(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 958 904 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
24.11.1999 Bulletin 1999/47

(51) Int. Cl.[6]: **B28B 5/02**, B28B 3/12, B28B 23/02

(21) Application number: **99201586.7**

(22) Date of filing: **19.05.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **19.05.1998 NL 1009217**

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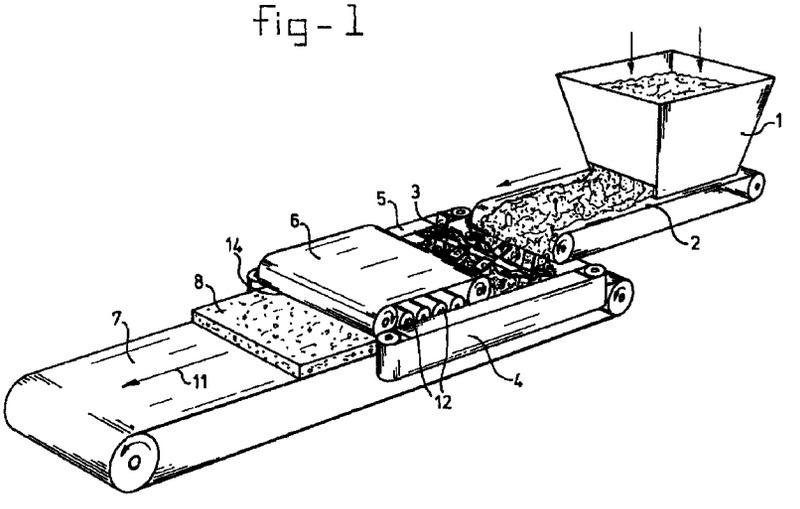
(54) Method and device for moulding sand-lime building products

(57) A method for moulding products from a settable mortar, such as sand-lime products, comprises the following steps:

- supplying a mortar,
- placing the mortar on a belt-like conveyor mechanism (7),
- enclosing the mortar between the said belt-like conveyor mechanism (7) and at least two further belt-like mechanisms (4,5,6) which extend along the first belt-like conveyor mechanism and adjoin the latter so as to form a tunnel-like mould cavity,
- moving the mortar through the mould cavity in order to mould the mortar (8), and
- arranging a rod-like or wire-like reinforcement (13) in the mortar, which reinforcement is conveyed through the mould cavity together with the mortar

Fig-1



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Description

[0001] The invention relates to the fabrication of products such as bricks, blocks or panels made from a settable mortar. In particular, the invention relates to the production of sand-lime products.

[0002] According to a standard production technique, the mortar is placed in a moulding die. A moulding die of this nature usually comprises a moulding box which is closed off on the underside by means of a pressure plunger and on the top side by means of a pressure plate or a second moulding plunger.

[0003] By means of the moulding plunger(s), the mortar in the moulding box is compressed, after which the compressed product is ejected by means of the bottom moulding plunger. Finally, the product is convened in an autoclave under the influence of saturated steam and heat; in the case of a mortar comprising lime and sandstone, the result is hydrated calcium silicate, otherwise known as lime sandstone.

[0004] This known method has a number of drawbacks. Firstly, a different moulding die is required for each format. Only one dimension, namely the height, can be varied for each moulding die.

[0005] Furthermore, the successive method steps of filling, compressing and ejecting require a relatively long time. Moreover, the method is energy-intensive, as a result of the high speeds, accelerations and decelerations involved in achieving a reasonable production capacity.

[0006] Furthermore, US-A-1,473,044 has disclosed a method for moulding products from a settable mortar, comprising the following steps:

- supplying a mortar,
- placing the mortar on a belt-like conveyor mechanism,
- enclosing the mortar between the said belt-like conveyor mechanism and at least two further belt-like mechanisms which extend along the first belt-like conveyor mechanism and adjoin the latter so as to form a tunnel-like mould cavity,
- moving the mortar through the mould cavity in order to mould the mortar.

[0007] In this known method, the steps of filling, compressing and discharging are also carried out, but now these steps are carried out continuously. The result is that more time is available for compression, so that this step can be carried out more gradually and therefore requires less energy.

[0008] Although this known method can be used to produce products of varying dimensions, there are nevertheless problems with further processing. In the case of wall panels, for example, there is a problem of possible breakage when they are lifted at the construction site. This breakage may be caused by the force exerted when the panels are lifted. However, unforeseen impact loads may also cause a breakage.

