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

(11) Publication number: **0 192 884**
A1

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **85308002.6**

(22) Date of filing: **04.11.85**

(51) Int. Cl.⁴: **B 28 B 1/29**
B 28 B 1/08

(30) Priority: **08.11.84 FI 844389**

(43) Date of publication of application:
03.09.86 Bulletin 86/36

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI NL SE

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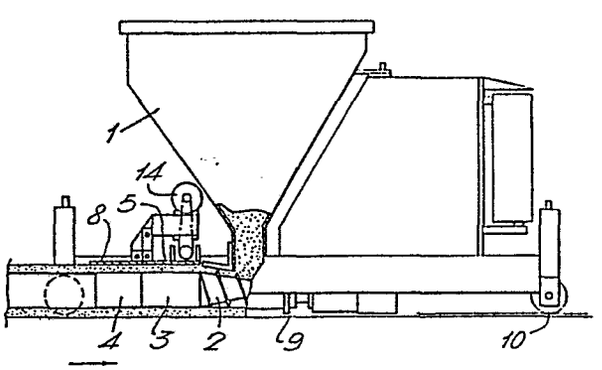
(54) **Method and device for the slide-casting of concrete hollow products.**

(57) Method and device for the casting of concrete products by means of a continuous slide-casting method. The concrete mix is compacted by displacing one or several walls of the slide-casting mould structure. The wall (5) of the slide-casting mould structure is displaced along a predetermined path of movement while facing the forming member (3) forming the cavity and moving eccentrically relative its centre axis or moving back and forth around an articulated shaft.

Fig.1.



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Method and device for the casting of concrete products

The present invention is concerned with a method for the casting of concrete products by means of a continuous slide-casting method, whereat the concrete mix is compacted by displacing one or several walls of the slide-casting mould structure. The invention is also concerned with a device for the casting of concrete products by means of the continuous slide-casting method, whereat the device includes longitudinal walls as well as, inside the said walls, one or several forming members that form cavities.

The slide-casting technique for the manufacture of hollow slabs is commonly known. E.g., in the US Patent 4,046,848, the manufacture of hollow slabs is described. In prior art, different methods are known for the compacting of the concrete mix in slide casting. Vibrators are commonly used for vibrating the inside and outside wall of the casting mould and for compacting the concrete mix. A drawback of the vibrators is, however, the noise caused by them. Moreover, as a result of the oscillation, the accuracy of dimensions and shape of the product deteriorates.

From the Finnish Patents 64,072 and 64,703, a method is known for the compacting of stiff concrete mix so that, in stead of vibration, shearing forces are applied to the mix so as to compact the mix. The shear forces are produced by pivoting two opposite mould walls back and forth in the same direction relative each other.

The object of the present invention is to provide a casting method in which the compacting takes place at the same time both efficiently and free of noise. At the same time, the quality of the face of the product is improved as compared with the products manufactured by means of the prior-art technique. The method in accordance with the invention is character-

ized in that a wall of the slide-casting mould structure is displaced along a predetermined path of movement while facing the forming member forming the cavity and moving eccentrically relative its centre axis or moving back and forth around an articulated shaft. The device in accordance with the invention is characterized in that a wall of the slide-casting mould structure is displaceable along a predetermined path of movement while facing the forming members forming the cavity and moving eccentrically relative the centre axis or moving back and forth around an articulated shaft.

The idea of the invention is that, at the initial end of the mix flow, the amplitude of the wall is remarkably high, being reduced to zero at the trailing end. In other words, the movement becomes smaller towards the trailing end of the compacting mechanism. If required, a so-called levelling board follows after the mobile compacting board.

The invention and its details will be described in the following with reference to the accompanying drawings, wherein

Figure 1 is a general view of a hollow-slab machine, seen from the side and partly in section,

Figure 2 is a sectional side view of a detail of one embodiment of the invention,

Figure 3 shows a cross section of the embodiment shown in Fig. 2,

Figure 4 is a side view of a second embodiment of the invention,

Figure 5 shows a cross section of the embodiment shown in Fig. 4,

Figure 6 is a side view of a third embodiment of the invention,

Figure 7 shows a cross-section of the embodiment shown in Fig. 6,

Figure 8 is a side view of a fourth embodiment of the invention,

Figure 9 shows a cross section of the embodiment shown in Fig. 8,

Figure 10 shows the embodiment of Fig. 8 as viewed from the top,

Figure 11 is a side view of a fifth embodiment of the invention,

Figure 12 shows a cross section of the embodiment shown in Fig. 11,

Figure 13 is a side view of a sixth embodiment of the invention,

Figure 14 shows a cross section of the embodiment shown in Fig. 13, and

Figure 15 shows the embodiment of Fig. 13 as viewed from the top.

At the initial end of the slide-casting machine, there is a feeding funnel 1 for feeding the concrete mix. Depending on the size of the slab to be cast, the machine is provided with one or several spiral screws 2, which are in such a way conical that they become larger towards the final end of the machine. After the spiral screw 2, a cavity mandrel 3 is fitted, which is, if required, followed by a follower tube 4. The rear end of the cavity mandrel 3 is fixed, e.g., by means of a ball joint or equivalent mode of fastening which permits a change in the angle of the axis, and the forward end of the mandrel performs an eccentric movement relative the longitudinal axis and compacts the mix around the cavity. Moreover, the device is provided with a compacting board 5 and side boards 6. Behind the compacting board 5, there is a levelling board 8. The machine moves on a base 9, being supported on wheels 10, in the direction indicated by the arrow.

In the embodiment shown in Figures 2 and 3, the compacting board 5 is, by its trailing end, fixed to a horizontal transverse shaft 11. The front end of the compacting board is connected to a motor 14 in

a suitable way, e.g. by the intermediate of an arm 12 and an eccentric cam 13. By means of the eccentric cam, the front end of the board is displaced back and forth up and down. The path of movement is illustrated as a side view in the bottom part of Fig. 2. Towards the trailing end, the movement of the board is reduced to zero. The movement may be synchronized with the eccentric movement of the cavity mandrel 3 so that the rising and falling of the board take place at the same time as the rising and falling of the cavity mandrel. The frequency of the movement of rising and falling of the board may also differ from the frequency of the movement of the mandrel, and they may be in a suitable mutual relationship. In this way, in the portion of the slab placed above the cavities, in the mix, a shearing movement is produced, which, together with the pressure produced by the screws and with the movement of the mandrels, compacts the mix. The direction of movement of the board may, however, also be contrary to the movement of rising and falling of the mandrel.

