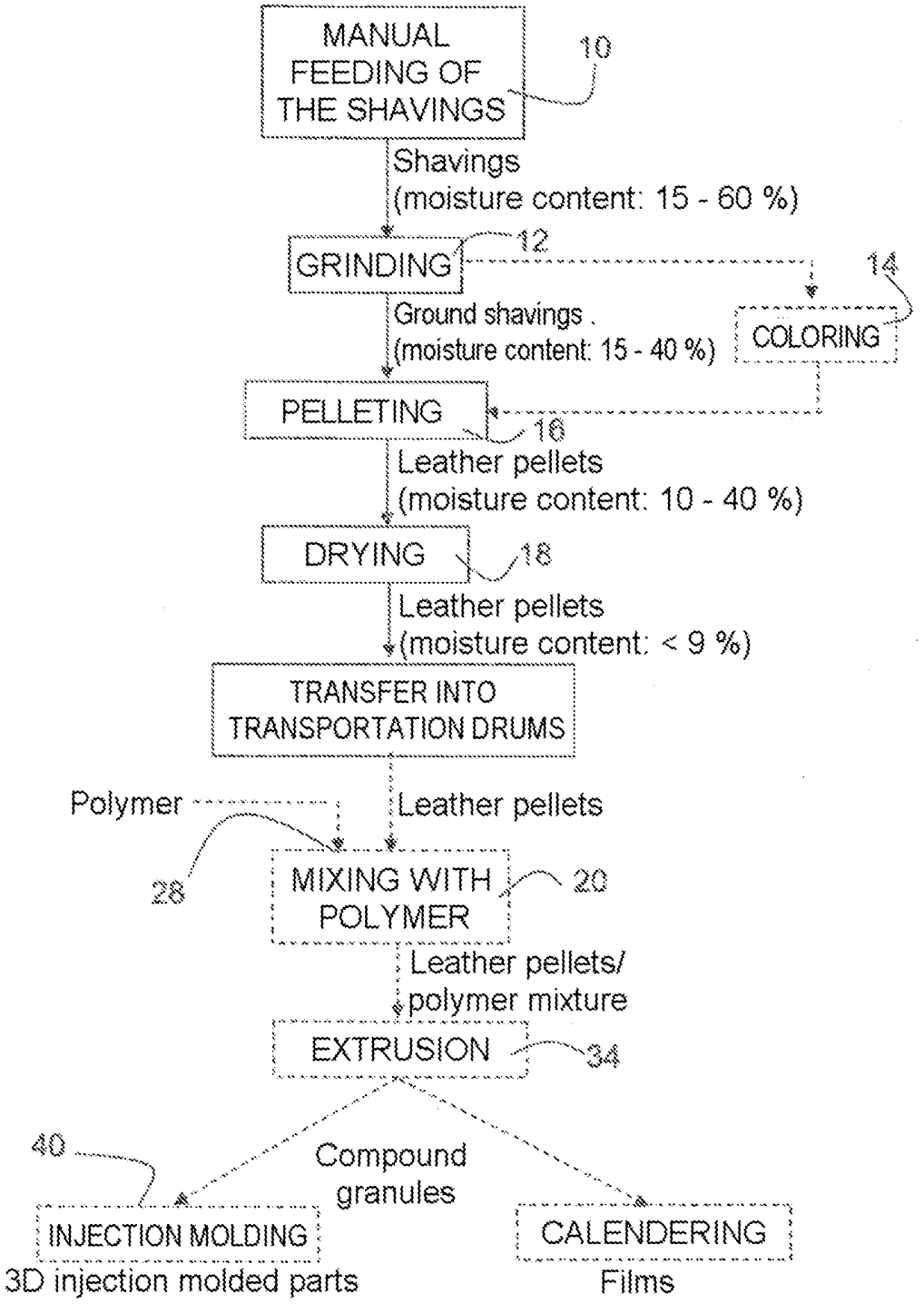
MANUAL FEEDING OF THE SHAVINGS
10
Shavings
(moisture content: 15 - 60 %)
GRINDING
12
14
COLORING
Ground shavings .
(moisture content: 15 - 40 %)
PELLETING
16
Leather pellets
(moisture content: 10 - 40 %)
DRYING
18
Leather pellets
(moisture content: < 9 %)
TRANSFER INTO TRANSPORTATION DRUMS
Polymer
28
Leather pellets
MIXING WITH POLYMER
20
Leather pellets/
polymer mixture
EXTRUSION
34
40
Compound granules
INJECTION MOLDING
3D injection molded parts
CALENDERING
Films