[0009] The object of the invention is therefore to provide a method for fabricating products made from sand-lime which have an improved mechanical resistance to such loads. This object is achieved by means of a method for moulding products from a settable mortar, such as sand-lime products, comprising the following steps:

- supplying a mortar,
- placing the mortar on a belt-like conveyor mechanism,
- enclosing the mortar between the said belt-like conveyor mechanism and at least two further belt-like mechanisms which extend along the first belt-like conveyor mechanism and adjoin the latter so as to form a tunnel-like mould cavity,
- moving the mortar through the mould cavity in order to mould the mortar, and
- arranging a rod-like or wire-like reinforce-ment in the mortar, which reinforcement is conveyed through the mould cavity together with the mortar.

[0010] The reinforcement used may be any kind of materials which are able to withstand a temperature of 200°C, which is the temperature in the autoclave during the conversion process. The reinforcement may comprise metal or plastic, and may be in the form of rods, wires, mats and the like.

[0011] It is also possible to vary the dimensions not only in the thickness direction but also in the longitudinal direction, in that the continuously pressed length of material can be sawn off to the desired length.

[0012] The method according to the invention comprises in particular the step of moving the mortar through a mould cavity, the cross-sectional dimensions of which decrease gradually, transversely with respect to the conveying direction, in order to compress the mortar.

[0013] Preferably, the compression is carried out by the step of moving the mortar through a mould cavity using parallel top and bottom belt-like mechanisms which are at a distance from one another which decreases gradually in the conveying direction.

[0014] The invention also relates to a device for moulding products using the method described above. This device comprises a conveyor belt, means for feeding a mortar to the conveyor belt, as well as at least two further belts which extend along the conveyor belt and, together with the conveyor belt, enclose a mould cavity for moulding the mortar as it is conveyed, as well as means for feeding a reinforcement into the mould cavity. The dimensions of the cross-section decrease in the conveying direction.

[0015] Preferably, in total three further belts are provided, one of which extends at a distance above the conveyor belt, and the other two of which extend at a distance from one another, so as to bridge the distance

between the conveyor belt and the belt situated above it. The distance between the conveyor belt and the belt situated above it decreases in the conveying direction.

[0016] The mould cavity can be closed off by the conveyor belt and the belt situated above it being enclosed between the two further belts.

[0017] In order to ensure a desired, uniform pressure on the mortar when it is being moulded, the conveyor belt and the further belts, over their part which faces towards the mould cavity, may be supported by support rolls. In the same connection, the conveyor belt and the further belts, over their part which faces towards the mould cavity, may also be subjected to a tensile load in order to reduce deviations.

[0018] Finally, the invention relates to a moulded product, comprising a block-like or plate-like body made of compressed mortar and a reinforcement which extends between two oppositely directed faces of the product.

[0019] The invention will now be explained in more detail with reference to an exemplary embodiment which is illustrated in the figures, in which:

Figure 1 shows a perspective view of the device according to the invention;
Figure 2 shows a plan view of the device;
Figure 3 shows a side view of the device;
Figures 4-7 show views of a further device.

[0020] The device according to the invention which is illustrated in Figure 1 comprises a container 1 into which mortar, for example a mixture of lime and sandstone, is poured. By means of belt 2, this mortar 1 is added uniformly onto the conveyor belt 7.

[0021] At the spreader 3, the mortar is distributed uniformly over the surface of the conveyor belt 7.

[0022] Then, the mortar passes into the chamber which is defined between the conveyor belt 7, belt 6 situated above it and the side belts 4, 5. In the side view shown in Figure 3, it can be seen that the space between mutually facing parts 9, 10 of the belt 6 and the conveyor belt 7 decreases in the conveying direction 11.

[0023] As a result of this decreasing distance, the mortar is compressed, since the side belts 4, 5 prevent the mortar from moving sideways.

[0024] As the mortar is conveyed further between the belts 4-7, a compressed extrudate 8 is then formed.

[0025] Both the belt 6 and the conveyor belt 7 are in any case supported, at the location of the nip, by a number of rolls 12 which are positioned closely together and ensure that the surface of the mutually facing parts 9, 10 does not deviate under the pressure exerted by the mortar material.

[0026] In order to limit these deviations further, the parts 9, 10 are placed under a tensile load.