Moreover, at the sides of the device, a groove former 30 is connected with the board 5 by means of a lever arm 29, the said groove former 30 moving along with the board 5 up and down. The final end of the groove former is linked to the side board 6 by means of a pin 31. In this way, the movement of the groove former is at the initial end at the maximum and at the final end zero. This groove former promotes the compacting of the slab at the lateral areas of the slab.

In the embodiment of Figures 4 and 5, the transverse shaft 11 at the trailing end of the board 5 is attached to an articulated arm 15, whose top end is attached to a transverse shaft 16. The front end of the board 5 is displaced by means of an eccentric cam 17 along a path of movement revolving around a transverse shaft. The movement of the trailing end of the board is in the vertical direction zero, but in the

horizontal direction the length of the path of movement corresponds to the stroke length provided by the eccentric cam when the articulated arm 15 swings around the shaft 16. The path of movement of the board is illustrated as a side view in the bottom part of Fig. 4.

In the embodiment of Figures 6 and 7, the trailing end of the board 5 is attached to a vertical shaft 18 by means of a ball joint 21 or equivalent. The front end of the board 5 is attached to an eccentric cam 20 by the intermediate of a transverse arm 19, the said eccentric cam 20 providing a horizontal transverse movement back and forth for the front end of the board. At the trailing end, the movement is zero at the ball joint 21, but at the sides of the board mainly movement in the longitudinal direction of the slab. The direction of movement of the front end of the board 5 is contrary to the lateral movement of the mandrel 3, but the direction may also be the same. The path of movement of the board is illustrated as viewed from the top in the bottom part of Fig. 6.

In the embodiment of Figures 8 to 10, the compacting plane 5 is supported by means of two vertical shafts 22. At the lower end of each shaft 22, there is an eccentric cam 23, which brings the plane 5 into a horizontal grinding movement. The path of movement is illustrated as a top view in the bottom part of Fig. 10. The lateral component of the movement of the board may be either of opposite direction or of the same direction compared with the horizontal component of the movement of the front end of the mandrels 3.

In the embodiment of Figures 11 and 12, one or, side by side, several eccentric cams 24 synchronized with each other are connected with the front end of the compacting plane 5, which said eccentric cams 24 revolve eccentrically relative the longitudinal axis 25. Thereby, the front end of the board 5 receives a rotary

movement so that it rises and falls and moves to both sides. In other words, the movement takes place in a vertical transverse plane. The trailing end of the board 5 is supported at the middle preferably, e.g., by means of a ball joint 21 so that the movement of the plane 5 at the joint is zero but, at the trailing end at the sides of the board, longitudinal movement. The movement of the board 5 may be synchronized and either of the same direction or of opposite direction relative the movement of the mandrels 3.

In the embodiment of Figures 13 to 15, the compacting board unit 5 consists, e.g., of three subsequent transverse beams 5', which are attached to two or more longitudinal binder beams 27 by means of articulated joints 26. At their trailing ends, the binder beams are attached to vertical shafts 28. By means of an arm 19 and an eccentric cam 20, the system of beams is brought into a transverse horizontal movement, which is reduced towards the trailing end. The movement may be synchronized and either of opposite direction or of the same direction relative the horizontal component of the movement of the mandrels 3.

The invention is not restricted to the above embodiments only, but it may show variation in many ways within the scope of the patent claims. The movement of the compacting board 5 may be synchronized with the movement of the mandrels 3, being either of the same direction or of opposite direction. The movements may also have a certain other phase angle. The frequency of the movement of the compacting board 5 may also differ from the frequency of the movement of the mandrels 3. This is accomplished by selecting the speeds of rotation of the eccentric cams appropriately.

Besides being an eccentric movement produced by means of a ball joint or equivalent placed at the trailing end, the movement of the mandrels 3 may also be a movement taking place relative a vertical or

horizontal shaft placed at the trailing end.

In stead of using an eccentric cam, it is also possible to use, e.g., a hydraulic cylinder for displacing the upper board.

The groove formers 30 may also be used in the devices of the other embodiments, besides that shown in Figures 2 and 3.

CLAIMS

1. Method for the casting of concrete products by means of a continuous slide-casting method, whereat the concrete mix is subjected to pressure by means of a spiral screw or screws (2) and one or several cavities are formed in the product by means of one or several forming members (3) and whereat the concrete mix is compacted by displacing one or several walls of the slide-casting mould structure forcibly along a predetermined path of movement, c h a r a c t e r i z e d in that the moving wall (5) of the slide-casting mould structure is fitted as facing the forming members (3) which form the cavities and alter the angle of their longitudinal axes relative a certain articulation point.

2. Method as claimed in claim 1, c h a r a c t e r i z e d in that the top wall of the slide-casting mould structure is displaced back and forth around a horizontal shaft (11) placed at the trailing end of the wall.

3. Method as claimed in claim 1, c h a r a c t e r i z e d in that the top wall (5) of the slide-casting mould structure is displaced back and forth around a vertical shaft (18 or 28) placed at the trailing end of the said wall.

4. Method as claimed in claim 1, c h a r a c t e r i z e d in that the top wall (5) of the slide-casting mould structure is displaced in the horizontal direction by means of an eccentric cam (23) revolving around a vertical shaft (22).

5. Method as claimed in claim 1, c h a r a c t e r i z e d in that the front end of the top wall (5) of the slide-casting mould structure is displaced along a path of movement that moves around the longitudinal axis of the top wall.

6. Device for the casting of concrete products by means of a continuous slide-casting method, whereat the device includes longitudinal walls (9,6,5), means for displacing one or several walls forcibly along a predetermined path of movement, a spiral screw or screws (2) for feeding the mix, as well as, inside the walls, one or several forming members (3) that form cavities, c h a r a c t e r i z e d in that the moving wall (5) of the slide-casting mould structure is fitted as facing the forming members (3) which alter the angle of their longitudinal axes relative a certain articulation point.

7. Device as claimed in claim 6, c h a r a c t e r i z e d in that the top wall (5) of the slide-casting mould structure is displaceable back and forth around a horizontal shaft (11) placed at the trailing end of the wall.

8. Device as claimed in claim 6, c h a r a c t e r i z e d in that the top wall (5) of the slide-casting mould structure is displaceable back and forth around a vertical shaft (18 or 28) placed at the trailing end of the said wall.

9. Device as claimed in claim 8, c h a r a c t e r i z e d in that the top wall (5) of the slide-casting mould structure is divided, in the transverse direction, into two or more parts (5'), which are interconnected by means of two or more longitudinal beams (27), whereat the said longitudinal beams are displaceable back and forth around vertical shafts (28) placed at their trailing ends.

