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(54) A machine for producing blocks or elements.

(57) A machine for producing blocks or elements includes a base board 13 which defines a surface to close the lower end of a mould box 12. Extending into the upper end of the mould box is a frame 14 forming part of or secured to a throat portion 11 which depends from a hopper 10. Means not shown is provided to raise the mould box following compaction of the material in the throat portion and mould box, above the lower end of the frame 14, to eject the compacted material from the box. Further means is provided to raise the throat portion and frame by a limited amount to cause fracture of the compacted mass of material in a plane generally defined by the frame. The plug of compacted material in the frame and throat portion until vibrated, prevents material in the hopper from falling through the throat portion.

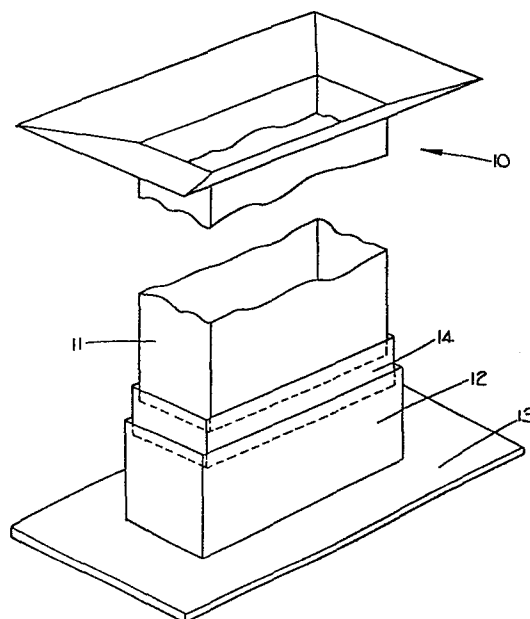


FIG. 1.

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This invention relates to a machine for producing blocks or elements, which are formed by compacting in a mould box a particulate semi-dry mix of material from which the block or element is to be formed.

5           Various forms of machines are known in the art for the production of blocks or elements as aforesaid but in general each known machine incorporates in its design and construction a feed box which is open top and bottom, and which can be reciprocated in order to  
10       convey material from a storage hopper, situated at the rear of the machine to the mould box, which is open top and bottom, situated at the front of the machine.

          In the known machines the material is fed to the feed box during the time the feed box is in the  
15       retracted position, from a hopper usually carried by the structure of the machine and in order to prevent the material falling from the hopper when the feed box is advanced over the mould box, a valve has to be provided. The valve may be simple in form but it does  
20       represent an additional part of the machine and is subject to wear.

          Situating beneath the feed box is the feed table over which the material is pushed by the feed box from the position under the hopper to a position above the  
25       mould box. The mould box has a horizontal top plate to form a continuation of the feed table. An actuating mechanism is required to effect the necessary movement of the feed box. This movement causes wear of the feed table and the top plate of the mould box  
30       and the time required to operate the feed box adds substantially to the machine operating cycle time.

A further item regarded as essential to the known

machines is a tamper plate which is moved into the  
mould box, after the feed box has been retracted, to  
effect compaction of the material in the mould box,  
such compaction in a number of forms of machines being  
5 assisted by vibration. The operation of the tamper  
plate, from its position sufficiently above the mould  
to allow the lateral movement of the feed box, to its  
lowered position onto the material in the mould box  
also adds substantially to the machine operating cycle  
10 time.

The object of the present invention is to provide  
a machine of the kind specified in a simple and  
convenient form.

According to the invention a machine for producing  
15 blocks of elements comprises a hopper having a  
depending throat portion, said throat portion or a part  
carried thereby being shaped so that in use, it will  
locate within a mould box supported in use by the  
machine, support means for the mould box, means for  
20 effecting relative movement of said support means and a  
surface serving in use to close the lower end of said  
mould box, further means for effecting relative  
movement of said throat portion and said surface and  
means for vibrating the material in the mould box and  
25 said throat portion to achieve compaction of the  
material, means located on said throat portion or said  
part for defining a fracture plane in the compacted  
material whereby when said further means is operated  
the compacted material will fracture  
30 generally in said plane.