[0027] As shown in the side view illustrated in Figure 3, a wire-like or cable-like reinforcement 13 may also be arranged in the extrudate 8 via the access 15. This reinforcement 13 is pulled into the nip between the parts 9, 10 of the belts 7, 6 with the mortar. The reinforcement 13 may also comprise mats or a mesh or the like.

[0028] Finally, the extrudate 8 is cut to the desired length.

[0029] The device illustrated in Figures 4-7 comprises substantially the same components as the device in accordance with Figures 1 and 3, such as a container 1, belt 2 and spreader 3. There is also a conveyor belt 7, which is guided around the reversing rolls 16, 17. The belt 6 situated above it is guided around the reversing rolls 18, 19. The side belts 4, 5 are guided around the reversing rolls 20, 21.

[0030] As seen in the conveying direction 11, the distance between the conveyor belt 7 and the top belt 6 can be adjusted by means of a series of hydraulic adjustment devices 22 which interact with the top belt 6, and by a series of bottom hydraulic adjustment devices 23, which interact with the top part 10 of the bottom belt 7. The side belts 4 and 5 are each supported by means of rolls 24, 25.

[0031] As shown in Figure 7, each pair of adjustment devices 22, 23 comprises two hollow hydraulic piston-cylinder units, through which the tension rods 27 pass. The rolls 24, 25 are also rotatably mounted on these tension rods by means of bearings 28.

[0032] The hydraulic piston-cylinder units 26 each interact with a yoke 29, provided with a number of roller chains or axle chains 30 which extend one behind the other in the conveying direction and move along with the belts. These roller chains or axle chains 30 support the conveyor belts 6, 7, in particular their mutually facing parts 9, 10.

[0033] The yokes 29 furthermore support roller chains 31, over which the parts 32, 33 which face away from one another are guided.

[0034] As shown in Figure 6, each roller chain 30 comprises a relatively large number of rolls, thus ensuring a uniform pressure for the conveyor belts 6, 7.

Claims

1. Method for moulding products from a settable mortar, such as sand-lime products, comprising the following steps:

   - supplying a mortar,
   - placing the mortar on a belt-like conveyor mechanism,
   - enclosing the mortar between the said belt-like conveyor mechanism and at least two further belt-like mechanisms which extend along the first belt-like conveyor mechanism and adjoin the latter so as to form a tunnel-like mould cavity,
   - moving the mortar through the mould cavity in order to mould the mortar, and
   - arranging a rod-like or wire-like reinforce-ment in the mortar, which reinforcement is conveyed

through the mould cavity together with the mortar.

2. Method according to Claim 1, comprising the step of moving the mortar through a mould cavity, the cross-sectional dimensions of which decrease gradually, transversely with respect to the conveying direction, in order to compress the mortar.

3. Method according to Claim 2, comprising the step of moving the mortar through a mould cavity using parallel top and bottom belt-like mechanisms which are at a distance from one another which decreases gradually in the conveying direction.

4. Method according to Claim 3, comprising the step of moving the mortar through a mould cavity using two parallel vertical belt-like conveyor mechanisms which adjoin the top and bottom belt-like mechanisms.

5. Method according to one of the preceding claims, in which the reinforcement is in rod or wire form or is in the form of a reinforcement mat.

6. Method according to one of the preceding claims, in which the mortar comprises at least lime and sand.

7. Method according to one of the preceding claims, comprising the step of sawing through the moulded material transversely with respect to the conveying direction.

8. Method for moulding products from a settable sand-lime mortar, comprising the following steps:

- supplying a sand-lime mortar,
- placing the sand-lime mortar on a belt-like conveyor mechanism,
- enclosing the sand-lime mortar between the said belt-like conveyor mechanism and at least two further belt-like mechanisms which extend along the first belt-like conveyor mechanism and join the latter so as to form a tunnel-like mould cavity,
- moving the sand-lime mortar through the mould cavity in order to mould the mortar.

9. Device for moulding products from a mortar by means of the method according to one of Claims 1-8, comprising a conveyor belt (7), means (1, 2) for feeding a mortar to the conveyor belt (7), as well as at least two further belts (4-6) which extend along the conveyor belt (7) and, together with the conveyor belt (7), enclose a mould cavity (14) for moulding the mortar as it is conveyed, as well as means for feeding a reinforcement into the mould cavity.