10. Device as claimed in claim 6, c h a r a c t e r i z e d in that the top wall (5) of the slide-casting mould structure is supported on one or several vertical shafts (22), whereby the top wall is displaceable in the horizontal direction.

11. Device as claimed in claim 6, c h a r - a c t e r i z e d in that the front end of the top wall (5) of the slide-casting mould structure is displaceable along a path of movement that moves around the longitudinal axis of the top wall.

12. Device as claimed in any of the preceding patent claims, whose side walls (6) are provided with means (30) for forming grooves into the sides of the concrete product, c h a r a c t e r i z e d in that the said means (30) for forming the groove are displaceable along with the top wall (5) of the slide-casting mould structure.

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Fig.1.

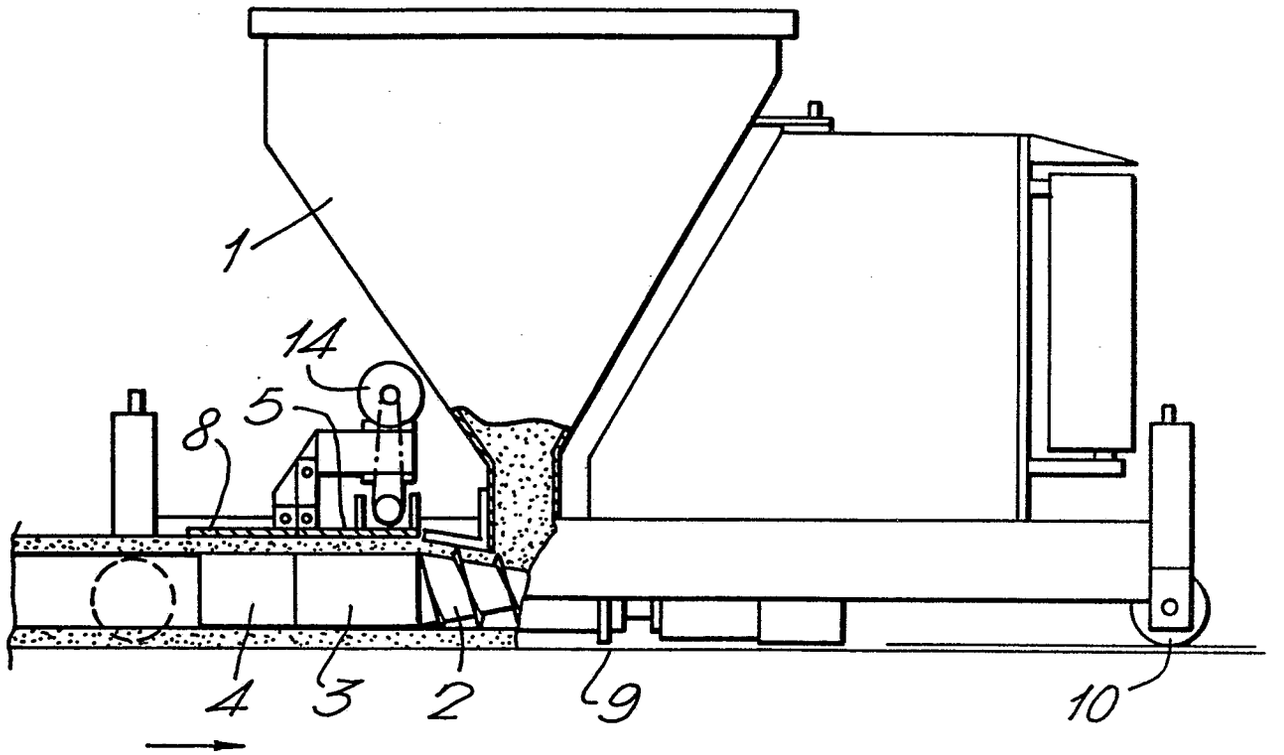

Fig.2.

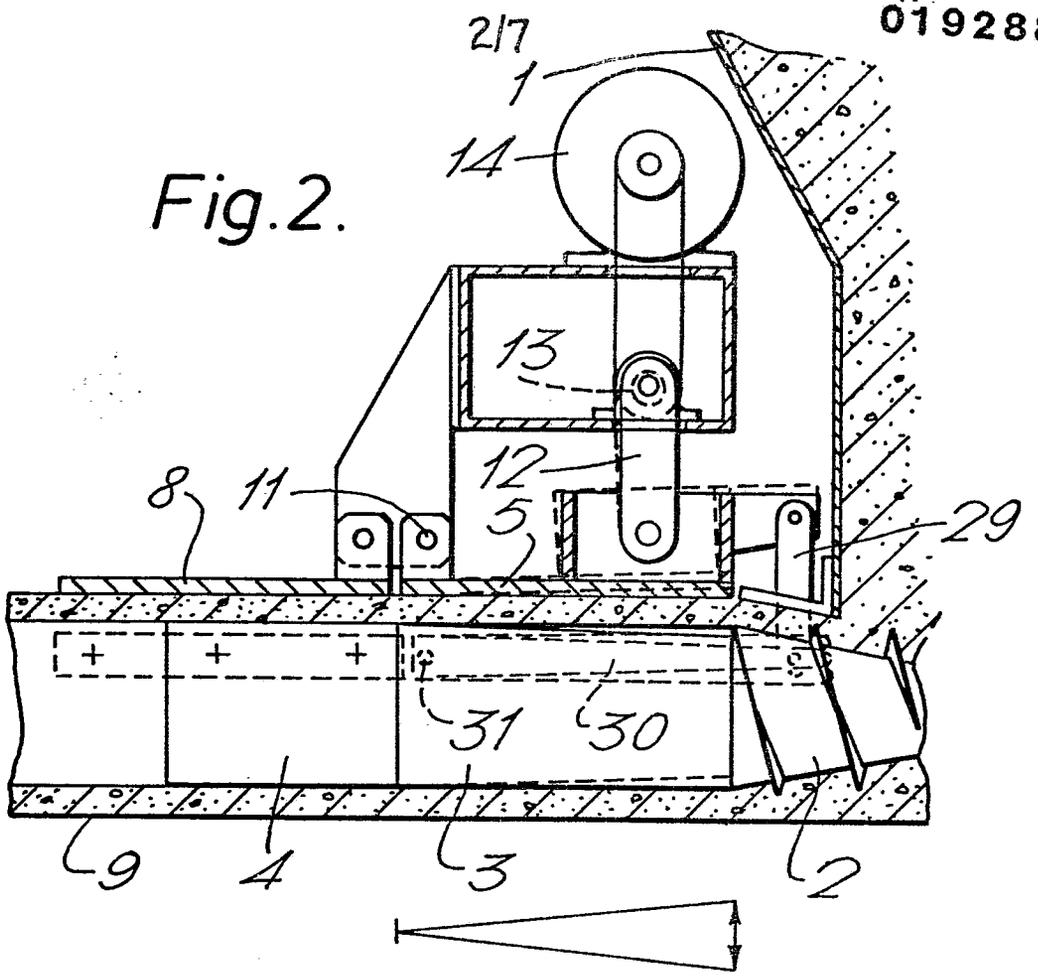

Fig.3.