In the accompanying drawings:-

Figure 1 is a diagrammatic perspective view showing

the essential components of the machine,

Figure 2 is a side view of a practical form of the machine, and

5 Figure 3 is an end view to an enlarged scale of a portion of the mechanism in Figure 2.

With reference to Figure 1, the machine comprises a hopper generally indicated at 10 having a depending throat portion 11 which is of a size so that it will enter into the open upper end of the mould box 12.

10 The throat portion is detachably coupled to the hopper but it can integral therewith. The mould box in the type of machine to be described is located on a base board 13 and this board serves to support the finished block or element in this case a building block or

15 element, during the manufacture and curing of the block or element. The material is a semi-dry mix having say 5% by weight of water, the other constituents being well known in the art.

The throat portion in the particular example is

20 provided with a frame 14 which is detachably secured around the lower portion of the throat portion, this frame sliding in use with limited clearance in the mould box.

A first actuating mechanism not shown is provided

25 to lift the mould box 12 away from the base board, the amount of movement being greater than the required height of the compacted block or element. A second actuating mechanism again not shown is provided to raise at least the throat portion 11 and the frame 14

30 by a limited distance as will be explained. In practice the second actuating mechanism will also raise the hopper 10 and the two mechanisms can derive their lifting effort from a single power source.

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Forming an important part of the machine are vibrators which vibrate the material in the mould box and also the throat portion 11. The vibrators may be of any convenient type and on the example would make contact with the support (not shown) for the base board. In the type of machine where the compacted block or element is deposited onto the floor of the production area the vibrators for compacting the material in the mould box could be attached to the mould box itself.

Considering now the operation of the machine, from rest; a semi-dry mix of material from which the block or element is to be formed, is fed into the hopper and with the mould box resting on the base board the material will fall through the throat portion and frame into the mould box. The hopper is maintained substantially full of material so that the loose material fills the mould box and throat portion. The vibrators are then turned on and the vibration results in compaction of the material in the mould box together with the material in the throat portion. This compaction is assisted by the weight of material in the hopper. When the required degree of compaction has been attained the vibrators are stopped and the first actuating means is operated to raise the mould box away from the base board. This has the effect of ejecting the compacted mass of material from the mould box. The mould box is raised away from the base board until its lower edge lies above the lower edge of the frame 14. Finally the second actuating means is operated to raise the throat portion 11 and the frame 14, the extent of movement being of a small order for example two or three centimeters.

The limited movement effected by the second

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actuating means results in fracture of the compacted material generally at the lower end of the frame. The block or element is therefore left on the base board and the compacted material in the throat portion serves  
5 as a plug to prevent the material in the hopper falling through the throat portion.

The fracture plane is in part defined by a projection on the inner surface of the frame or the throat portion if a frame is not fitted, and  
10 conveniently may be formed by a generally horizontal continuous line of weld material or the like. In this manner the edge of the fracture plane is well defined but random fracture takes place through the mass of compacted material generally in said plane. As a  
15 result the upper surface of the block or element has a random split appearance such as is obtained when a piece of stone is split. The fracture plane can be further defined by an element or elements mounted on or within the frame. The elements may be mounted so that  
20 they extend transversely of the flow of material into the mould box or they may be mounted so that they extend in line with the flow. In the former case the elements may be in the form of rods or bars which can be arranged so as to provide on the fractured surface  
25 of the block, a defined pattern. In the latter case the elements which again may be in the form of rods, are of a length such that the ends terminate in the fracture plane. If the ends lie in a flat plane then the fracture plane will be substantially flat but will  
30 still have the random split appearance. The fractured surface of the block or element can be arranged so that it is generally convex or concave, by altering the lengths of the rods.

Returning now to the operation of the machine, the

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base board together with the block or element is removed, a fresh board placed in position and the mould box lowered so that it rests on the base board. The next operation is to destroy the plugging effect of the compacted material in the throat portion. This is achieved by operating the vibrator mechanism and when the plug has been broken the material forming the plug drops into the mould box together with fresh material from the hopper. The frame together with the throat portion and the hopper may be lowered to the product height before the compaction of the material in the mould box has started. In some circumstances however it is preferable to delay lowering of the frame until some compaction by vibration has taken place because the action of lowering the frame ensures that the material forming the block or element is further compacted. This can be effected by the second actuating means.

