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(71) Applicant: **BOTTERO S.p.A.**
Via Genova, 82
I-12010 Roata Canale (Cuneo)(IT)

(72) Inventor: **Ghinamo, Leonardo**
Via Cuneo, 37
I-12012 Boves(IT)

(74) Representative: **Jorio, Paolo et al**
STUDIO TORTA Società Semplice Via Viotti 9
I-10121 Torino(IT)

(54) A system for distributing small quantities of glass into suitable moulds for the production of glass product.

(57) A system is described for the distribution of small quantities of molten glass into appropriate moulds for the production of glass products, of the type comprising a rotating distributor (5) adapted to channel the quantities of molten glass in a predetermined sequence via its lower portion (7) to a plurality of moulds positioned along the arc of a circle described in several stops by the lower portion (7).

The principal characteristic of the present invention lies in the fact that it includes a stepping motor (13) controlled by an electronic central processor (23) operable to control, by means of a transmission mechanism (19, 36, 53 or 61) the axial translation of a rack (3) a toothed portion of which meshes with a central toothed portion (4) of the distributor (5).

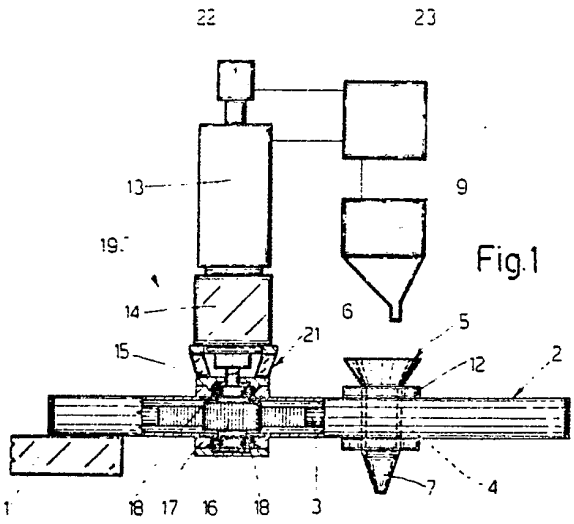

Fig.1

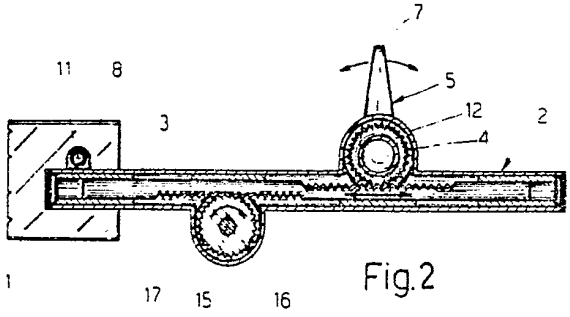

Fig.2

EP 0 353 322 A1

A SYSTEM FOR DISTRIBUTING SMALL QUANTITIES OF GLASS INTO SUITABLE MOULDS FOR THE PRODUCTION OF GLASS PRODUCTS

The present invention relates to a system for distributing small quantities of molten glass into suitable moulds for the production of glass products.

Present systems of the above-indicated type essentially comprise a distributor element having a funnel-shape upper part, a toothed central part meshing with a rack, and a bent lower part able to distribute small quantities of molten glass into the moulds. The distributor element can rotate, under the action of the rack, about the axis of its central part in such a way that the lower part can distribute small quantities of molten glass in a predetermined sequence into moulds positioned along the arc of the circle described by the end of the lower part. The rack is installed within an arm supported by a frame which further supports an electric motor which, by means of a series of cams, controls the rotation of a cam lever. A profile of this latter cooperates with one end of the rack and causes axial translation of this. The sequence of distribution of the small quantities of molten glass is determined by the succession of displacements of the cam lever controlled by the electric motor.

Systems such as that described above have several disadvantages.

In particular, in such systems, when it is desired to vary the sequence of distribution of the small quantities of molten glass it is necessary to install a different cam lever designed in such a way that the new distribution sequence corresponds to its succession of displacements controlled by the electric motor. The operator must, therefore, with all the costs which this involves, have available a plurality of interchangeable cam levers one for each distribution sequence which it is possible to select. Moreover, given the constructional complexity of the transmission mechanism from the electric motor to the rack, the replacement of the cam lever is not easily achieved.

The object of the present invention is that of providing a system for the distribution of small quantities of molten glass into suitable moulds for the production of glass products, which will be free from the stated disadvantages and which, therefore, will be flexible in such a way that it is possible to deliver quantities of molten glass in different distribution sequences with the same mechanism.

Further objects and advantages will be described in the course of the following description.

According to the present invention there is provided a system for distributing quantities of molten glass into appropriate moulds for the production of glass products, of the type comprising at least one rotary distributor adapted to receive quantities of molten glass from a feeder and to direct these in a predetermined distribution sequence via its bent lower portion to a plurality of underlying moulds positioned along the arc of a circle described in several stops by the end of the said lower portion, characterised by the fact that it includes a stepping motor controlled by an electronic processor and a mechanism for transmitting motion from the output shaft of the said stepping motor to an axially translatable rack having a toothed portion meshing with a central toothed portion of the said distributor.

