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

(11) Publication number: **0 153 800**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 85300346.5

(51) Int. Cl.⁴: E 01 C 19/52

(22) Date of filing: 18.01.85

(30) Priority: 20.01.84 GB 8401564

(43) Date of publication of application:
04.09.85 Bulletin 85/36

(84) Designated Contracting States:
BE DE FR NL

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(54) Improvements in or relating to block laying apparatus.

(57) A block laying apparatus is driven to the location of a stack of layers of interlocking concrete blocks such that the stack (154) is located within the apparatus below a scissors lift assembly (60). The operator can control movement of the lift assembly (60) such that arms (62) are lowered past lugs (76) on the apparatus frame to surround the stack (154). When the lift assembly (60) is raised engagement between the arms (62) and the lugs (76) causes the scissors action to become effective and the arms (62) can move into clamping engagement with the stack (154). Further raising lifts the arms (62) with the stack (154). A block platform (80) is movable from an outboard position to a position beneath the stack (154), and further operation of the lift assembly (60) enables a lowermost layer of the stack (154) to be positioned on the platform (80) whereupon the latter can be moved back to the outboard laying position. When the apparatus reaches a laying location, the operator can move onto a platform (38) and engage a clamping frame (88) with the layer of blocks. The platform (80) is then returned to a loading position below the stack (154) and the operator can control release of the clamping frame (88) to lay the blocks in a correct position. The apparatus can then be driven to the next laying location while a further layer of blocks from the stack (154) is deposited on the platform (80) and transferred to the laying position.

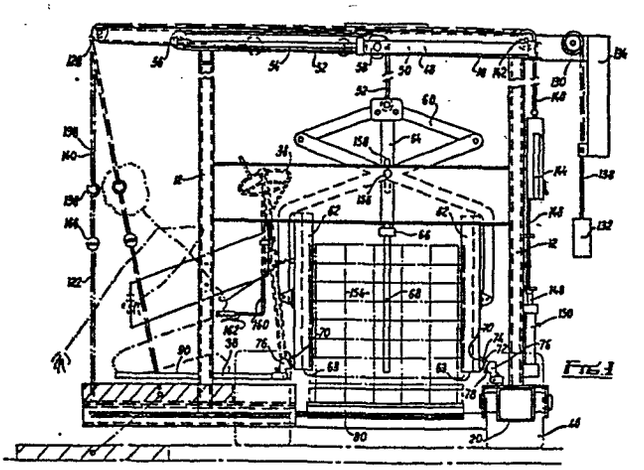

Fig.1

EP 0 153 800 A1

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Improvements in or Relating to Block Laying Apparatus

This invention is concerned with improvements in or relating to block laying apparatus, particularly apparatus for simultaneously laying a plurality of concrete interlocking blocks in a predetermined arrangement.

Different types of automatic block laying machines have already been proposed but they generally suffer the disadvantage that the machine has to travel back and forth between a stacked layer of blocks and the laying locations, the machine being designed to lift and lay one layer of blocks at a time. A variation of such a machine utilises a swinging boom which reduces the amount of travel of the machine, but such a machine still has the ability only to lift and lay a single layer of blocks at any one time. In addition the machine is designed to lay blocks of a specific shape and the shape in question requires the operator to infill spaces existing when layers are laid adjacent to one another.

The known machines are therefore disadvantageous as regards the amount of travel time relative to laying time, and it is an object of the present invention to provide a block laying apparatus which obviates or mitigates such disadvantages.

According to the present invention there is provided block laying apparatus comprising drive means for controlling travel of the apparatus, characterised in that there are provided means for collecting and retaining a plurality of stacked layers of blocks in a first or storage position in the apparatus, means for trans-

ferring in the apparatus respective layers of the blocks successively from said first position to a second or laying position, and means for releasing the blocks from the apparatus together in a layer from the second position so as to enable a single laying of each layer of blocks.

Preferably the stack collecting and retaining means comprises a scissors lift assembly having arms which are movable between a clamping position in engagement with the stacked layers and a release position. The lifting mechanism may comprise a scissors lift assembly which is suspended from an upper part of a frame of the apparatus, and the scissors lift assembly may be suspended by a pulley line connected to a piston of a pneumatic piston and cylinder assembly. Latch means may be provided to be engageable with lugs on the arms so as to control the location on the stack where clamping of the arms becomes effective.

Preferably also the layer transfer means comprises a block platform movable between a loading position below the first position of the stack and an outboard position relative to the apparatus such that, with the platform in the loading position, a layer of blocks can be released from the stack onto the platform, and the layer of blocks can be transferred to the second position, when the platform is moved to the outboard position. Further, an operator platform may be provided at the outboard position for supporting an operator above the block platform, when the latter is in the second position with a layer of blocks thereon, so as to enable manual control of laying.

Desirably means are provided to counter-balance the weight of

that part of the apparatus at the outboard position. Also adjustable means may be provided to counter-balance the transfer of a layer of blocks to the outboard position.

The block releasing means preferably comprises a frame having clamping members engageable with at least two opposed sides of the layer of blocks and operator controlled means for releasing the clamping members.

An embodiment of the present invention will now be described by way of example only with reference to the accompanying drawings in which :-

Fig. 1 is a front elevation of a block laying apparatus according to the invention;

Fig. 2 is a plan view of the apparatus of Fig. 1;

Fig. 3 is an elevation view in the direction or arrow A;

Fig. 4 is an elevation view in the direction of arrow B;

Fig. 5 is a view in plan of a part of the apparatus; and

Fig. 6 is an elevation of the apparatus part of Fig. 5, partly schematic.