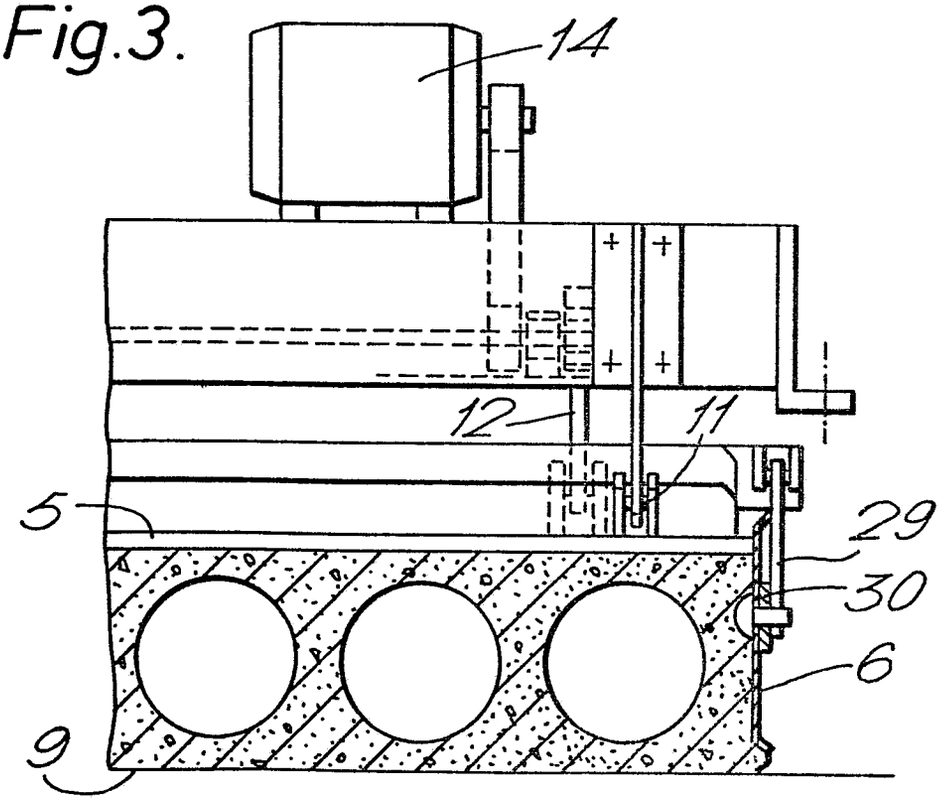

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Fig.4.

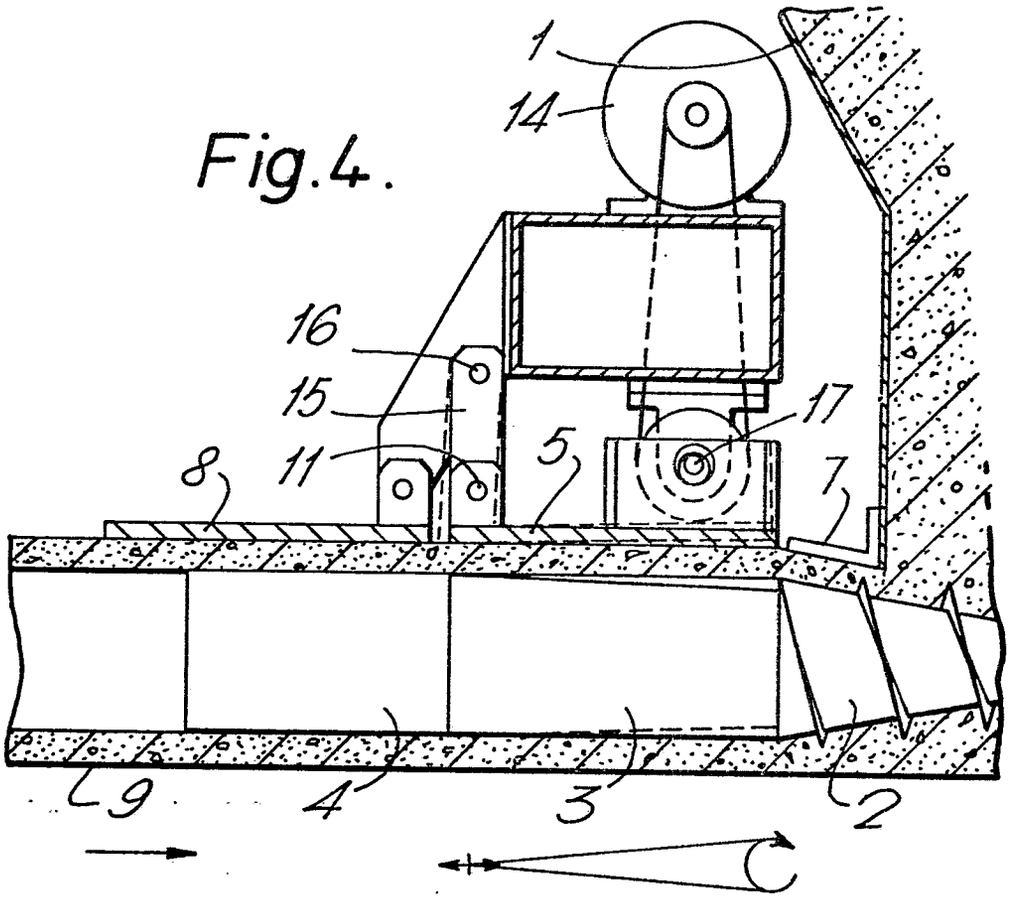

Fig.5.