For a better understanding of the present invention several preferred embodiments are now described purely by way of non-limitative example, with reference to the attached drawings, in which:

Figures 1 and 2 are respectively partially sectioned side and plan views of a first embodiment of the system of the invention;

Figure 3 is a partially sectioned plan view of a second embodiment of the system of the invention;

Figure 4 is a section on an enlarged scale taken on the line IV-IV of Figure 3;

Figure 5 is a partially sectioned plan view of a third embodiment of the system of the invention;

Figure 6 is a section taken on the line VI-VI of Figure 5; and

Figure 7 is a partially sectioned plan view of a fourth embodiment of the system of the invention.

As illustrated in Figures 1 and 2 the system of the invention comprises a frame 1 which supports a hollow arm 2 within which is installed an axially translatable rack 3 a toothed portion of which meshes with a central toothed portion 4 of a rotary distributor 5. This has a funnel shaped upper portion 6 and a lower portion 7 bent with respect to the axis of the portion 4 and adapted to channel quantities of molten glass in a predetermined sequence to a plurality of moulds of known type positioned beneath the end of the portion 7 along the arc of the circle described by this end during rotation of the distributor 5. The quantities of molten glass are introduced into the distributor 5 from an appropriate feeder 9 schematically indicated in Figure 1 since it is of known type and naturally disposed above the portion 6. From one end of the arm 2 extends a lug 8 pivoted to a vertical pin 11 carried by the frame 1. The arm 2 can therefore rotate about the pin 11 between a working position illustrated in the Figure and a retracted position which allows access to the feeder device 9. Rota-

tion of the arm 2 takes place in a known manner by the action of a pneumatic or hydraulic piston, not illustrated for simplicity. This rotation takes places automatically in the event of incorrect operation or breakdown of the system. The central portion 4 of the distributor 5 is housed in a semi-cylindrical seat 12 formed in a side wall of the arm 2.

The part of the system described so far is also found in the other embodiments illustrated in the attached drawings. For this reason the reference numerals for such parts will be the same for all the embodiments of the system.

With reference to Figures 1 and 2, the system of the invention includes a stepping motor 13 the output shaft of which is vertical and is connected by means of a transmission mechanism 19 to the rack 3. The mechanism 19 includes a reduction gear box 14 mounted on the output shaft of the motor 13 and a toothed wheel 16 fitted to the output shaft 15 of the reduction gear box 14. The wheel 16 meshes with a second toothed part of the rack 3 and is housed in a semi-cylindrical seat 17 formed in a lateral wall of the arm 2. In this seat 17 are housed two bearings 18 for centring the shaft 15. On the upper edge of the seat 17 is fixed a small frame 21 which supports the reduction gear box 14 and therefore also the stepping motor 13. On the output shaft of the stepping motor 13 is mounted a position sensor 22 preferably made by utilising an optical encoder, adapted to detect the angular position of the output shaft of the stepping motor 13 and therefore to detect the angular position of the distributor 5. As already mentioned, in use the distributor 5 rotates to assume different angular positions corresponding to the position of the moulds positioned along an arc of a circle described by a succession of stopping positions of the end of the lower portion 7. At each stop the lower portion 7 channels a small quantity of molten glass into the underlying mould. The sequence of displacements of the distributor 5 is programmable in an electronic control processor 23 which, on the basis of detection of the angular position of the output shaft of the stepping motor 13, controls the supply of electrical pulses to this latter thus determining the displacement of the distributor 5 between one stop and the next. At each stop the central processor 23 controls the feeder 9 in such a way that this allows a small quantity of molten glass to fall into the distributor 5.

In other embodiments of the system of the invention the motor 13 is connected to the rack 3 by means of a respective transmission mechanism including a cam lever 25. This has a first end pivoted to a vertical pin 26 carried by the frame 1 and a second end from which a tongue 27 extends co-planarly (Figure 4) which has a U-shape slot 28 formed on the face directed towards the frame 1. This slot 28 is engaged by a roller 31 freely rotatably mounted on a vertical pin 32 carried by a flat tongue 33 extending from the end of the rack 3 projecting from the arm 2. The lever 25 has along its perimetral edge facing the distributor 5, and which starts close to the said second end, a curved profile 34 adapted to cooperate with the roller 31 (according to the broken outline arrow) during rotation of the arm 2 in the first mentioned cases.

Between the motor 13 and the lever 25, as already described, each embodiment illustrated in Figures 3, 5 and 7 has a different mechanism for transmitting motion which in each case causes a reduced rotation of the lever 25 about the pin 26. Rotation of the lever 25 causes a corresponding axial translation of the rack 3 and therefore, by means of this, an amplified rotation of the distributor 5. The amplification ratio between the rotation of the lever 25 and of the distributor 5 is a function of the diameter and therefore of the number of teeth formed on the central portion 4 of the distributor 5.

As illustrated in Figure 3, a transmission mechanism generally indicated 36 is mounted between the stepping motor 13 and the lever 25. The mechanism 36 includes a reduction gear box 37 having a first output shaft 38 on which is fitted a first toothed wheel 41 meshing, by means of a second toothed wheel 42, with a third toothed wheel 43 fitted on the output shaft of the stepping motor 13. The reduction gear box 37 includes a second output shaft 44 orthogonal to the first and having at one end a toothed bevel gear 45 meshing with a toothed bevel gear 46 the hub 47 of which is supported by the frame 1. On the hub 47 there is fitted a crank 48 coupled to a connecting rod 51 one end of which is pivoted to a central part of the lever 25. Also mounted on the shaft 44 is the position sensor 22 connected to the central processor 23 to which the stepping motor 13 is also connected. For simplicity in Figure 3, as also in Figures 5 and 7, the feeder 9 has not been illustrated.