10. Device according to Claim 9, in which the dimensions of the cross section decrease in the conveying direction (11).

11. Device according to Claim 9 or 10, in which three further belts (4-6) are provided, one (6) of which extends at a distance above the conveyor belt (7), and the other two (4, 5) of which extend at a distance from one another, so as to bridge the distance between the conveyor belt (7) and the belt (6) situated above it.

12. Device according to Claims 10 and 11, in which the distance between the conveyor belt (7) and the belt (6) situated above it decreases in the conveying direction (11).

13. Device according to Claim 12, in which the conveyor belt (7) and the belt (6) situated above it are enclosed between the two further belts (4, 5).

14. Device according to one of Claims 9-13, in which the conveyor belt (7) and the further belts (4-6), over their part which faces towards the mould cavity, are supported by support rolls (12).

15. Device according to one of Claims 9-14, in which the conveyor belt (7) and the further belts (4-6), over their part (9, 10) which faces towards the mould cavity, are subjected to a tensile load in order to reduce deviations.

16. Device according to one of Claims 9-15, in which sawing means are provided for sawing off the moulded material transversely with respect to the conveying direction.

17. Moulded product obtained by means of the method according to one of Claims 1-7, comprising a block-like or plate-like body of compressed mortar and a reinforcement which extends between two oppositely directed faces of the product.

18. Moulded product obtained by means of the method according to Claim 8, comprising a block-like or plate-like body made from compressed sand-lime mortar.