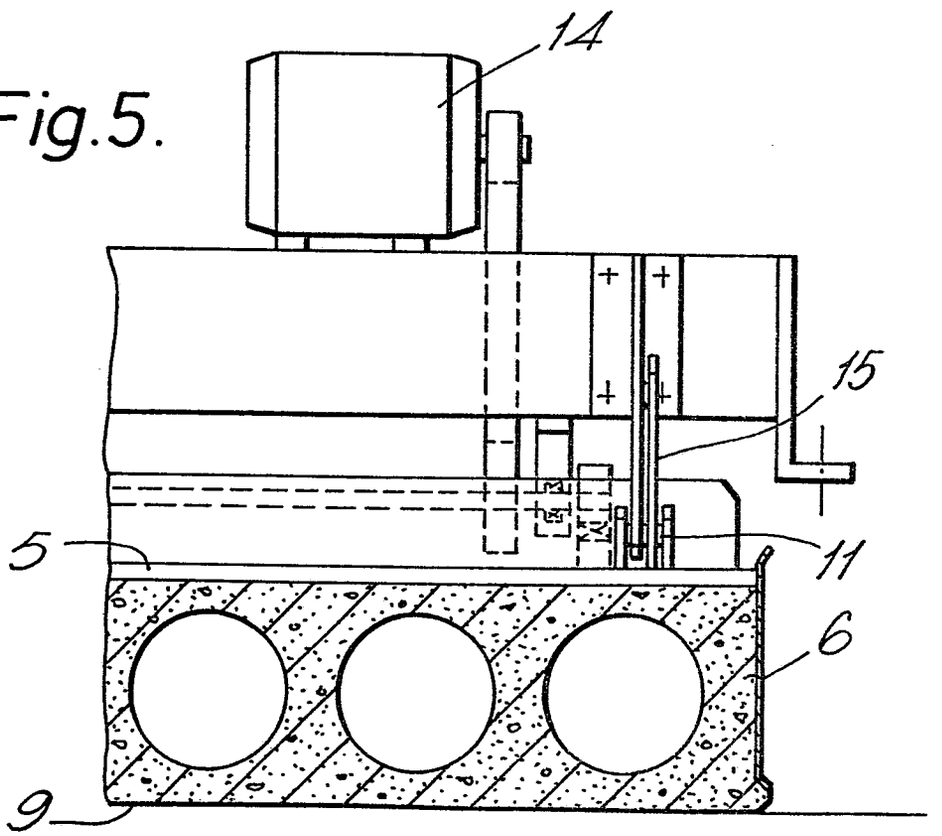

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Fig.6.

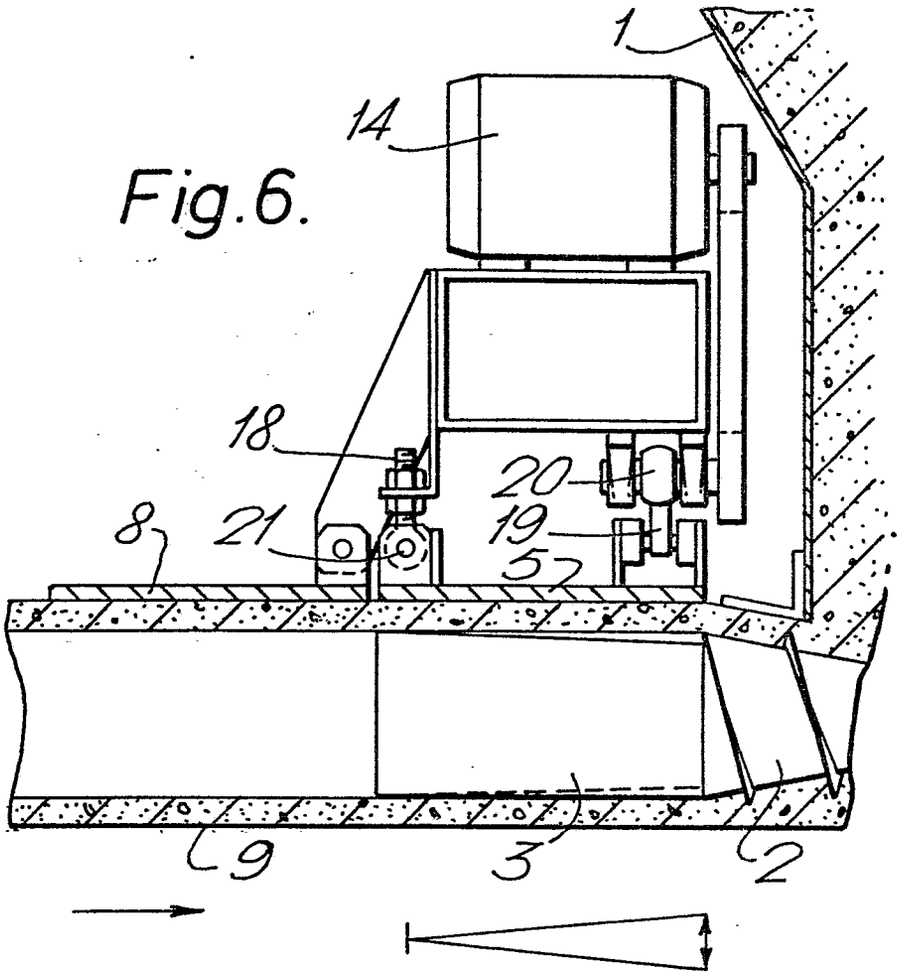

Fig.7.