In Figure 7 the reference numeral 53 indicates a transmission mechanism similar to the mechanism 36 and therefore indicated with the same reference numerals. The single difference lies in the fact that in place of the crank and connecting rod mechanism the mechanism 53 has a rotating element 54 keyed to the hub 47 and including a slot 55 with a curvilinear longitudinal axis within which is housed a roller 56 freely rotatable on a vertical pin 57 carried by the lever 25.

As illustrated in Figure 5 a transmission mechanism generally indicated 61 comprises a reduction gear box 62 mounted on the output shaft of the stepping motor 13 on which the sensor 22 is also mounted. The reduction gear box 62 has an output shaft 63 on which is keyed a first toothed

wheel 64 meshing, by means of a second toothed wheel 65, with a third toothed wheel 66 keyed onto one end of a worm screw 67 installed within a seat 68 formed in the frame 1. Along the worm screw 67 an internally threaded sleeve 71 is translatable, which externally has a U-shape slot 72 engaged by a roller 73 freely rotatably mounted (Figure 6) on a vertical pin 74 carried by an intermediate portion of the lever 25.

As already described the distributor 5 rotates according to a predetermined sequence set into the central processor 23 and performs several stops at each of which it channels a small quantity of molten glass into the underlying mould. In fact, at each stop the central processor 23 controls the feeder 9 which allows a small quantity of molten glass to fall into the distributor 5. The rotation of the distributor 5 is determined by the axial translation of the rack 3 which receives motion from the stepping motor 13 by means of a transmission mechanism 19, 36, 53 or 61. The stepping motor 13 is supplied from the central processor 23 which, via its connection with the sensor 22, indirectly controls the displacements of the distributor 5. The operation of the distribution mechanisms 19, 36, 51 and 61 are not described because they are simple to understand.

From what has been described above the advantages achieved with the embodiment of the present invention will be evident.

In particular, in the systems described above it is possible to set several sequences for the distribution of small quantities of molten glass without having to replace any components of the transmission mechanism each time. The systems are thus particularly flexible therefore favouring any requirements of the user as far as the sequence of distribution is concerned which, it will be recalled, are varied by variation in the number, disposition and size of the moulds. Therefore, by exploiting the characteristics of the stepping motor it is possible to make the transmission mechanism of the system simple in construction and independent of the distribution sequence. Finally, the above described systems have several identical components even if they are combined and positioned in a different manner. This makes it possible to produce systems of different configuration utilising a certain number of similar components, with all the advantages which derive therefrom as far as production costs are concerned.

Finally, it is clear that the systems described and illustrated here can have modifications and variations introduced thereto without by this departing from the protective ambit of the present invention.

In particular, the position sensor 22 can be fitted to the output shaft of the stepping motor or to the output shaft of the reduction gear box. In place of the sensor 22 the sensor can be provided with a different sensor which can be fitted to the rack 3 or on the arm 2 and adapted to detect the translation of the rack 3.

Finally, it is to be noted that on the same system there can be installed several distributors 5 caused to rotate in use by the same rack.

Claims

1. A system for the distribution of small quantities of molten glass into appropriate moulds for the production of glass products, of the type comprising at least one rotating distributor (5) adapted to receive small quantities of molten glass from a feeder (9) and to channel these in a predetermined distribution sequence via a bent lower portion (7) to a plurality of underlying moulds positioned along the arc of a circle described in successive stops by the end of the said lower portion (7), characterised by the fact that it comprises a stepping motor (13) controlled by an electronic central processor (23) and a transmission mechanism (19, 36, 53 or 61) for transmitting motion between the output shaft of the said stepping motor (13) and an axially translatable rack (3) having a toothed portion meshing with a central toothed portion (4) of the said distributor (5).

2. A system according to Claim 1, characterised by the fact that it includes a position sensor (22) mounted on the output shaft of the said stepping motor (13) and adapted to detect the angular position of this latter and to indicate this position to the said central processor (23).

3. A system according to Claim 1, characterised by the fact that it includes a position sensor (22) mounted on a movable component of the said transmission mechanism (36) and adapted to detect the angular position of this component which is dependent on that of the output shaft of the said stepping motor (13) and to indicate this position to the said central processor (23).

4. A system according to Claim 1, characterised by the fact that it includes a position sensor (22) adapted to detect the axial position of the said rack (3) dependent on the angular position of the output shaft of the said stepping motor (13) and to indicate this position to the said central processor (23).

5. A system according to any preceding Claim, characterised by the fact that the said rack (3) is housed within a hollow arm (2) supported by a frame (1) and having a semi-cylindrical seat (12) in which the said central portion (4) of the said distributor (5) is housed, which latter further includes an upper, preferably funnel shape portion (6).

6. A system according to Claim 5, characterised by the fact that the said transmission mechanism (19) includes a reduction gear box (14) mounted on the output shaft of the said stepping motor (13) and having an output shaft (15) on which is keyed a toothed wheel (16) meshing with a second toothed portion of the said rack (3).

7. A system according to Claim 5, characterised by the fact that it includes a cam lever (25) pivoted at a first end to a first pin (16) carried by the said frame (1) and having at a second end a first tongue (27) in a slot (28) in which is housed a roller (31) freely rotatably mounted on a second pin (32) carried by a second tongue (33) extending from one end of the said rack (3); the said lever (25) having a perimetral edge portion (34) with a curved profile adapted to cooperate with the said roller (31) in the event of rotation of the said arm (2) about a pin (11) carried by the said frame (1).