The height of the compacted block or element depends upon the distance between the lower edge of the frame 14 and the upper surface of the base board. This distance is adjustable in the actual machine. A single mould box can therefore be used to construct a wide range of heights of block the essential requirement being that when the mould box is in position on the base board the frame must lie within the mould box.

A number of blocks or elements can be produced at the same time by providing division walls in the mould box and by providing complementary shaped divisions in the frame and throat. Moreover, the mould box may be provided with side apertures into which can be inserted, prior to the filling operation, cores of the appropriate shape. It will of course be understood that the cores must be withdrawn after the vibrators

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have been stopped but before ejection of the compacted block or blocks from the mould box can take place.

5 Alternatively cores may be placed vertically within the throat portion and mould box which will, by being attached through the hopper opening to linkage connected to the mould box, raise and lower in unison with the mould box. The cores may be laterally located by members secured to the frame.

10 In some types of machine, the mould box is fixed in the machine but at the same time is capable of being vibrated for the purpose of compacting the material therein. In such a machine a support is provided for the base board which closes the lower end of the mould box. In this case, following compaction of the  
15 material, the aforesaid first actuating mechanism effects movement of the support for the base board in a downward direction and the second actuating mechanism effects downward movement of the frame and throat portion through the mould box in unison with the  
20 movement of the base board, to eject the compacted block from the mould box, followed by upward movement of the second actuating mechanism to achieve fracture.

25 In some other types of machine, the hopper, throat portion and attached frame are fixed in the machine and the mould box and the support for the base board, which closes the lower end of the mould box, are movable up and down by the aforesaid first and second actuating mechanisms. In this case following compaction of the material, the aforesaid first actuating mechanism  
30 effects movement of the mould box in an upward direction to eject the compacted block and the second actuating mechanism effects downward movement of the support for the base board, to achieve fracture.



In Figures 2 and 3 of the drawings there is illustrated a practical version of the machine, Figure 3 also illustrating a mould box for producing a number of blocks. The machine includes a support structure 15 and in the particular example, a pair of spaced guide pillars 16, a similar pair of pillars being provided on the opposite side of the machine. Each pair of pillars mounts two pairs of slides 17, 18. The hopper 10 together with the throat portion 11 and the frame 14 are carried on the upper pair of slides 17 and the mould box 12 is supported on the lower pair of slides 18. Each of the guide pillars 16 is provided with an adjustable stop 19 which limits the downward movement of the slides 17 and therefore fixes the distance between the lower edge of the frame 14 and the base board 13. The positions of the stops 19 therefore determine the height of the finished block or element.

Each slide 18 is connected to a pair of spaced actuating rods 20. The actuating rods of the machine are interconnected at their upper ends as in known machines to ensure parallel movement of the slides 18 and are also connected to an hydraulic actuating mechanism. Each rod 20 is provided with a lower adjustable stop 21 and an upper adjustable stop 22 located below and above respectively of the respective slide 17. Moreover, depending from the upper part of the structure 15 of the machine are clamp rods 23 and carried on the slides 17 are clamp mechanisms 24 which can grip the rods 23 respectively as will be explained.

The mould box 12 is not rigidly connected to the lower slide 18 since as shown in Figure 3, the main portion of the lower slide 18 can continue to move downwardly in spite of the fact that the lower edge of

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the mould box is resting on the base board. During such movement springs 25 are compressed. Figure 3 shows a mould box having division plates 26 whereby a number of blocks or elements can be produced. It will be noted that the mould box is symmetrical about its attachment lugs 27. The throat portion 11 is attached to the hopper 10 and includes pairs of division plates 28. Each pair of plates comprises a pair of spaced plates disposed on opposite sides of the respective division plate 26 of the mould box and at the lower ends of the division plates there is provided a detachable frame 14.