Referring to the drawings, there is provided an apparatus for the laying of concrete blocks, the apparatus being designed to simultaneously lay a plurality of interlocking blocks of an 'axehead' shape, i.e. a generally rectangular block having a first pair of opposed sides concavely curved and a second pair of opposed sides convexly curved. Such blocks are laid with adjacent blocks turned through 90° relative to one another so as to form an interlocking relationship.

The apparatus is constructed from a main frame assembly comprising a base 10 and uprights 12, one of the latter at each of the four corners of a rectangular area, the uprights 12 being arranged in pairs at respective sides of the apparatus. The uprights of each pair each include a vertical section 14 and an upper inwardly angled section 16, the sections 16 being interconnected at their upper ends by a frame member 18 which extends laterally of the apparatus between each pair of uprights 12. The base 10 includes a longitudinally extending box section frame member 20 at one side of the apparatus and a channel member 22 extending laterally along the rear of the apparatus and being open at its inwardly facing wall. The channel member 22 extends laterally beyond the location of the respective uprights 12 at the side remote from the frame member 20. At the front of the apparatus, a further channel arrangement extends laterally and comprises a removable channel part 24 at the box frame member 20 and a fixed channel part 26 aligned with the channel part 24 and extending laterally from a location inwardly of the respective pair of uprights 12 to a location laterally outwardly of these uprights 12, the free end of the channel part 26 being aligned with the free end of the laterally extending channel member 22.

At the rear side, the frame structure provides a support 28 on which is mounted a pair of inboard drive wheels 30 for the apparatus, there being further provided a diesel engine 32 for driving the wheels 30 and a steering assembly 34 connected with the drive wheels 30 in a conventional manner, being controlled by a steering wheel 36 located substantially centrally of

the apparatus on an operator platform 38 supported by the frame structure. The support 28 also locates a fuel tank 40 and an air reservoir 42, while the engine 32 is operatively connected with a compressor 44 for a purpose hereinafter described. At the front side of the apparatus the frame structure freely mounts a pair of outboard larger sized wheels 46. The construction of the apparatus is such as to define a substantially U-shaped arrangement where the rear side is formed as the base of the U and the front side is open, although it can be closed by the mounting thereon of the removable channel part 24.

On the upper, laterally extending frame member 18 there is mounted a pneumatic piston and cylinder assembly 48, the open end of the fixed cylinder 50 having connected thereto one end of a rope 52. The piston 54 mounts at its outer end a pulley 56 and the rope 52 is wrapped around the pulley 56 and around a fixed pulley 58 so as to be able to be suspended substantially centrally of the U-shaped area of the apparatus. At its other end, the rope 52 isconnected to a scissors lift assembly 60 on the lower ends of the arms of which are mounted downwardly extending clamping arms 62. At a lower end of a centre vertical support 64 of the lift assembly 60 there is provided a horizontal support 66 extending longitudinally of the apparatus and mounting a further pair of guide rods 68. Each of the clamping arms 62 is provided at its lower end with a projecting lug 70 presenting respective upper and lower angled faces 72, 74. These lugs 70 operatively engage with lugs 76 pivotally mounted on the frame structure and each presenting

an angled operating face 78 for a purpose hereinafter described. It will be appreciated that reciprocal movement of the piston 54 in the cylinder 50 will effect raising and lowering of the scissors lift assembly 60 and thus the arms and rods 62, 68.

A block support platform 80 has guides 82 slidably located by means of linear bearings 84 in the channel arrangement 22, 24, 26 and is movable therein by means of a piston/cylinder assembly 86. The platform 80 is movable between an outboard position where it extends between the fixed channel part 26 and the laterally outwardly extending section of the channel member 22 to be clear of the central part of the U-area of the apparatus, and an inboard position where it extends between the removable channel part 24 (when this is mounted in the apparatus) and the inner section of the channel member 22 for a purpose hereinafter described.

At the outboard position, there is suspended, as hereinafter described, a clamping frame 88 (Fig. 5) positioned below a laterally extending section 90 of the fixed operator platform 38. The latter is spaced inwardly of the movable platform 80 and the clamping frame 88 at both the front and rear of the apparatus, and also inwardly of the outer edge of the clamping frame 88 and the platform 80 when the latter is in its outboard position. The clamping frame 88 comprises a member 92 extending laterally relative to the apparatus, and fixed centrally of the member 92, to extend at right-angles thereto, is a piston/cylinder assembly 94, the cylinder 96 being fixed

at one end to the member 92 and the piston 98 being connected at its outer end to a frame member 100 extending parallel to the member 92. The member 100 mounts a series of downwardly projecting clamps 102, one clamp at each end and a third clamp centrally thereof. A further frame member 104 is provided on the opposed side of the fixed member 92 from the member 100 and also mounts a similar series of downwardly extending clamps 102. The members 100, 104 are interconnected by a pair of telescopic rod and tube assemblies 106 extending longitudinally, relative to the apparatus, at respective ends of the members 100, 104. The tubes 108 of the assemblies 106 are each fixed at one end to the frame member 104, with the frame member 92 being mounted at either end on respective ones of the tubes 108. The rods 110 of the assemblies 106 extend outwardly of the tubes 108 and are each fixed at the outer ends to the frame member 100. A fixed collar 112 is provided on each of the rods 110 and a compression spring 114 surrounds each of the rods 110 and extends between the collar 112 and an end abutment 116 on the respective tube 108.