19. Moulded product according to Claim 18, in which there is a reinforcement inside the block-like or plate-like body.

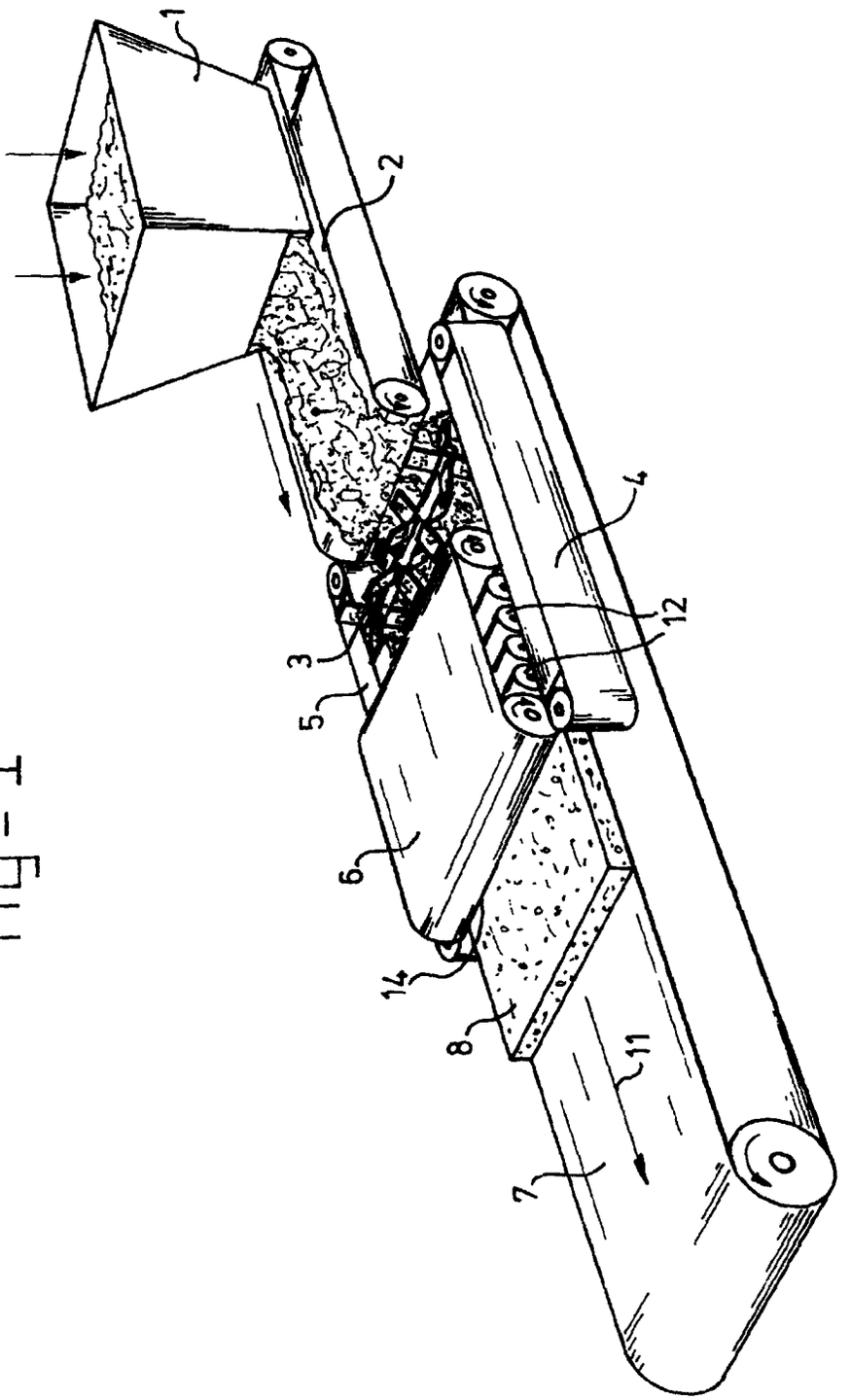


fig - 1

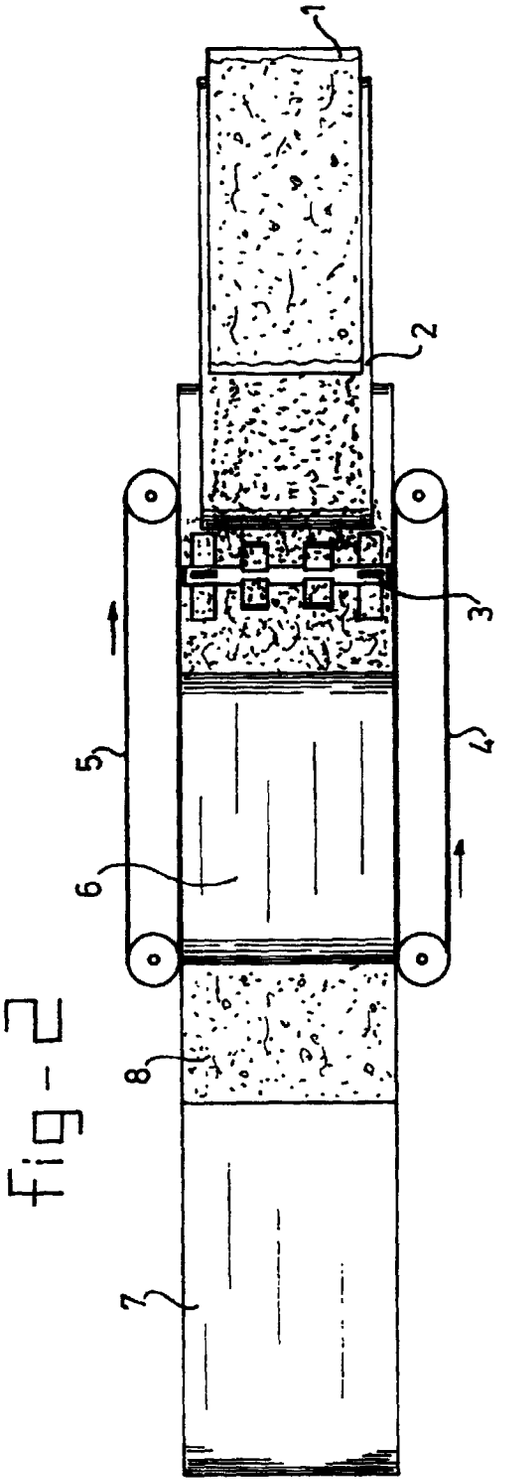