In operation, Figure 2 shows the positions of the various part following compaction of the material by vibrators 30 operatively connected to the base board, and after the rods 20 have just started to move upwardly. The clamp mechanisms 24 are in the gripping position so that the frame and throat portion are held against movement. As the rods 20 continue to move upwardly the mould box is lifted and the compacted mass of material is ejected from the mould box. When the lower edge of the mould box lies above the lower edge of the frame the stops 21 move into engagement with the slide 17. At the same time the clamp mechanisms 24 are released and the throat portion 11 together with the frame 14 is lifted an amount sufficient to cause fracture of the compacted mass. The completed block is then left on the base board and is removed along with the base board. A fresh board is then placed in position and the rods 20 lowered. Before the initial downward movement of the rods 20, the clamp is energised to retain the throat portion and frame 14 in the raised position. The mould box is lowered onto the new base board and the vibrators turned on. The vibration disintegrates the "plug" in the throat

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portion and frame and the material together with fresh material falls through the frame into the mould box. A few seconds after the vibrators have been switched on the clamps 24 are released and continued downward  
5 movement of the rods 20 forces the frame 14 downwardly until halted by the action of the stops 19. During such movement the springs 25 are compressed, and the material beneath the frame 14 is further compressed.

10 It will be seen that the machine as described is much simpler in construction, operation and maintenance as compared with the known forms of machines, because the actuating mechanism in the known machines, required to move the feed box, together with the feed box and  
15 feed table, are not required. Furthermore, due to the fact that these parts are not required, the machine as described also has a substantially reduced operating cycle time.

20 Furthermore, as wear of the lower portion of the mould box takes place owing to the abrasive action of the material, it is possible to turn the mould box over, since the upper portion of the mould box is protected by the division plates 28 and the walls of the throat portion 11.

25 In the machine as described a single power source provides for movement of the slides 17 which carry the throat portion and the slides 18 which carry the mould box, with the actuating means for the raising and lowering of the throat portion comprising the stops 21  
30 and 22 and the rods 20 coupled to the mould box forming the actuating means for the mould box. In some forms of the machine separate actuating mechanisms may be provided for the mould box and throat portion respectively.

CLAIMS

1. A machine for producing blocks or elements comprising in combination, a hopper having a depending throat portion, said throat portion or a part carried  
5 thereby being shaped so that in use, it will locate within a mould box supported in use by the machine, support means for the mould box, means for effecting relative movement of said support means and a surface serving in use to close the lower end of said mould  
10 box, further means for effecting relative movement of said throat portion and said surface and means for vibrating the material in the mould box and said throat portion to achieve compaction of the material, means located on said throat portion or said part for  
15 defining a fracture plane in the compacted material whereby when said further means is operated the compacted material will fracture generally in said plane.

2. A machine according to Claim 1 including stop  
20 means for limiting the extent of movement of said throat portion towards said surface said stop means being adjustable whereby differing heights of the block or element can be produced using a single mould box.

3. A machine according to Claim 1 in which the mould  
25 box is constructed so that it can be inverted following a period of use.

4. A machine according to Claim 2 including a pair of slides coupled to said throat portion, pillars carrying said slides, said stop means being mounted on said  
30 pillars.

5. A machine according to Claim 4 including a clamp

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mechanism on said slides and clamp rods secured to a support structure of the machine whereby the throat portion can be clamped against movement.

- 5      6.    A machine for producing blocks or elements comprising the combination and arrangement of parts substantially as hereinbefore described with reference to the accompanying drawings.