8. A system according to Claim 7, characterised by the fact that the said transmission mechanism (36) includes a reduction gear box (37) connected to the output shaft of the said stepping motor (13) and having an output shaft (44) on which is fitted a first bevel gear (45) meshing with a second bevel gear (46) on the hub (47) of which is keyed a crank (48) coupled to a connecting rod (51) one end of which is pivoted to an intermediate portion of the said lever (25).

9. A system according to Claim 7, characterised by the fact that the said transmission mechanism (53) includes a reduction gear box (37) connected to the output shaft of the said stepping motor (13) and having an output shaft (44) on which is fitted a first bevel gear (45) meshing with a second bevel gear (46) to the hub (47) of which is fitted a rotating member (54) having a slot (55) with a curvilinear longitudinal axis within which is housed a roller (56) freely rotatably mounted on a pin (57) carried by the said lever (25).

10. A system according to Claim 7, characterised by the fact that the said transmission mechanism (61) includes a worm screw (67) adapted to receive motion from the output shaft (13) and along which is translatable an internally threaded sleeve (71) externally provided with a slot (72) in which is housed a roller (73) freely rotatably mounted on a pin (74) carried by an intermediate portion of the said lever (25).

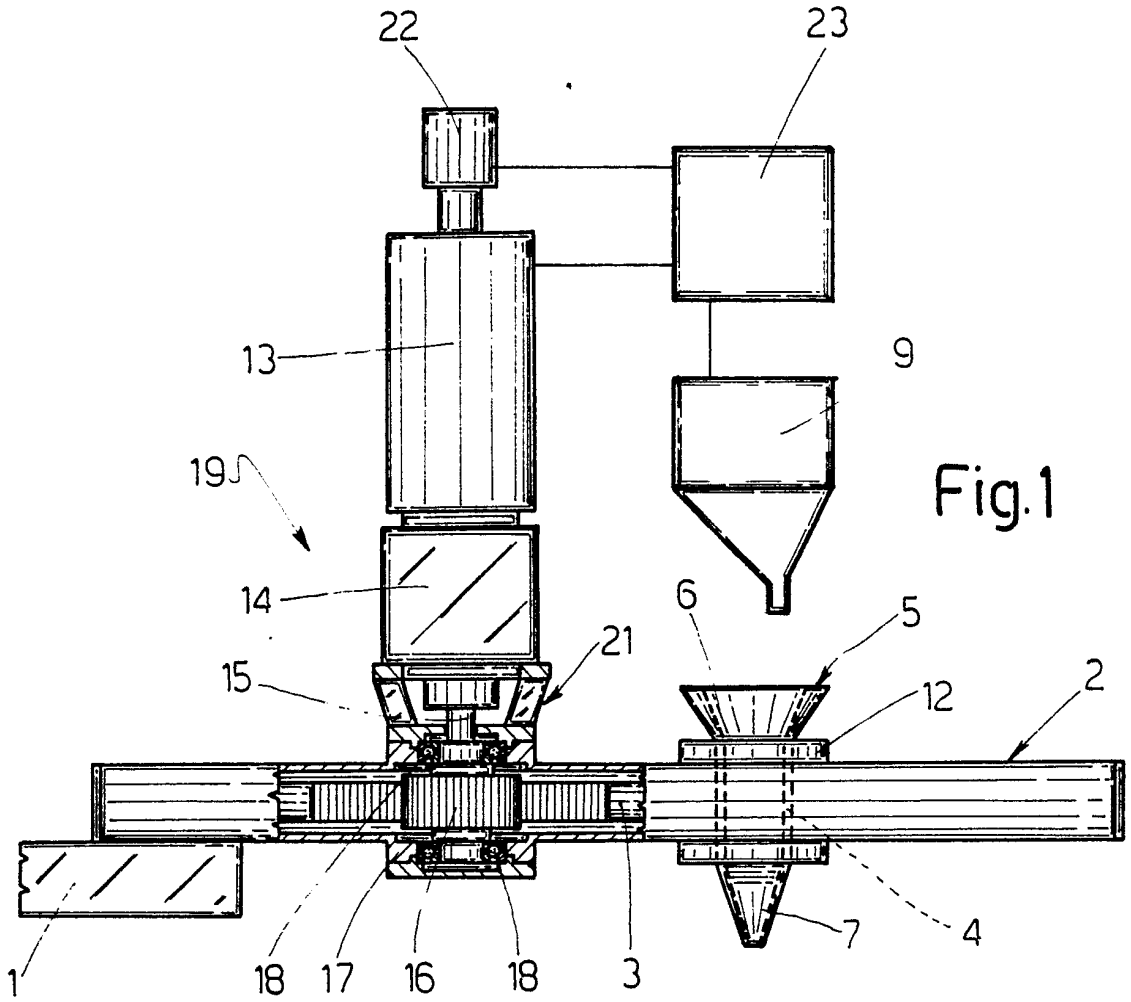

Fig.1

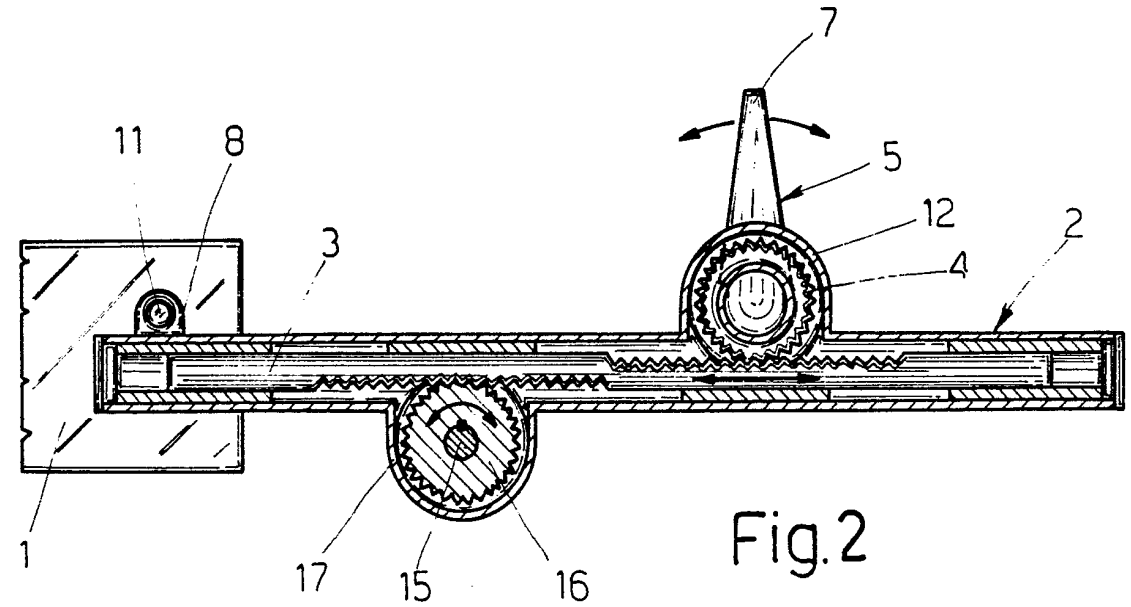

Fig.2

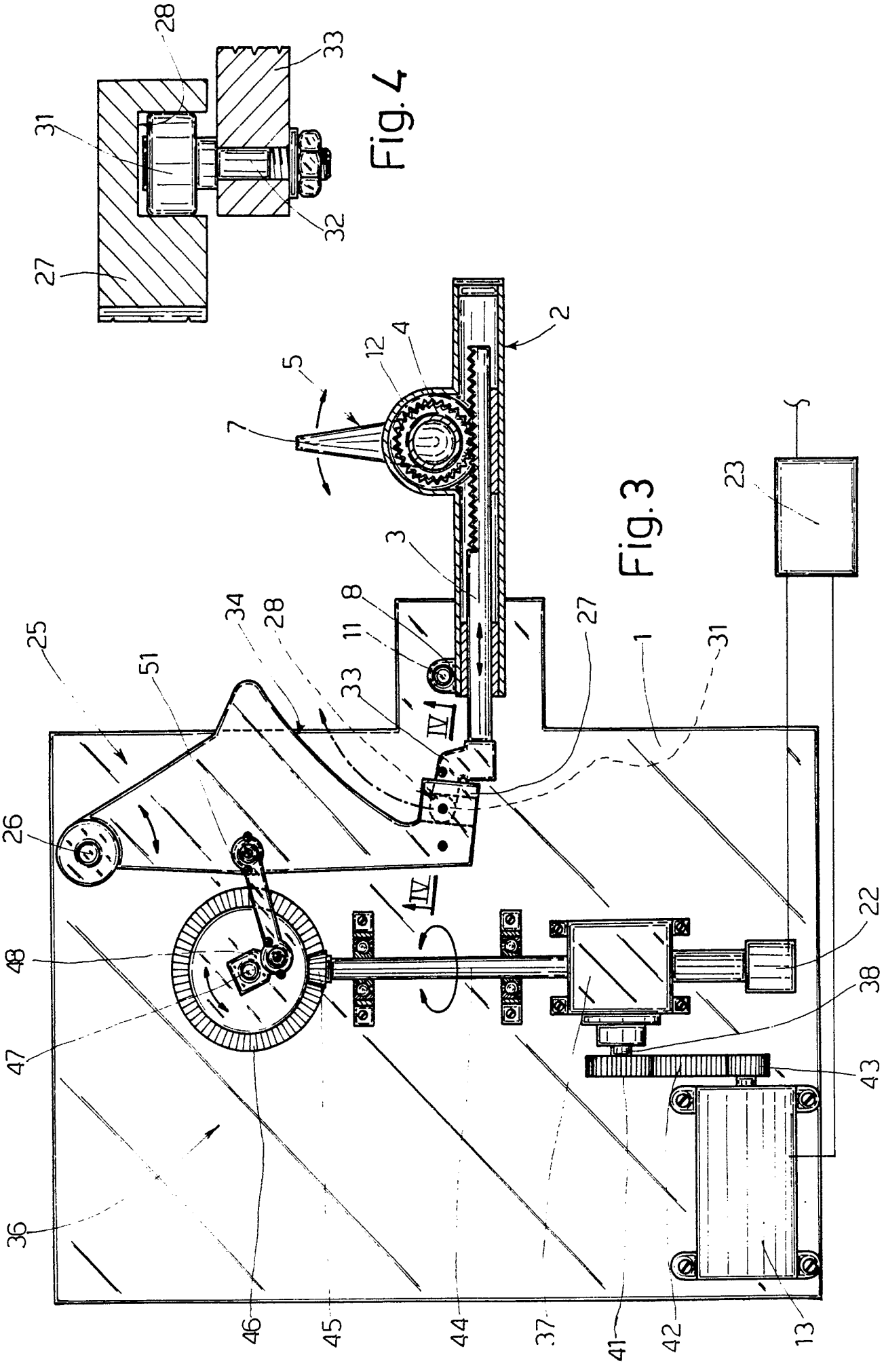
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Fig.4
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Fig.3