Fig - 2

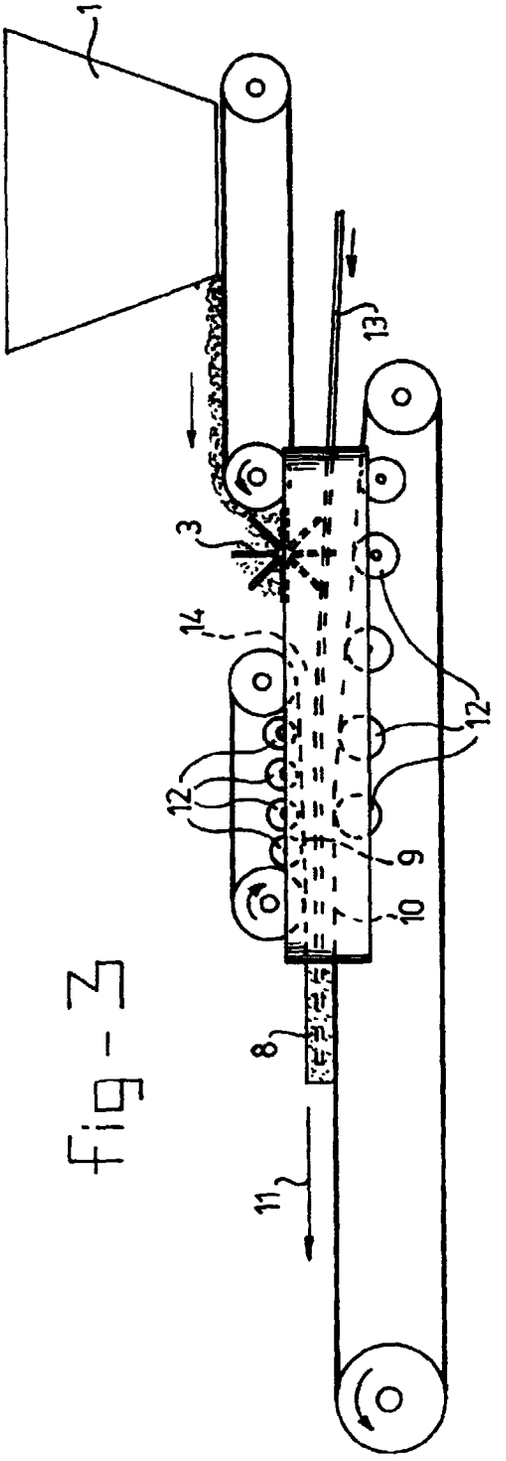


Fig - 3

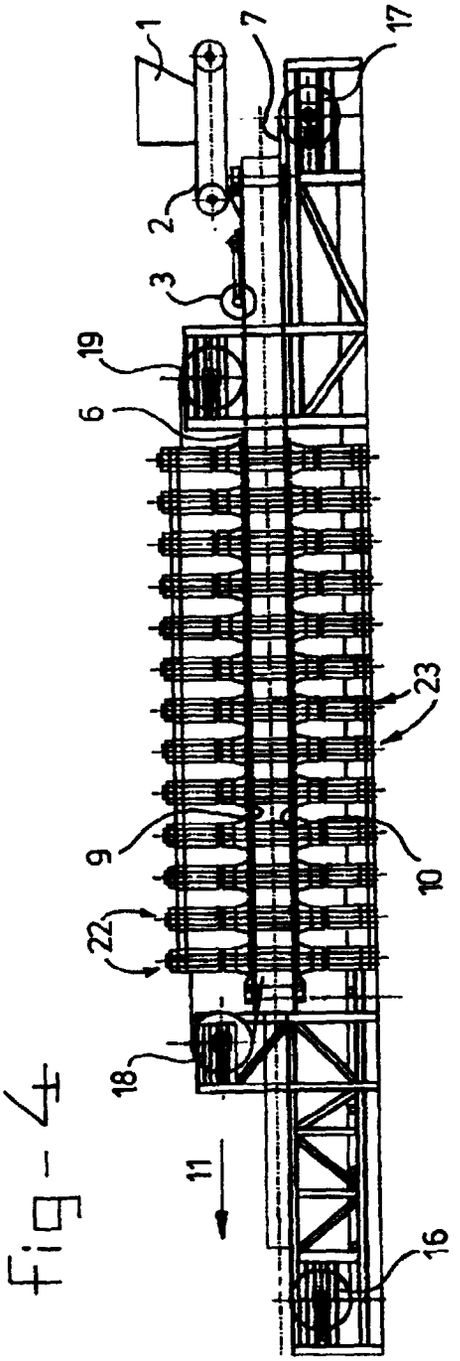


Fig - 4

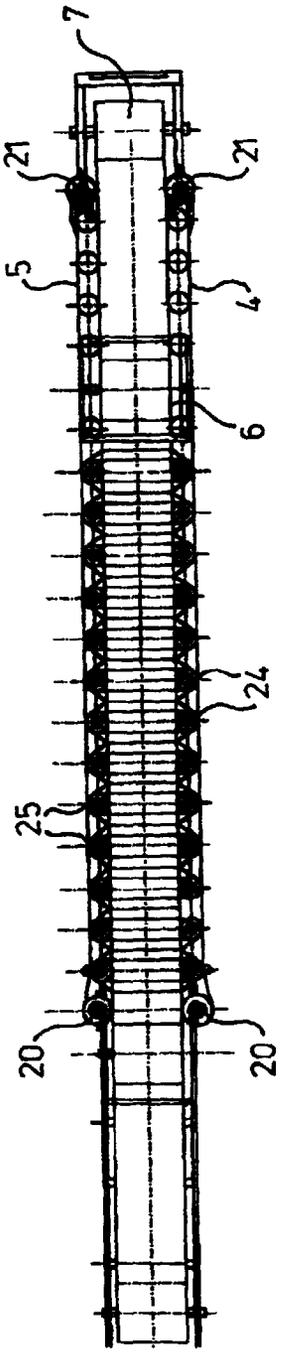


Fig - 5

Fig-6

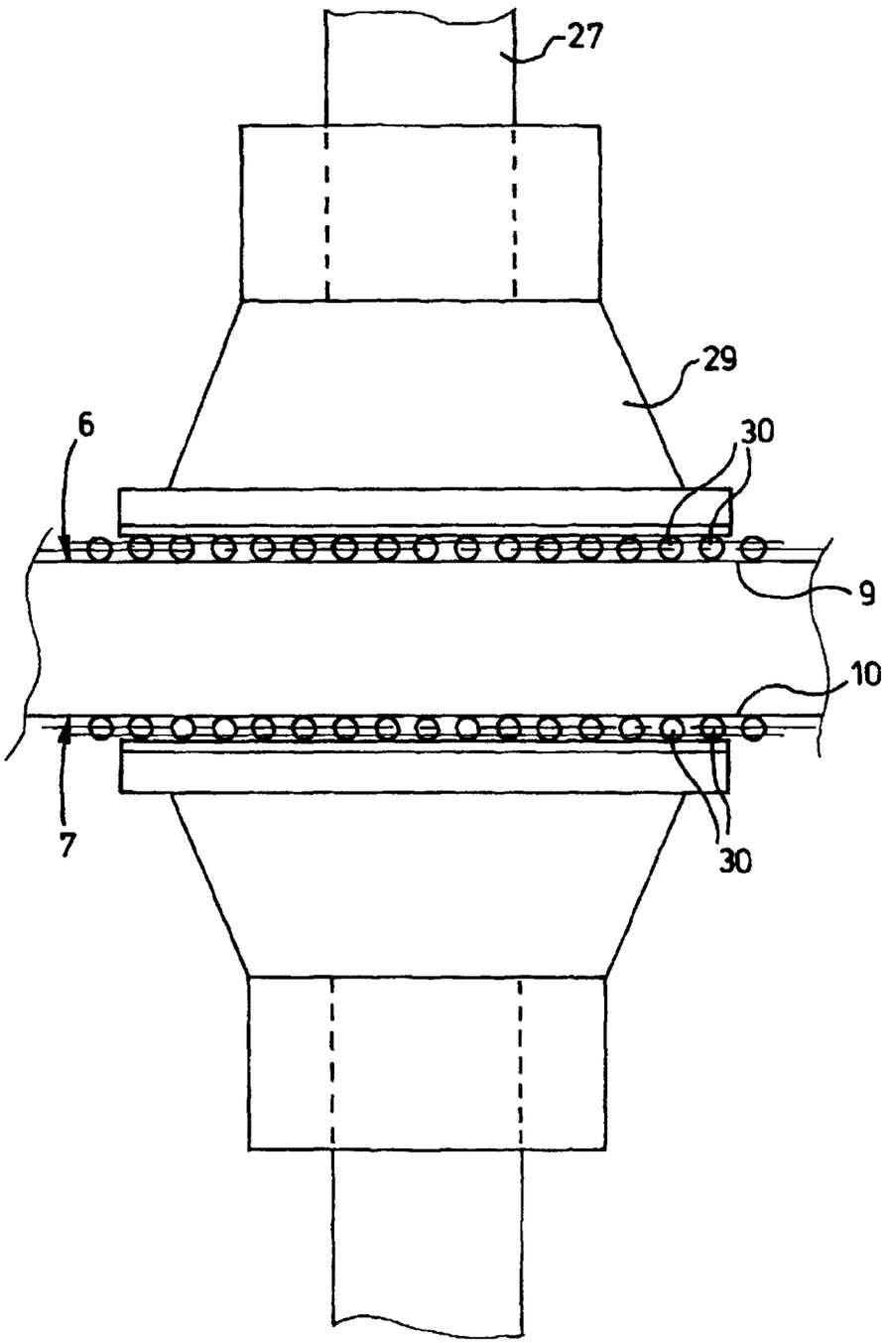