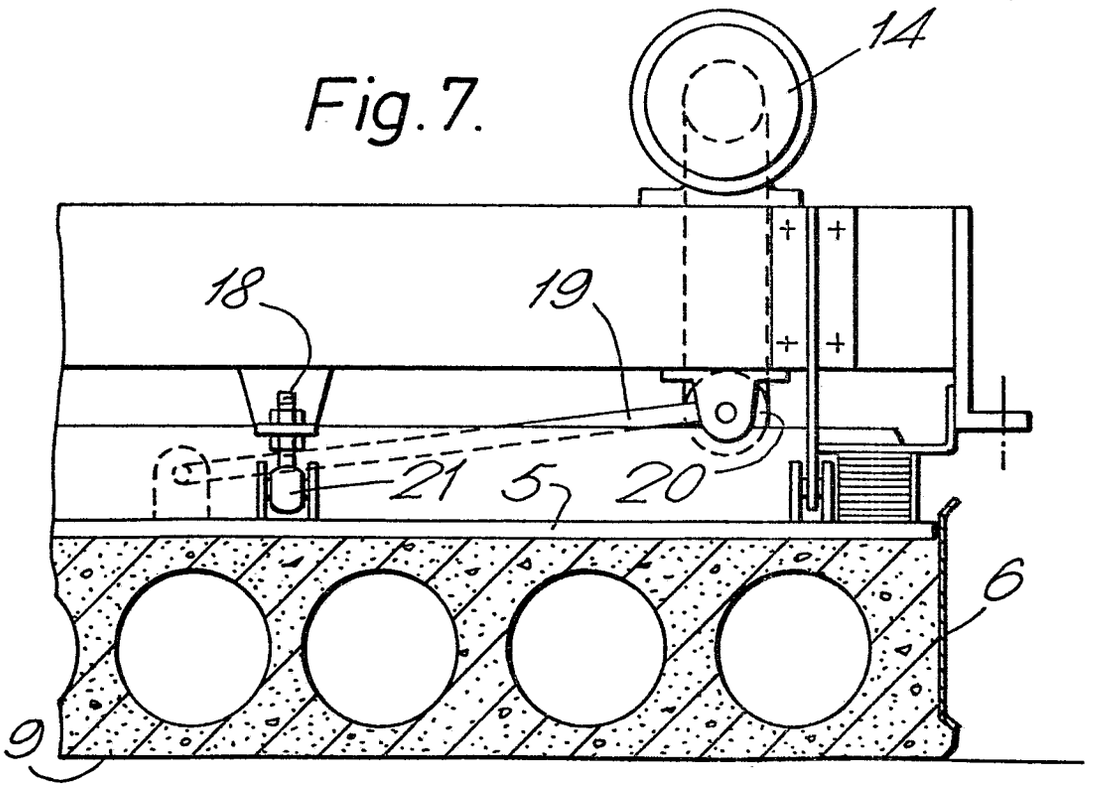

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Fig.8.

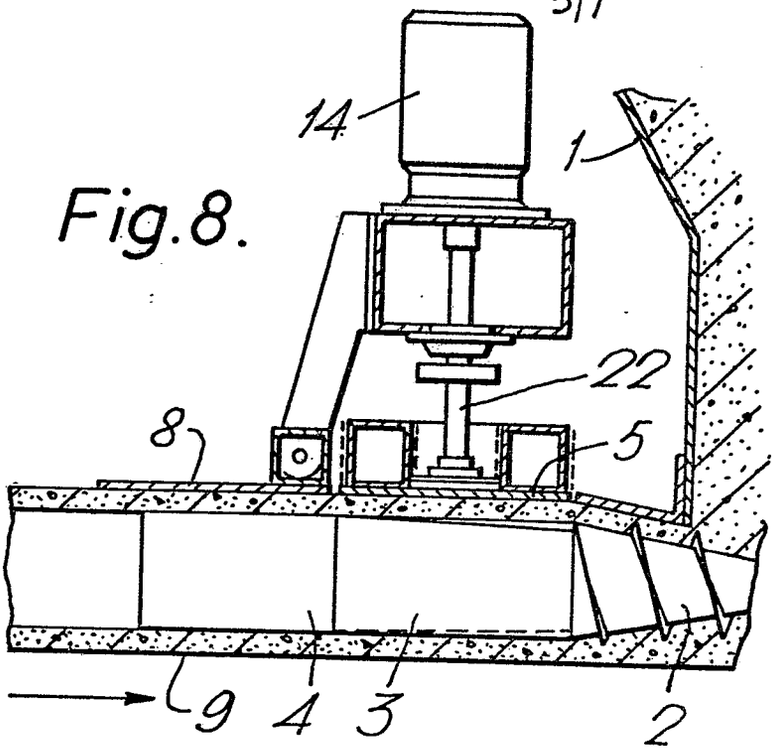


Fig.9.

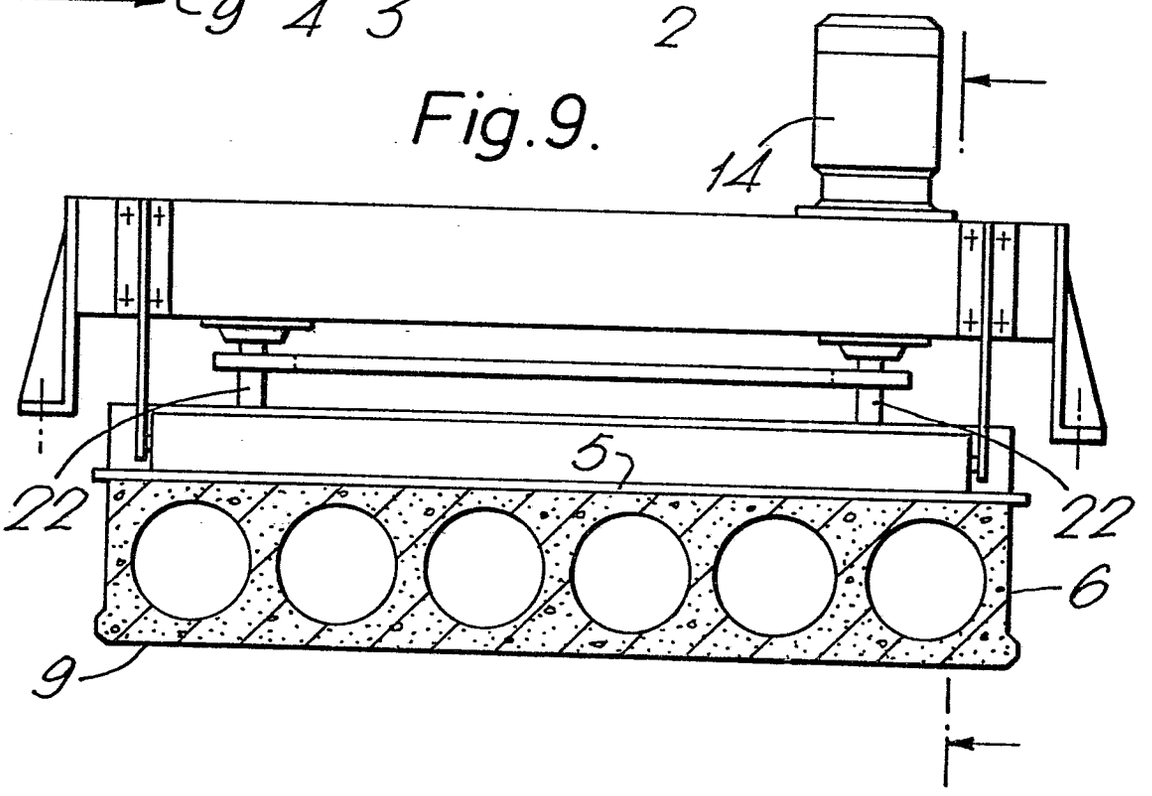


Fig.10.