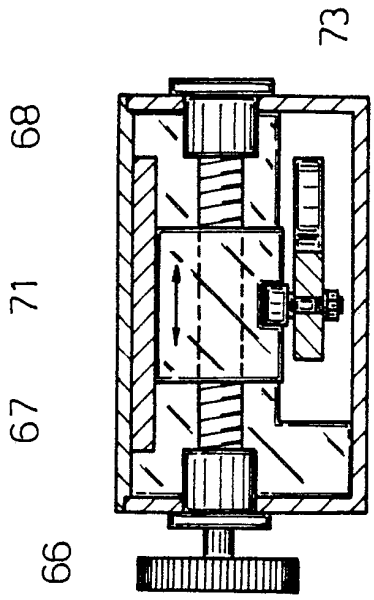
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Fig.6

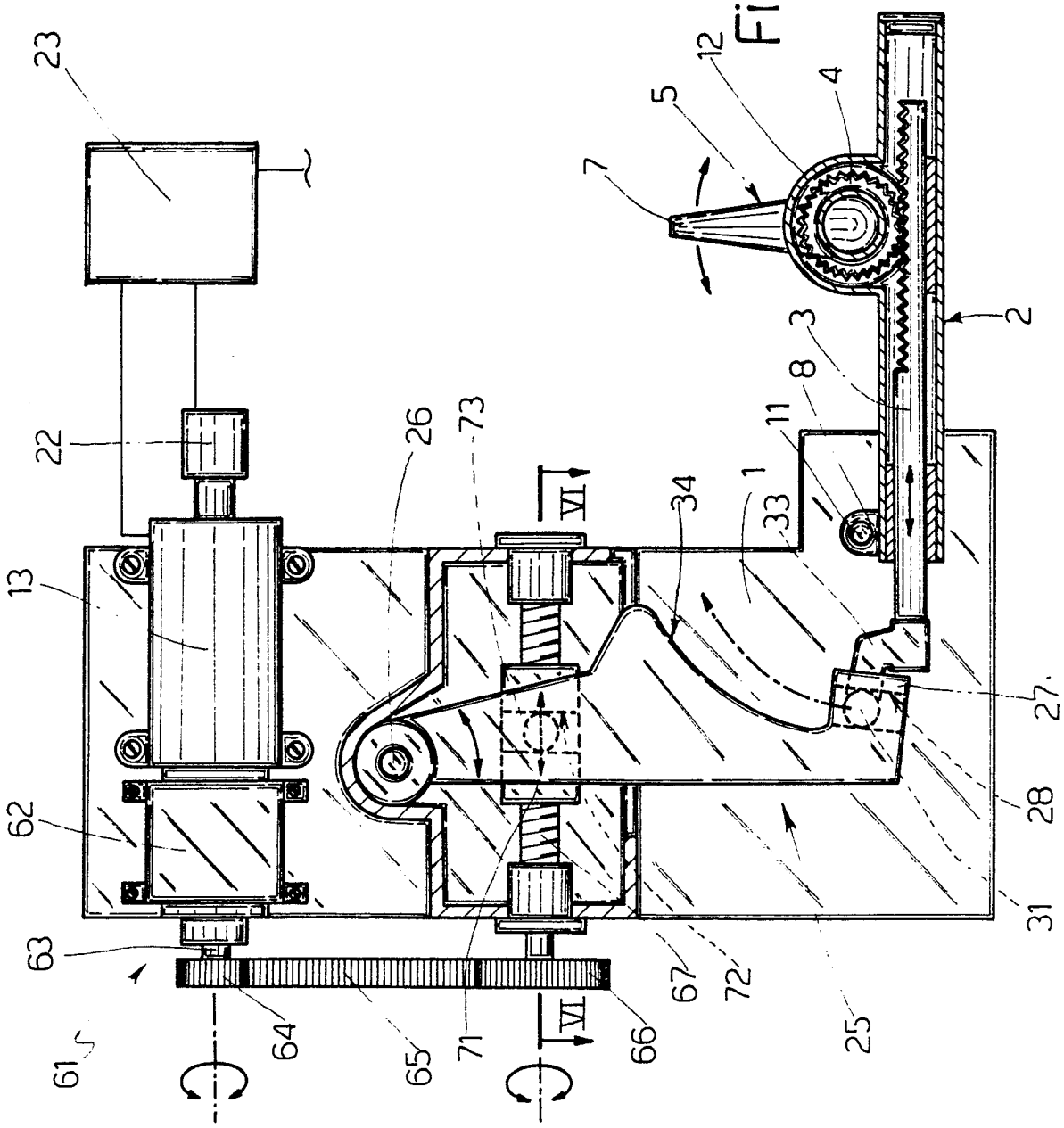
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Fig.5