For operation of the piston/cylinder assembly 94 there is provided a semicircular control arm 118 connected with the member 92 and accessible to an operator located on the section 90 of the operator platform 38. On one end of the arm 118 is provided a control lever 120 which operates the assembly 94. On the other end of the arm 118 is mounted a control lever 121 which operates a piston/cylinder assembly 150 as hereinafter described. In the non-extended position of the piston 98 and

the cylinder 96, the rods 110 and the tubes 108 are moved together and compress the spring 114. In this position the frame member 104 moves towards the frame member 100 and the clamps 102 engage opposed sides of a layer of blocks by engaging the concavely curved sides of alternate ones of the blocks. Because of the interlocking nature of the blocks, this clamping will retain the whole layer of blocks together. Manual operation of the lever 120 will extend the piston 98, to enable the springs 114 to bias the members 100, 102 away from their clamping positions and release the clamps 102. To return to the clamping position the lever 120 is released to its original position.

To suspend the clamping frame 88 and also counter-balance the weight thereof in the outboard position relative to the apparatus, a rope 122 is connected centrally of the clamping frame on the axis of the control arm 118 to extend to an intermediate connector ring 136 to which is also connected a rope 138. The latter extends upwardly around a pulley 128 which is mounted to extend laterally outwardly of the apparatus over the outboard position and therefrom the rope 138 extends laterally across the top of the apparatus around a further pulley 130 supported laterally outwardly at the opposed side of the apparatus. The rope 138 is then suspended from the pulley 130 and has a counter-balance weight 132 connected to its free end. Also at the same side of the apparatus a fixed counter-balance weight 134 is mounted on the frame structure.

To counter-balance the weight of the interlocking blocks when they are transferred by the platform 80 to the outboard

position as hereinafter described, a further rope 140 is attached to the connector 136 and extends around the pulley 128 and a pulley 142 at the opposed side of the apparatus frame from the outboard position. The free end of the rope 140 is connected to a counter-balance weight 144 and the latter has a downwardly extending rigid member 146 engageable by the free end of a piston 148 reciprocable in a cylinder of the pneumatic piston/cylinder assembly 150. Movement of the piston 148 can render the effect of the weight 144 effective or ineffective according to the actuation or release of the control lever 121 on the control arm 118.

The rope 122 attached to the clamping frame for counterbalancing the weight of the frame and of the blocks is provided with a twist connection 166 intermediate its length so that any twisting of the rope 122 at the clamping frame end will not affect the movement around the pulleys and thus the effect of the counter-balance weights.

In operation, a plurality of stacked layers of interlocking concrete axehead blocks are positioned at predetermined intervals along the length of an area which is to be paved. The apparatus is firstly driven by an operator standing on the operator platform 38 by operating conventional controls and the steering wheel 36. With the movable channel part 24 removed, the apparatus is driven to the location of a first stack 154 of interlocking blocks, preferably at or near the first laying location, and the apparatus is positioned such that the stack 154 is centrally located within the U-area, below the scissors lift assembly 60. Operation of the pneu-

matic assembly 48 by the operator by means of suitable controls will then lower the lift assembly 60, with the arms 62 and rods 68 on respective sides of the stack 154. The weight of the assembly 60 enables movement past the lugs 76, and engagement of the angled faces 74 of the lugs 70 with the faces 78 of the lugs 76 will pivot the latter to an inoperative position, allowing the lugs 70 to pass. When the arms and rods 62, 68 are in position around the stack 154, reverse operation of the pneumatic assembly 48 will raise the lift assembly 60, but the upper faces 72 of the lugs 70 abut lower edges of the lugs 76, such that movement past the latter is temporarily prevented. Continued raising of the assembly 60 then causes the scissors action to become effective by movement of a pivot pin 156 in a slot 158 of the support 64, and the arms 62 to be thus moved into clamping engagement with the sides of the stack 154, the guide rods 68 helping to ensure correct alignment. When in such engagement, further raising of the lift assembly 60 forces the lugs 70 to displace the lugs 76, and thus the arms 62 can move past the lugs 76 while firmly in engagement with the stack 154. The latter is thereby loaded and retained in the apparatus, both securely and at a constant vertical position relative to bottom faces 63 of the clamping arms 62.

The removable channel part 24 can then be repositioned on the apparatus and while the apparatus is being moved to the laying location, the operator, by means of the pneumatic assembly 86, can move the platform 80 to a position beneath the stack 154. Further operation of the pneumatic assembly 48 can then lower the lift assembly 60 with the stack 154 past the

lugs 76 until the stack 154 rests on the platform 80. Further lowering of the assembly 60 will firstly cause the slightly longer guide rods 68 to engage the platform 80 and bring the scissors action into effect such that the clamping arms 62 are released from engagement with the stack 154. Subsequent raising of the lift assembly 60 will then cause the arms and rods 62, 68 to lift while still clear of the stack 154 until the lugs 70 engage with the lugs 76. Thereafter, continued raising of the assembly 60 engages the clamping arms 62 with the lowermost-but-one layer of blocks in the stack 154, and the stack is then again raised, but leaving the lowermost layer on the platform 80. The latter is then moved to the outboard laying position by means of the pneumatic assembly 86.