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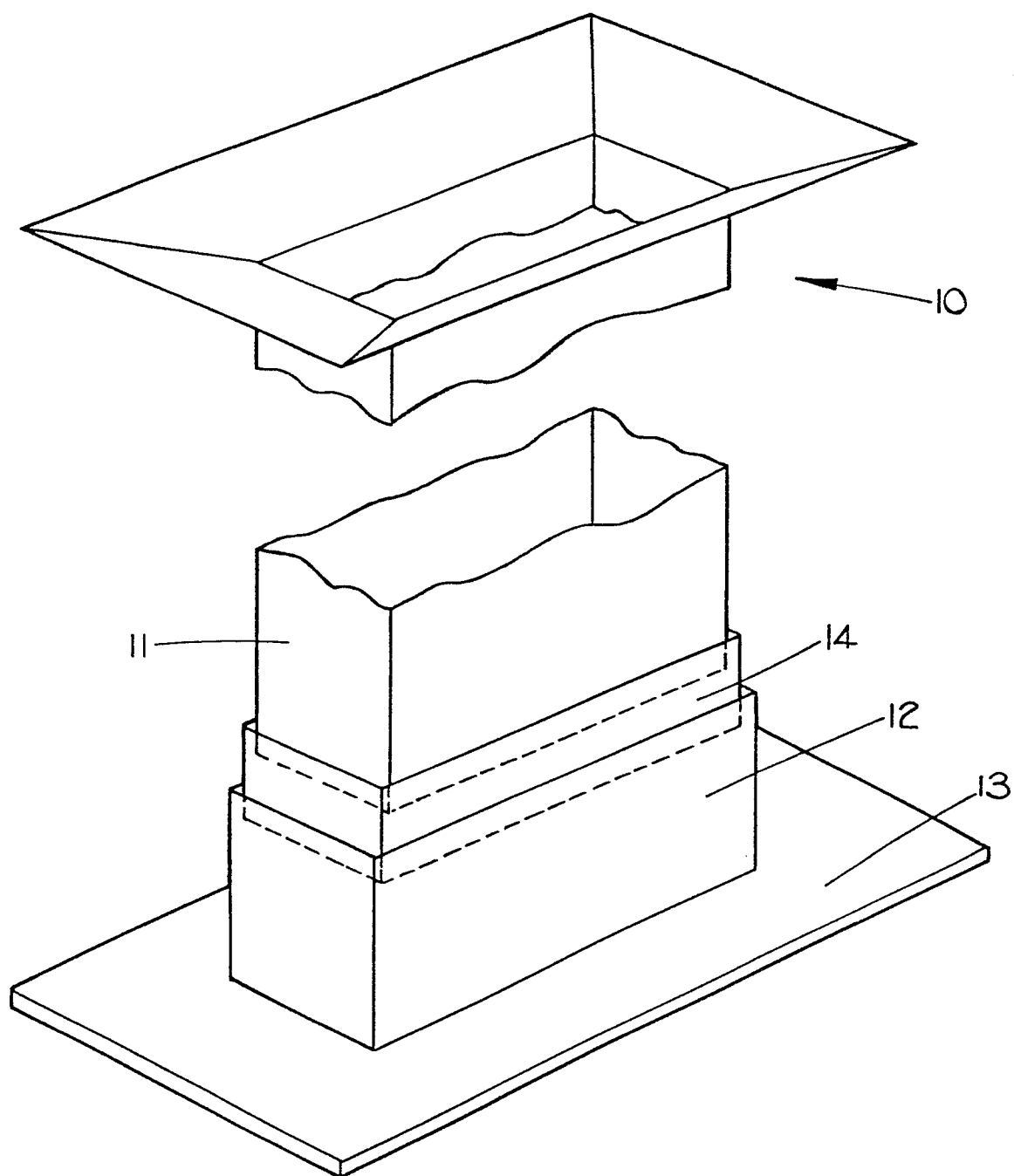


FIG. 1.