Fig. 1

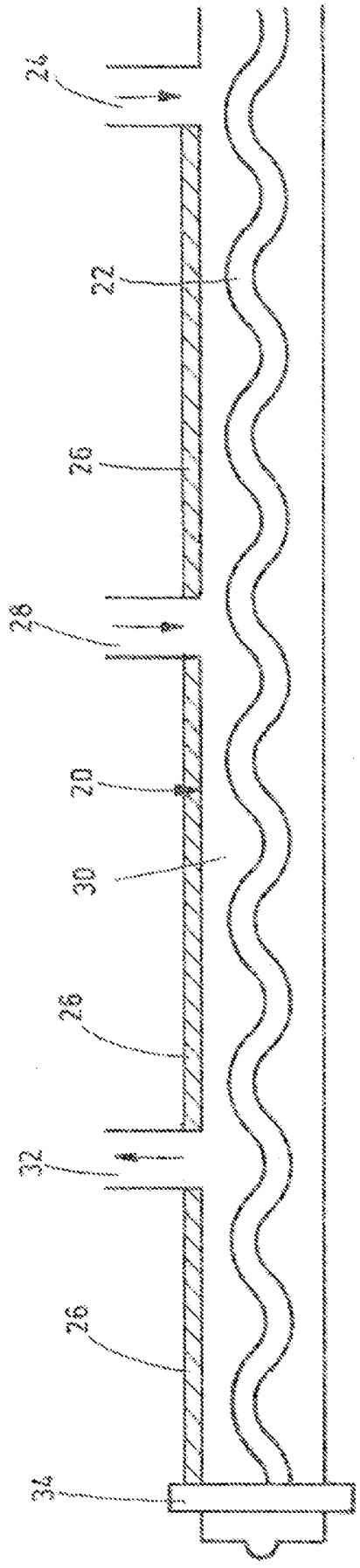

Fig.2

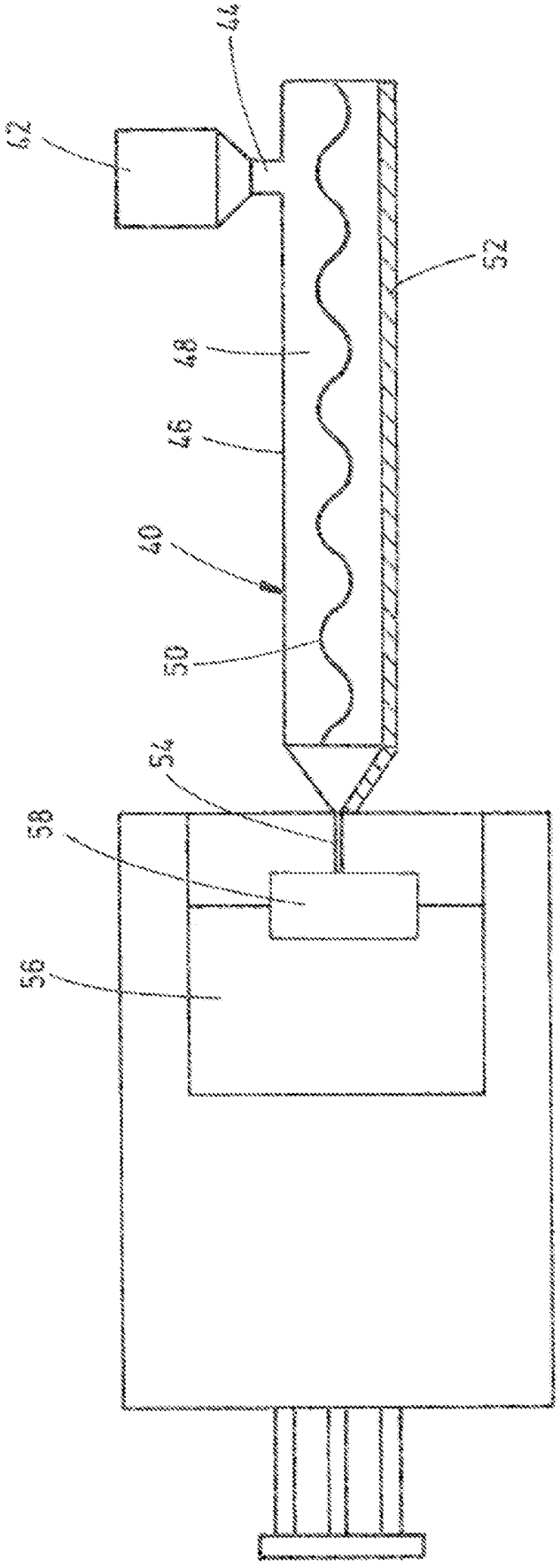

Fig.3