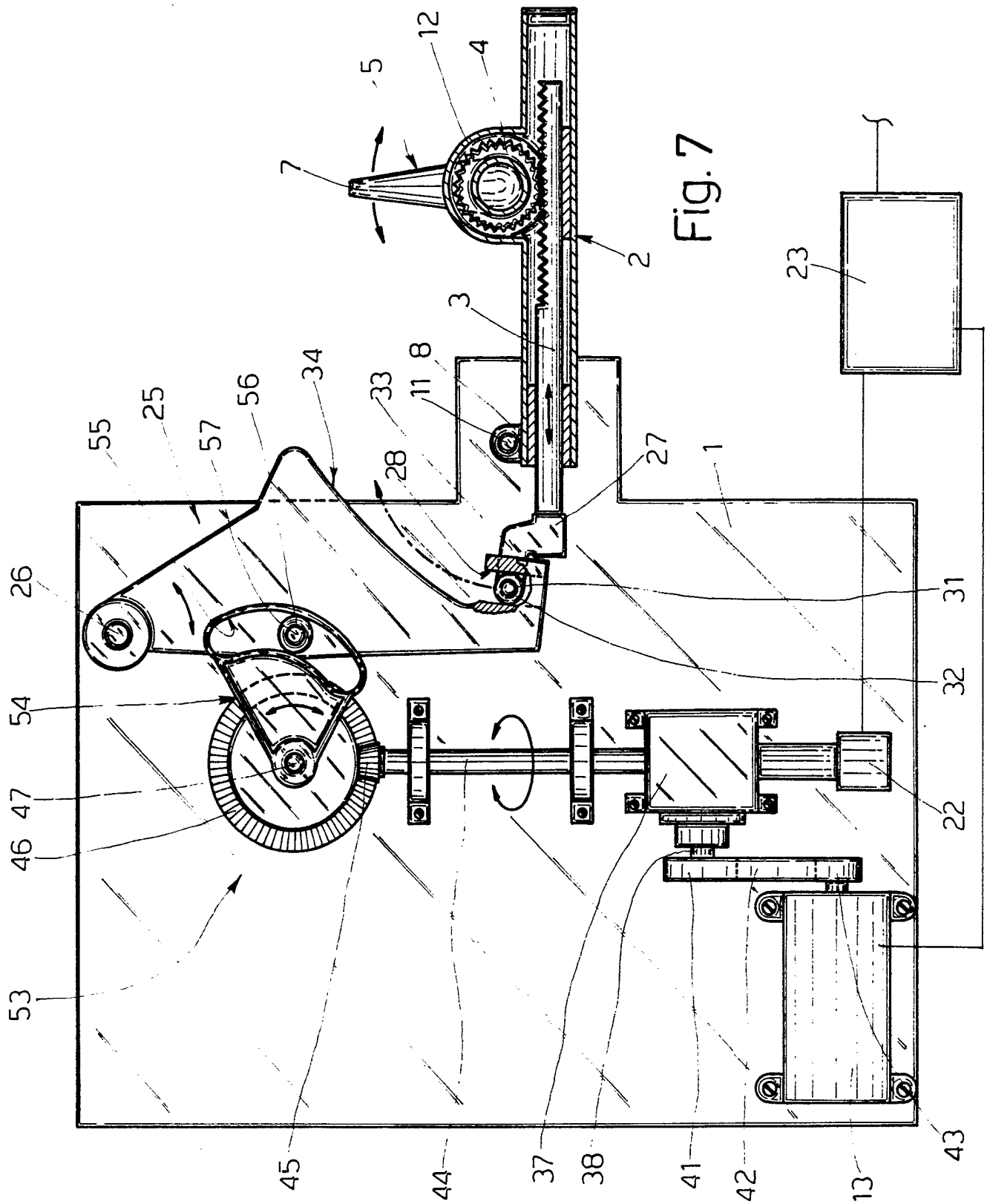
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Fig. 7

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 11 2566

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.4)
X	EP-A-0 202 116 (EMHART INDUSTRIES) * The whole document *	1	C 03 B 7/16
X	US-A-3 721 544 (BYSTRIANYK) * The whole document *	1	
A	US-A-3 871 858 (MARTIN) * The whole document *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

C 03 B 7/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23-03-1989	VAN DEN BOSSCHE W.L.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
O : non-written disclosure
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)

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wheel 64 meshing, by means of a second toothed wheel 65, with a third toothed wheel 66 keyed onto one end of a worm screw 67 installed within a seat 68 formed in the frame 1. Along the worm screw 67 an internally threaded sleeve 71 is translatable, which externally has a U-shape slot 72 engaged by a roller 73 freely rotatably mounted (Figure 6) on a vertical pin 74 carried by an intermediate portion of the lever 25.

As already described the distributor 5 rotates according to a predetermined sequence set into the central processor 23 and performs several stops at each of which it channels a small quantity of molten glass into the underlying mould. In fact, at each stop the central processor 23 controls the feeder 9 which allows a small quantity of molten glass to fall into the distributor 5. The rotation of the distributor 5 is determined by the axial translation of the rack 3 which receives motion from the stepping motor 13 by means of a transmission mechanism 19, 36, 53 or 61. The stepping motor 13 is supplied from the central processor 23 which, via its connection with the sensor 22, indirectly controls the displacements of the distributor 5. The operation of the distribution mechanisms 19, 36, 51 and 61 are not described because they are simple to understand.