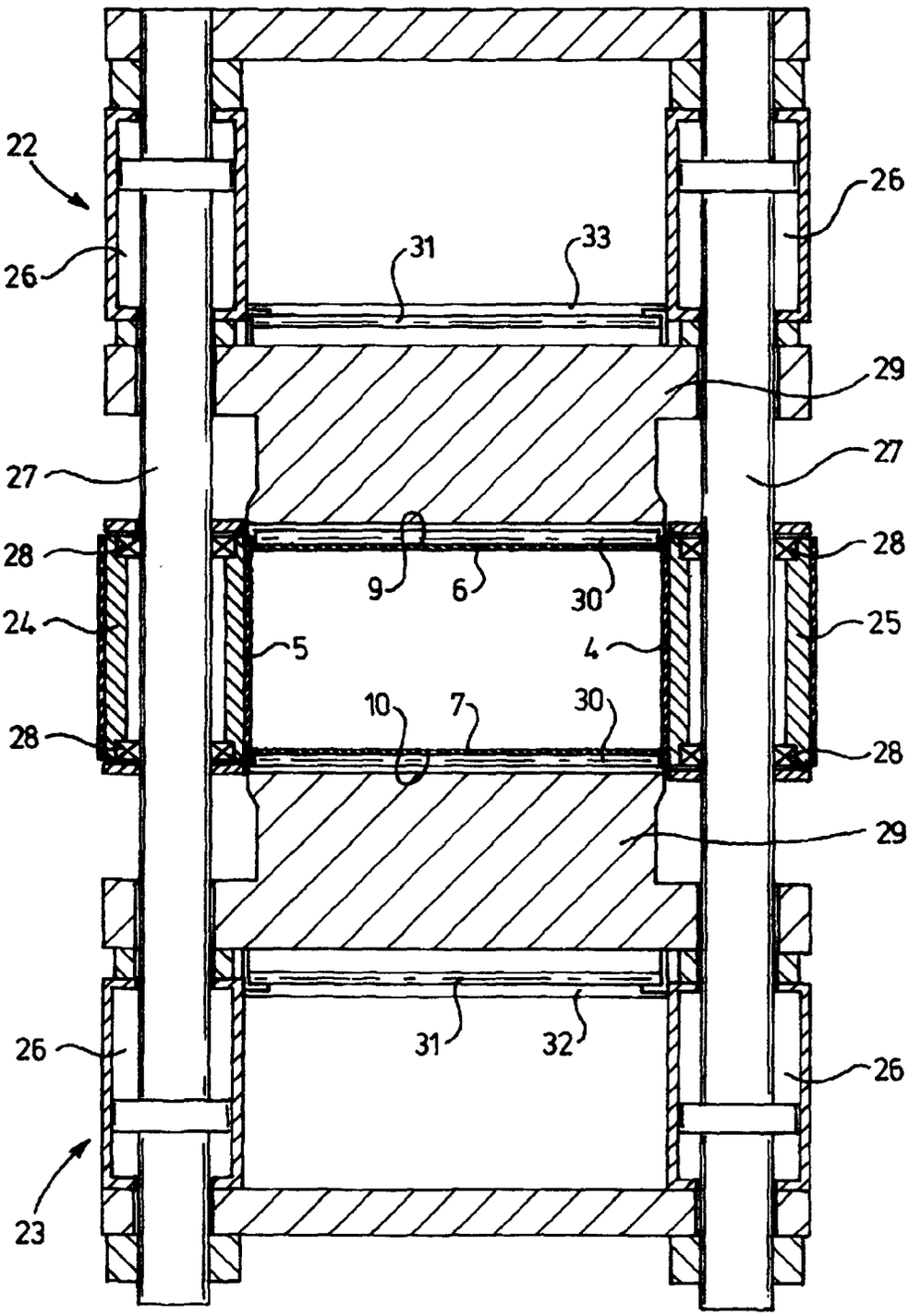


Fig - 7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EUROPEAN SEARCH REPORT

Application Number
EP 99 20 1586

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16 August 1999	Gourier, P

CATEGORY OF CITED DOCUMENTS

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EUROPEAN SEARCH REPORT

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