At the laying location it is convenient for the operator to kneel on the section 90 of the platform 38 and be able to view three edges of the layer of blocks. By means of the pneumatic assembly 94, the clamping frame 88 can then be made effective by the operator and the platform 80 can then be returned to a loading position below the stack 154. To enable further control of the position of the apparatus by the operator when in the laying position, a further propulsion lever 160 is provided in the apparatus, having a control lever 162 at its lower end for operation by the operator when the latter is in the kneeling position, and a control lever 164 at its upper end used when the operator is in the standing position.

Using the control arm 118, the operator can swing the clamping frame 88, incorporating the layer of blocks, forward and downward into position on the ground. When satisfied that

the alignment is correct, the clamping can be released such that the layer of blocks is left in its laid position. When the layer of blocks is clamped in the apparatus prior to the laying position, automatic operation of the pneumatic assembly 152 disengages the piston 148 from the rigid member 146 to thus allow the weight 144 to become effective. When the layer of blocks is released into its laid position, automatic operation of the pneumatic assembly 150 engages the piston with the rigid member 146 thus rendering the weight 144 ineffective. This system ensures that the load presented to the operator at any time is exactly counter-balanced, thus promoting speed and accuracy of alignment. It further promotes safe operation and reduces operator fatigue.

When the laying of the layer of blocks has been completed, the apparatus can then be driven to the next laying location while meantime a further layer of blocks from the stack 154 has been deposited on the platform 80 and the latter has been transferred to the laying position. On arrival at the next laying location, the apparatus is therefore again ready for laying of a layer of blocks by the operator. The twist connection 166 facilitates movement of the clamping frame through 90° for the laying of alternate layers. When the stack 154 has been exhausted, the apparatus will have approached the next stack of layers positioned on the site, such that it is only necessary for the operator to remove the channel part 24 and load a further stack of blocks into the apparatus as previously described. In this way it will be appreciated that there is little if any unnecessary travel of the apparatus, which is

designed such that preparation of a layer of blocks for laying can take place while the apparatus moves from one laying location to the next. There are therefore considerable advantages as regards savings in laying time and therefore expense.

Various modifications may be made without departing from the invention. For example, the removable channel part may be hinged to the apparatus frame, and the frame construction and construction of many of the other components, as well as the disposition of the components in the apparatus can vary from that described and shown, provided the apparatus is still capable of carrying out the desired functions. It will be appreciated that the apparatus could be designed to lay blocks of other than axehead shape.

Claims ;

1. Block laying apparatus comprising drive means for controlling travel of the apparatus, characterised in that there are provided means (60-68) for collecting and retaining a plurality of stacked layers of blocks in a first or storage position in the apparatus, means (80) for transferring in the apparatus respective layers of the blocks successively from said first position to a second or laying position, and means (83) for releasing the blocks from the apparatus together in a layer from the second position so as to enable a single laying of each layer of blocks.

2. Apparatus according to claim 1, characterised in that the stack collecting and retaining means comprises a scissors lift assembly (60) having arms (62) which are movable between a clamping position in engagement with the stacked layers (154) and a release position.

3. Apparatus according to claim 2, characterised in that latch means (76) is provided to be engageable with lugs (70) on the arms (62) so as to control the location on the stack (154) where clamping of the arms (62) becomes effective.

4. Apparatus according to claim 3, characterised in that each of the lugs (70) on the arms (62) presents a pair of angled faces (72,74), and the latch means (76) provides an angled operating face (73) and an abutment face for engagement with respective ones of the angled faces (74,72) of the lugs (70) during movement of the arms (62).

5. Apparatus according to any of the preceding claims, charac-

terised in that the layer transfer means comprises a block platform (80) movable between a loading position below the first position of the stack (154) and an outboard position relative to the apparatus such that, with the platform (80) in the loading position, a layer of blocks can be released from the stack (154) onto the platform (80), and the layer of blocks can be transferred to the second position when the platform (80) is moved to the outboard position.

6. Apparatus according to claim 5, characterised in that an operator platform (38) is provided at the outboard position for supporting an operator above the block platform (80), when the latter is in the second position with a layer of blocks thereon, so as to enable manual control of laying.

7. Apparatus according to claim 5 or 6, characterised in that means (132,134) are provided to counter-balance the weight of that part of the apparatus at the outboard position.

8. Apparatus according to any of claims 5 to 7, characterised in that adjustable means (144) is provided to counter-balance the transfer of a layer of blocks to the outboard position.

9. Apparatus according to any of the preceding claims, characterised in that the block releasing means comprises a frame (88) having clamping members (102) engageable with at least two opposed sides of the layer of blocks and operator controlled means (120) for releasing the clamping members (102).

10. Apparatus according to claim 9, characterised in that the clamping frame comprises a first arrangement providing a first member (104) mounting a plurality of clamps (102), and tubular

members (106), each connected at one end with the first member (104) and having the other end open to slidably receive a respective elongate member (110) of a second arrangement of the clamping frame, the second arrangement providing a further member (100) arranged parallel to the first member (104) of the first arrangement and mounting a plurality of clamps (102), the first and second arrangements being biassed apart into a non-clamping condition and being movable together into a clamping condition.