From what has been described above the advantages achieved with the embodiment of the present invention will be evident.

In particular, in the systems described above it is possible to set several sequences for the distribution of small quantities of molten glass without having to replace any components of the transmission mechanism each time. The systems are thus particularly flexible therefore favouring any requirements of the user as far as the sequence of distribution is concerned which, it will be recalled, are varied by variation in the number, disposition and size of the moulds. Therefore, by exploiting the characteristics of the stepping motor it is possible to make the transmission mechanism of the system simple in construction and independent of the distribution sequence. Finally, the above described systems have several identical components even if they are combined and positioned in a different manner. This makes it possible to produce systems of different configuration utilising a certain number of similar components, with all the advantages which derive therefrom as far as production costs are concerned.

Finally, it is clear that the systems described and illustrated here can have modifications and variations introduced thereto without by this departing from the protective ambit of the present invention.

In particular, the position sensor 22 can be fitted to the output shaft of the stepping motor or to the output shaft of the reduction gear box. In place of the sensor 22 the sensor can be provided with a different sensor which can be fitted to the rack 3 or on the arm 2 and adapted to detect the translation of the rack 3.

Finally, it is to be noted that on the same system there can be installed several distributors 5 caused to rotate in use by the same rack.

Claims

1. A system for the distribution of small quantities of molten glass into appropriate moulds for the production of glass products, of the type comprising at least one rotating distributor (5) adapted to receive small quantities of molten glass from a feeder (9) and to channel these in a predetermined distribution sequence via a bent lower portion (7) to a plurality of underlying moulds positioned along the arc of a circle described in successive stops by the end of the said lower portion (7), characterised by the fact that it comprises a stepping motor (13) controlled by an electronic central processor (23) and a transmission mechanism (19, 36, 53 or 61) for transmitting motion between the output shaft of the said stepping motor (13) and an axially translatable rack (3) having a toothed portion meshing with a central toothed portion (4) of the said distributor (5).

2. A system according to Claim 1, characterised by the fact that it includes a position sensor (22) mounted on the output shaft of the said stepping motor (13) and adapted to detect the angular position of this latter and to indicate this position to the said central processor (23).

3. A system according to Claim 1, characterised by the fact that it includes a position sensor (22) mounted on a movable component of the said transmission mechanism (36) and adapted to detect the angular position of this component which is dependent on that of the output shaft of the said stepping motor (13) and to indicate this position to the said central processor (23).

4. A system according to Claim 1, characterised by the fact that it includes a position sensor (22) adapted to detect the axial position of the said rack (3) dependent on the angular position of the output shaft of the said stepping motor (13) and to indicate this position to the said central processor (23).

5. A system according to any preceding Claim, characterised by the fact that the said rack (3) is housed within a hollow arm (2) supported by a frame (1) and having a semi-cylindrical seat (12) in which the said central portion (4) of the said distributor (5) is housed, which latter further includes an upper, preferably funnel shape portion (6).

claims con miei commenti

6. A system according to Claim 5, characterised by the fact that the said transmission mechanism (13) includes a reduction gear box (14) mounted on the output shaft of the said stepping motor (13) and having an output shaft (15) on which is keyed a toothed wheel (16) meshing with a second toothed portion of the said rack (3).

7. A system according to Claim 5, characterised by the fact that it includes a cam lever (25) pivoted at a first end to a first pin (16) carried by the said frame (1) and having at a second end a first tongue (27) in a slot (28) in which is housed a roller (31) freely rotatably mounted on a second pin (32) carried by a second tongue (33) extending from one end of the said rack (3); the said lever (25) having a perimetral edge portion (34) with a curved profile adapted to cooperate with the said roller (31) in the event of rotation of the said arm (2) about a pin (11) carried by the said frame (1).

8. A system according to Claim 7, characterised by the fact that the said transmission mechanism (36) includes a reduction gear box (37) connected to the output shaft of the said stepping motor (13) and having an output shaft (44) on which is fitted a first bevel gear (45) meshing with a second bevel gear (46) on the hub (47) of which is keyed a crank (48) coupled to a connecting rod (51) one end of which is pivoted to an intermediate portion of the said lever (25).

9. A system according to Claim 7, characterised by the fact that the said transmission mechanism (53) includes a reduction gear box (37) connected to the output shaft of the said stepping motor (13) and having an output shaft (44) on which is fitted a first bevel gear (45) meshing with a second bevel gear (46) to the hub (47) of which is fitted a rotating member (54) having a slot (55) with a curvilinear longitudinal axis within which is housed a roller (56) freely rotatably mounted on a pin (57) carried by the said lever (25).

10. A system according to Claim 7, characterised by the fact that the said transmission mechanism (61) includes a worm screw (67) adapted to receive motion from the output shaft (13) and along which is translatable an internally threaded sleeve (71) externally provided with a slot (72) in which is housed a roller (73) freely rotatably mounted on a pin (74) carried by an intermediate portion of the said lever (25).

cancellato sul B1

c'è un riduttore (14) fig. 1
(c'è già.. ref 13 vecchio)

c'è una leva camma (fig. 4)
(c'è già nel 13 e evitare)

cancellato sul B1

diventato 6, B1

c'è un riduttore 37 (fig. 3)

diventato 7, B1

c'è un riduttore (fig. 7)
una coppia conica 45

diventato 8, B1

c'è vite SP (fig 6)