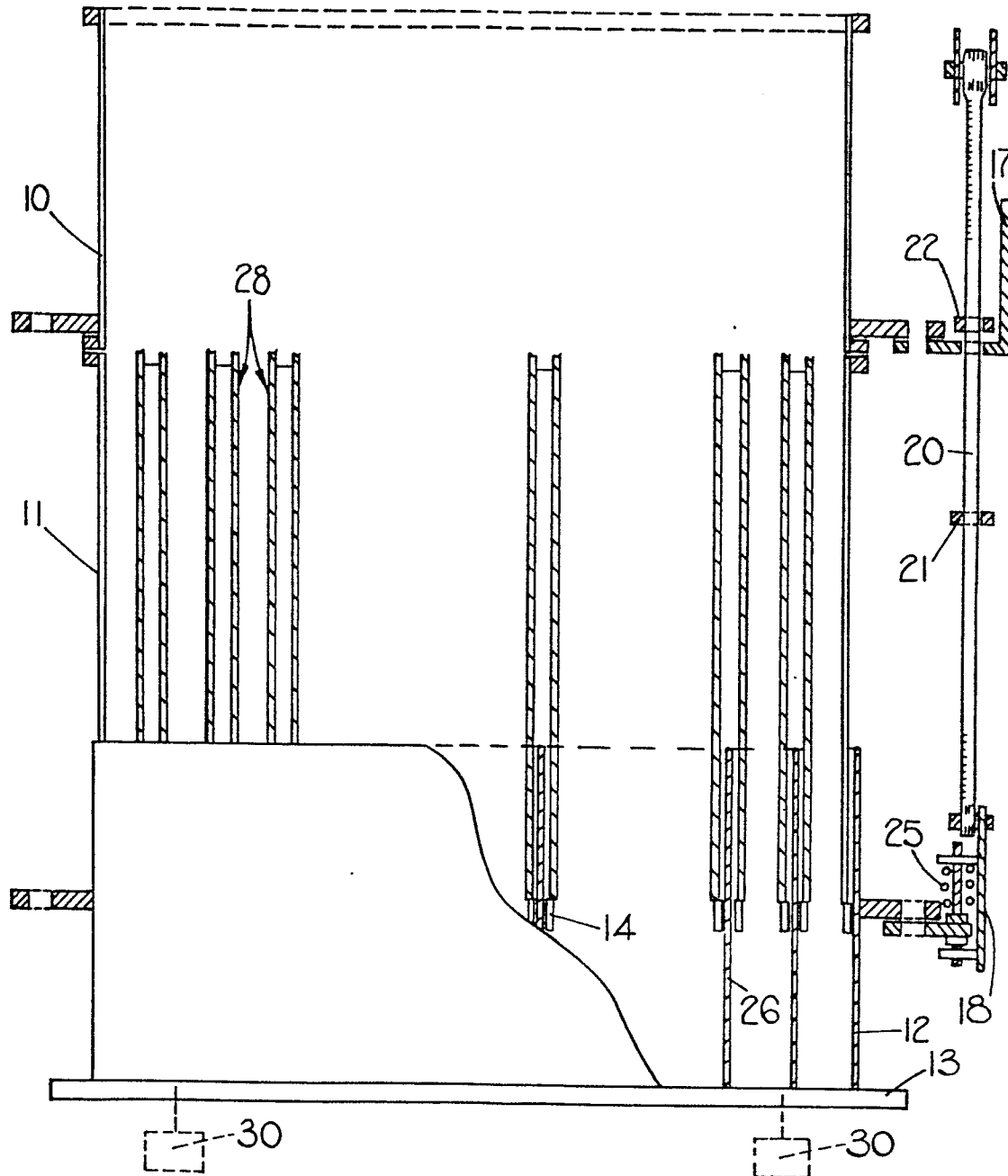


FIG. 3.



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# EUROPEAN SEARCH REPORT

Application number

EP 83303740.1

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. 3)
X	<p><u>FR - A - 848 306</u> (FREYSSINET)</p> <p>* Fig. 8; page 3, column 2, lines 92-96 *</p> <p>--</p>	1,6 .	B 28 B 1/08
A	<p><u>US - A - 2 389 673</u> (LOFDAHL)</p> <p>* Fig. 3 *</p> <p>--</p>		
A	<p><u>DE - B - 1 176 041</u> (AHRENS)</p> <p>* Fig. 5 *</p> <p>----</p>		
The present search report has been drawn up for all claims			<p>TECHNICAL FIELDS SEARCHED (Int. Cl. 3)</p> <p>B 28 B</p>
Place of search VIENNA		Date of completion of the search 08-09-1983	Examiner GLAUNACH
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone</p> <p>Y : particularly relevant if combined with another document of the same category</p> <p>A : technological background</p> <p>O : non-written disclosure</p> <p>P : intermediate document</p>		<p>T : theory or principle underlying the invention</p> <p>E : earlier patent document, but published on, or after the filing date</p> <p>D : document cited in the application</p> <p>L : document cited for other reasons</p> <p>&amp; : member of the same patent family, corresponding document</p>	