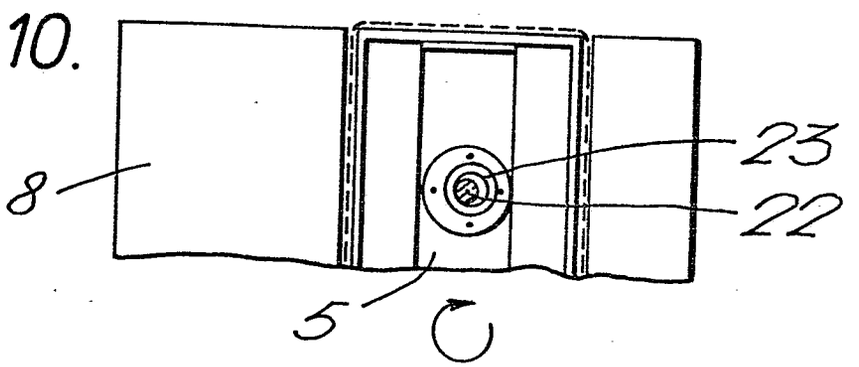


Fig.11.

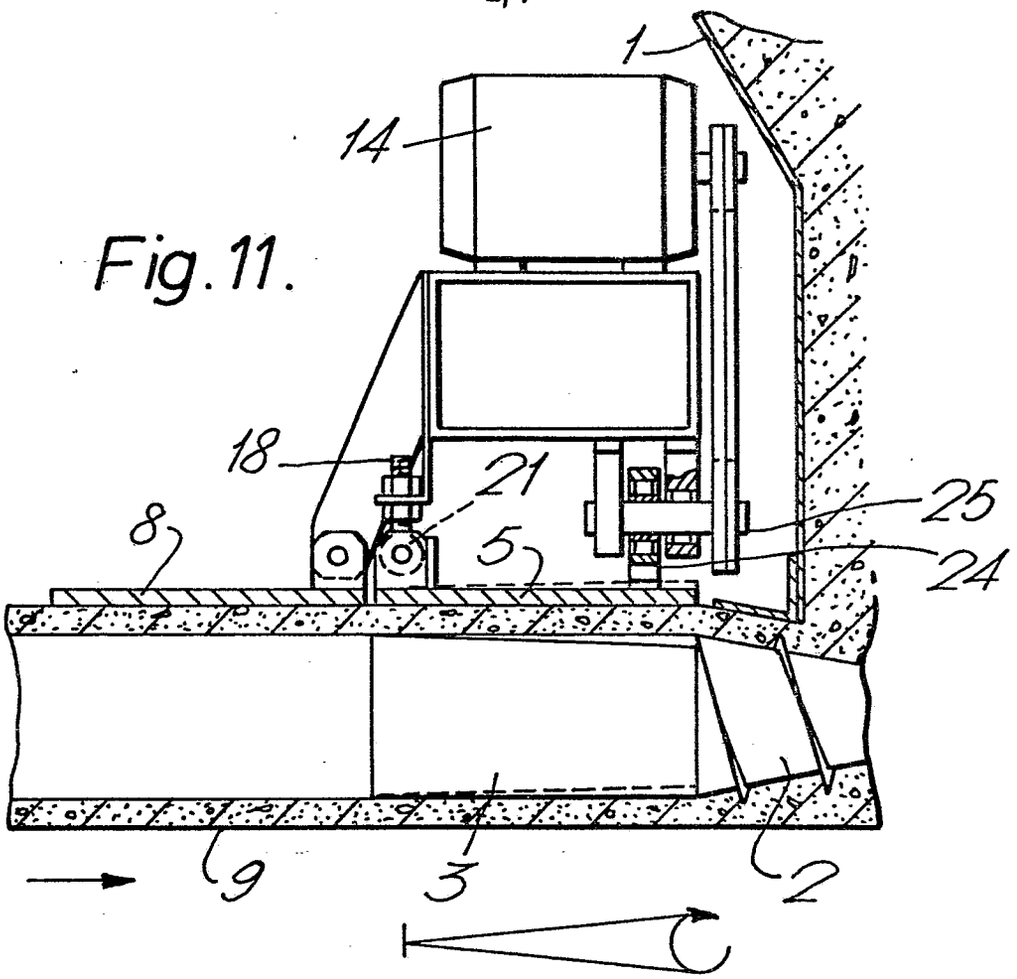


Fig.12.

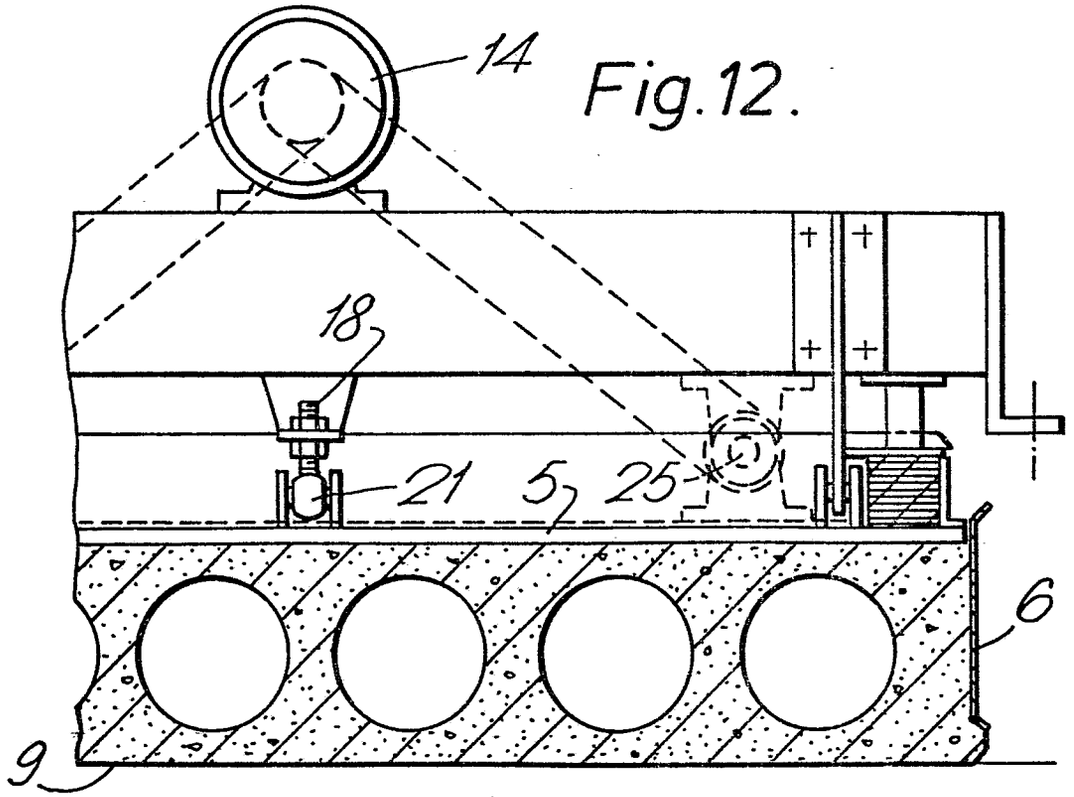


Fig. 13.