11. Apparatus according to claim 9 or 10, when dependent on claims 7 or 8, characterised in that the counter-balance means comprises a line (122,138) connected between the clamping frame (83) and a counter-balance weight (132), a connector ring (136) being provided in the line (122,138) between the clamping frame (83) and the counter-balance weight (132), and the adjustable counter-balance means comprises a further line (140) connected between the connector ring (136) and a further counter-balance weight (144) which is selectively effective, the line connection with the clamping frame being provided with a twist connection (166) intermediate of its length.

12. A method of laying blocks, characterised by collecting and retaining a plurality of stacked layers of blocks in a first or storage position in an apparatus, transferring in the apparatus respective layers of the blocks successively from the first position to a second or laying position, driving the apparatus with the stacked layer of blocks to respective laying locations, and, at each laying location, laying a respective layer of blocks by

releasing the blocks together in the layer from the second position in the apparatus.

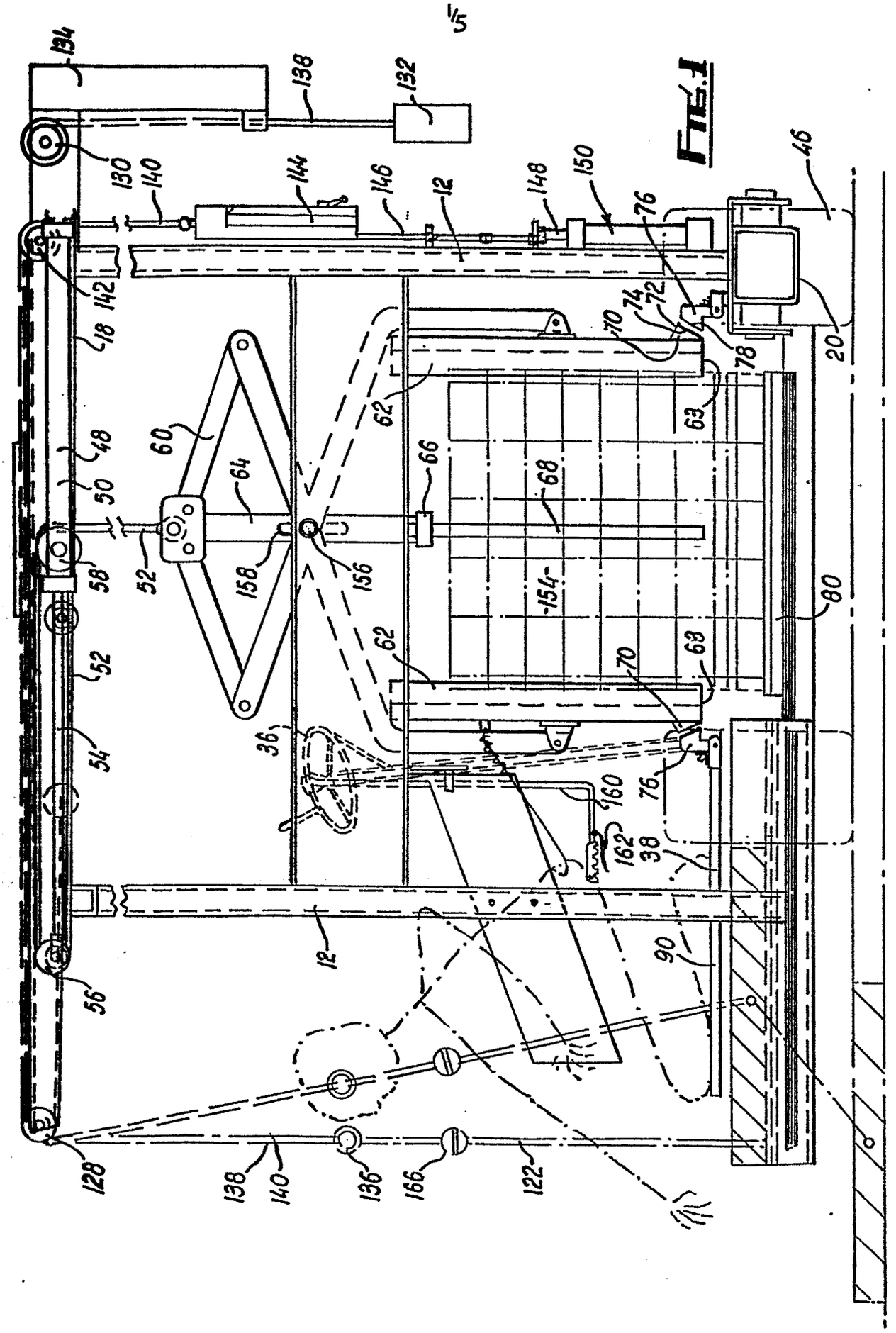
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FIG. 1

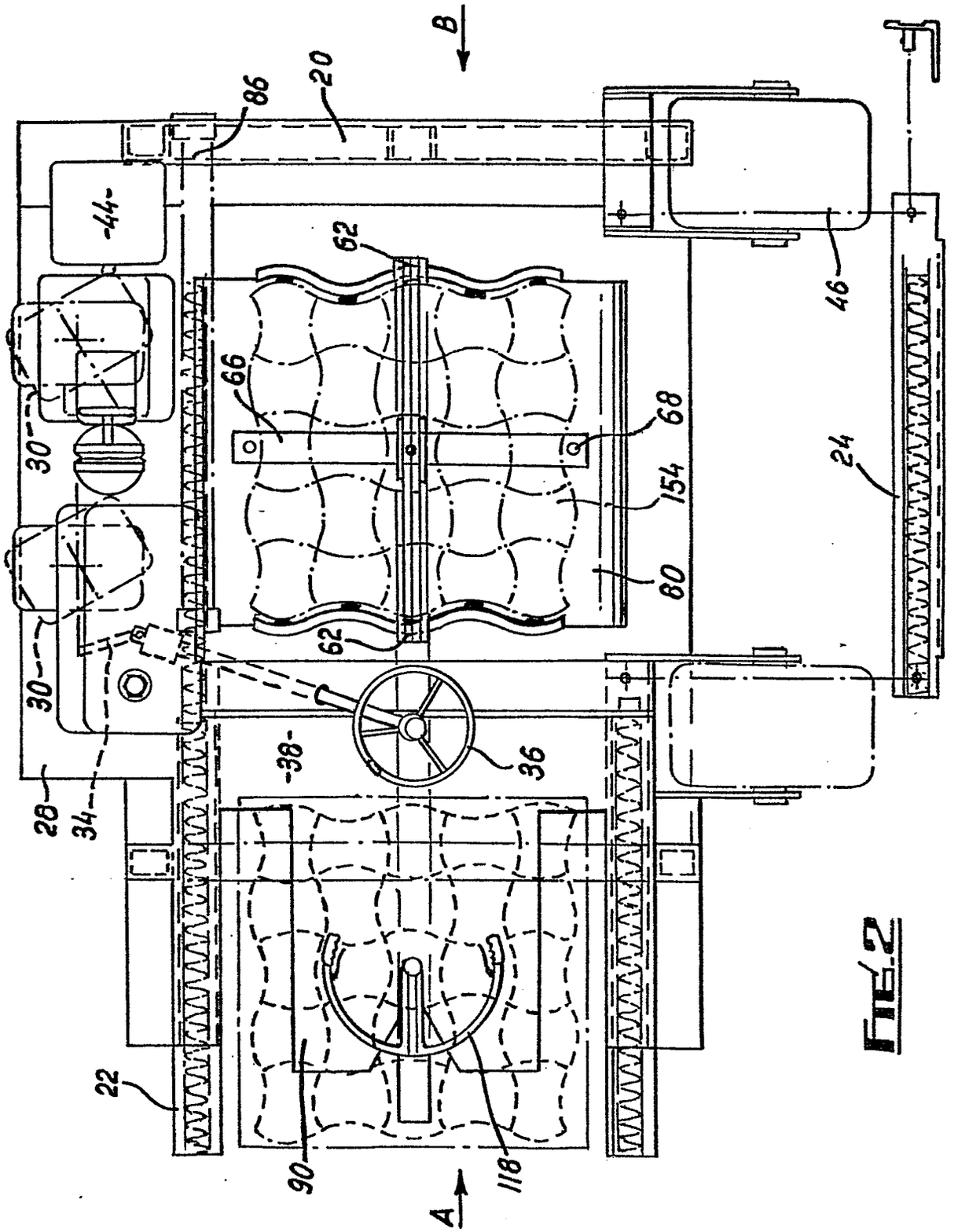

FIG.2

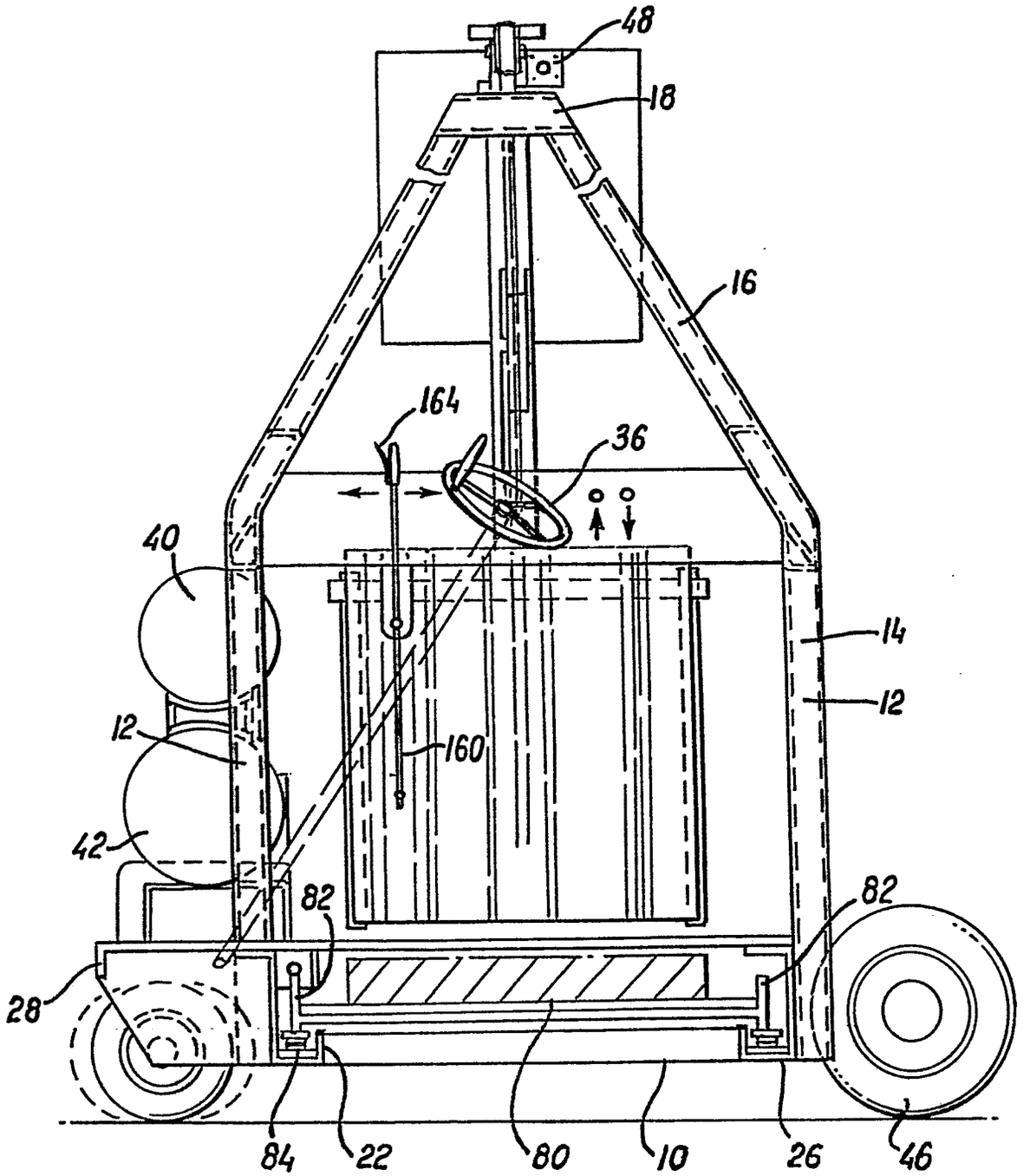

FIG. 3

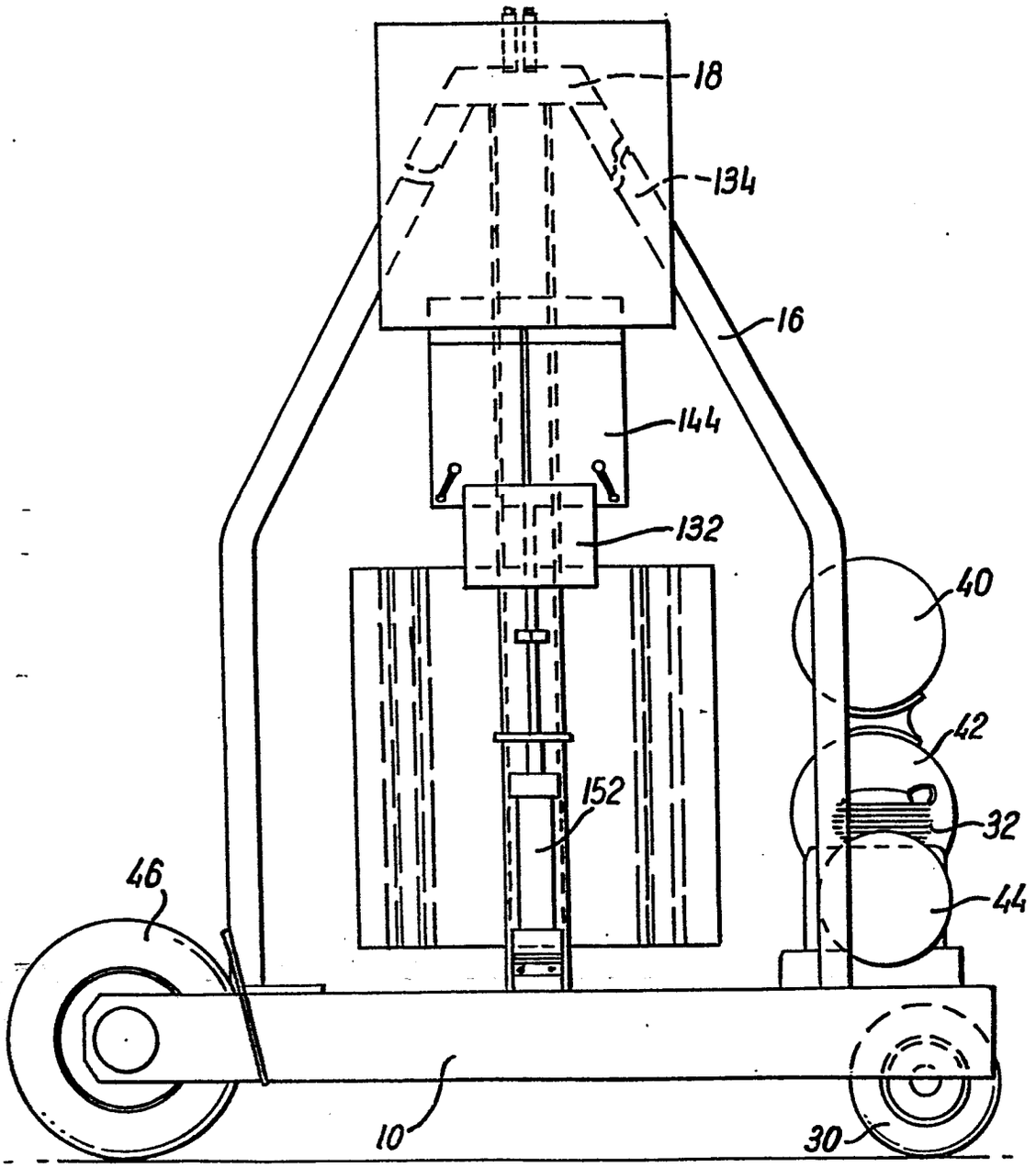

FIG.4

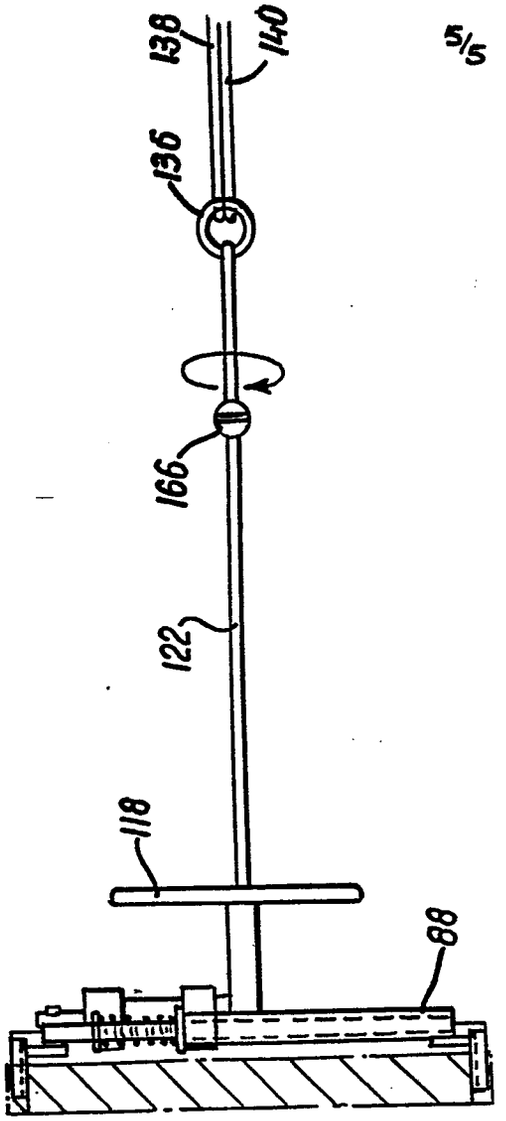
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FIG. 6

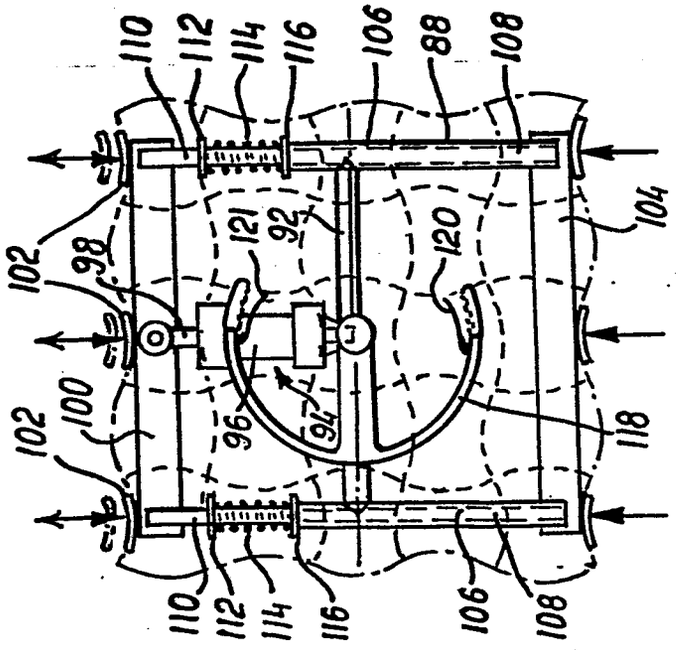
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FIG. 5

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EUROPEAN SEARCH REPORT

0153800
Application number

EP 85 30 0346

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	DE-A-2 335 158 (FORSCHUNGSGRUPPE FÜR BAUTECHNOLOGIE AG) * Complete document *	1	E 01 C 19/52
A		5,6,12	

X	DE-A-2 335 159 (FORSCHUNGSGRUPPE FÜR BAUTECHNOLOGIE AG) * Complete document *	1	
A		6,12	

A	DE-U-7 717 723 (LAHN-WASCHKIES GMBH & CO. KG, R. SCHNEIDER) * Figures 1-3 *	2	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
	---		E 01 C 19/00
A	DE-A-2 826 483 (F. VON LANGSDORFF BAUVERFAHREN GMBH et al.) * Pages 13,14; figure 1 *	7	

A	DE-A-2 918 232 (OLDENBURGER BETON-STEINWERKE GMBH) * Page 6; figure *	9	
	--- -/-		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	23-04-1985	PAETZEL H-J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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D : document cited in the application
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EUROPEAN SEARCH REPORT

0153800

Application number

EP 85 30 0346

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)
A	DE-A-2 751 515 (AXEL-HOLGER LEHNEN VERMIETUNG- UND VERPACHTUNG-LEASING) * Claim 1 *	11	
A	DE-A-2 936 472 (AUMILLER) * Page 10; figure 4 *	12	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

The present search report has been drawn up for all claims

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