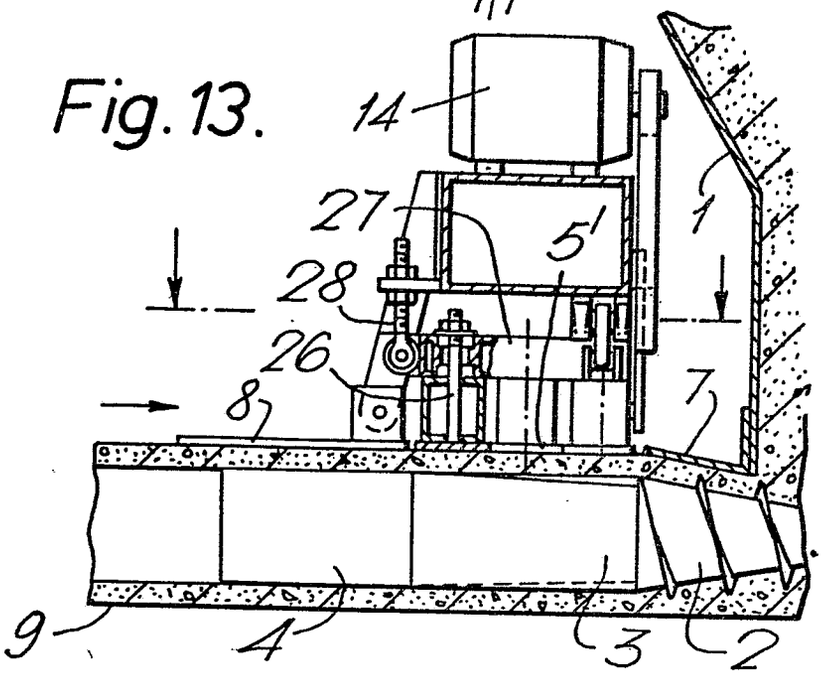


Fig. 14.

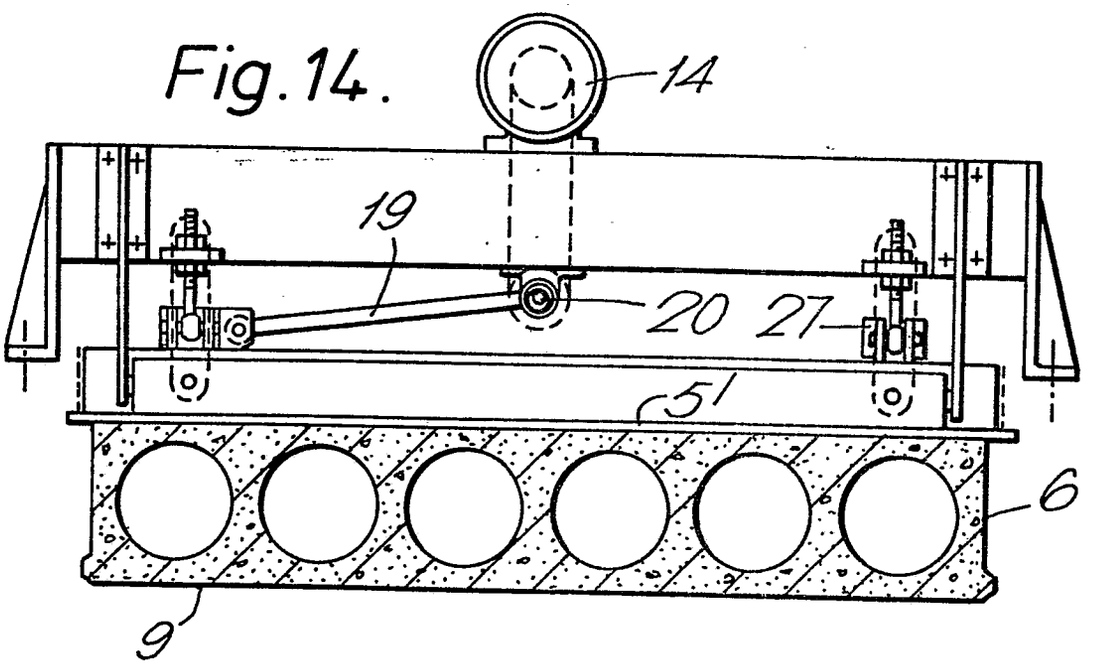
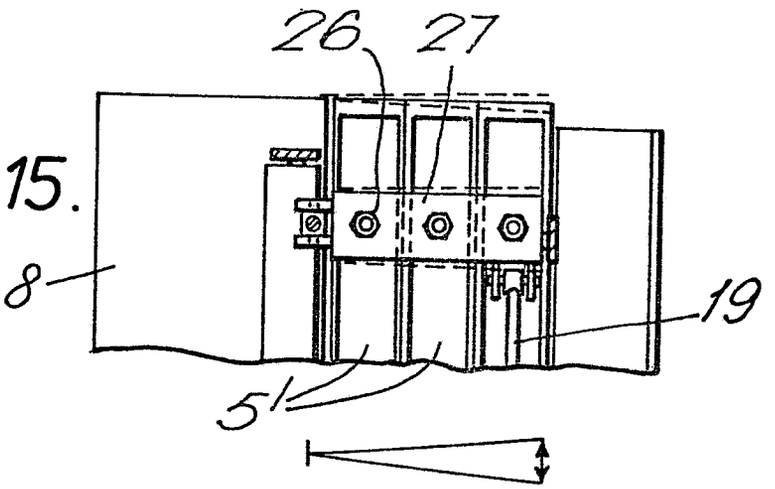


Fig. 15.



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EUROPEAN SEARCH REPORT

0192884
Application number

EP 85308002.6

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	US - A - 3 989 431 (MARTENS) * Column 2, lines 49-52; fig. 4 *	1,2,6	B 28 B 1/29 B 28 B 1/08
X	SOVIET INVENTIONS ILLUSTRATED, sections P,Q, week 84/23, July 18, 1984 DERWENT PUBLICATIONS LTD., London P 64 * SU-1 041 293 (ROSORG TEKH STROI) *	1,2,6	
A	DE - A - 1 584 512 (KLAUE) * Page 2, lines 16-18; fig. *	1,2,6	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 28 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	28-01-1986	GLAUNACH

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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