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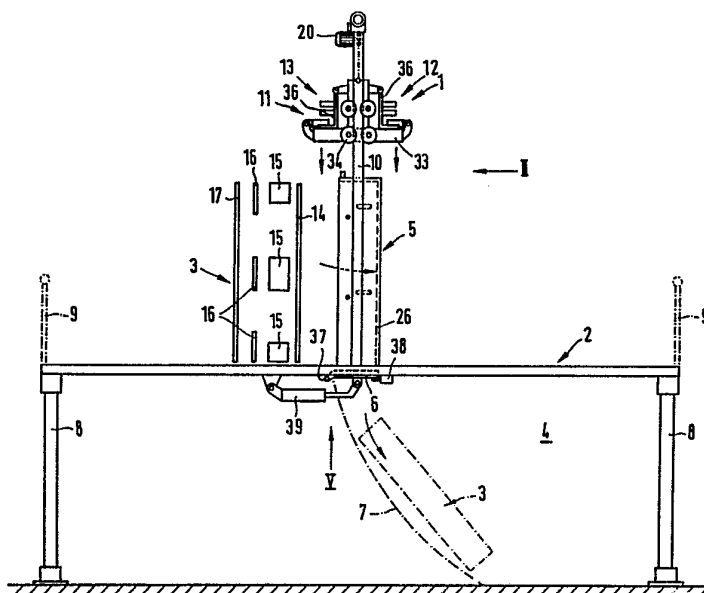
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(54) Title: APPARATUS AND PROCESS FOR MANUFACTURING PALLETS

(57) Abstract

With an apparatus (1) for manufacturing pallets (3) comprising at least one nailing device (12, 13) and an insertion frame (5) set for receiving pallet elements - namely bottom boards (14), blocks (15), cross boards (16) and cover boards (17) - it is provided in accordance with the present invention that the insertion frame (5) is mounted vertically and that on the front and back of this insertion frame (5), nailing devices (12, 13) can be positioned which nail the pallet elements (14-17) inserted in the insertion frame (5) from both sides simultaneously. At the insertion frame (5), holding devices (24, 25) with a locking function in vertical direction are arranged, which on the one hand retain the pallet elements (14-17) in the desired position during the inserting process and which on the other hand release the pallet elements (14-17) for transporting the pallets (3) after the nailing process is finished. The holding devices (24, 25) are mounted lateral to the insertion frame (5) and/or in the slots between the bottom boards (14) of the pallet (3).



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APPARATUS AND PROCESS FOR MANUFACTURING PALLETS

The invention relates to an apparatus for manufacturing pallets comprising at least one connecting device and an insertion frame set for receiving the pallet elements - namely bottom elements, blocks, cross elements and cover elements - as well as a process for manufacturing pallets.

With an apparatus for manufacturing pallets as known by DE-OS 29 07 641, the pallets are produced as a mass-product on an assembly line. With charging magazines, the pallet elements are brought on various feed-devices to a nailing machine and are nailed there in two steps. For this, the pallet must be turned over by a costly device. "Costly" because this turning device requires a lot of time and energy for pallet-assembly-lines as well as for single pallet machines and moreover, they are not free from interference.

The turning device of known pallet machines has furthermore the disadvantage to occupy much space.

An additional disadvantage of present-day technology is for manual assembly with nailing-tables that pallets must be taken out of the machines by physical strength.

DE-OS 22 02 405 describes an apparatus for manufacturing wooden half-timbering for roofs including an insertion frame in which the half-timbering-carriers can be put and providing that connecting pieces are brought at the front and the back of the insertion frame into such a position that they join the beams being put in the insertion frame simultaneously from both sides with aid of a hydraulic press.

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From US-PS 4 650 106, it is known that insertion frames can be arranged sloping to the vertical.

The principle object of the present invention is to provide an apparatus for manufacturing pallets which makes it possible to produce pallets in efficient special order with occupying little space and in short production intervals.

In accordance with the present invention, the features of the main claim respectively of claim 16 serve this purpose.

The vertical arrangement of the insertion frame makes it possible to arrange connecting devices on both sides of the insertion frame in an advantageous way so that the pallet elements put into the insertion frame can be joined from both sides simultaneously. In consequence, the pallets need not to be turned over for being joined on both sides and therefore, a costly turning device can be dropped. At the same time, the production interval for manufacturing one pallet is reduced. Furthermore, the apparatus for manufacturing pallets can be designed very space-savingsly compared to machines with turning devices.

A further advantage is that, in accordance with the present invention, the apparatus has a simple structure and can be operated without complicated and costly electronic steering. Aside from nailing machines run by compressed air, only a few electromagnetic or pneumatic driven devices are needed. Moreover, such an apparatus can easily be arranged and dismantled. The connecting devices are within easy reach so that replacing of single devices, e.g. nailing devices, or charging the

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devices with connecting pieces is possible in an easy way. In accordance with the present invention, the apparatus for manufacturing pallets can favourably be used universally for various pallet materials and connecting techniques.

On the insertion frame, flaps or something like that are mounted as holding devices having a vertical locking function. On the one hand, they retain the pallet elements in the desired position during the insertion process and on the other hand, they release the pallet elements for transporting the pallets after the joining process is finished. The flaps make it possible to hold the blocks and cross elements in a horizontal position during the pallet elements are aligned and until they are joined. The release of the pallet elements by the flaps allows to take the pallets after finishing the joining process vertically downwards to which gravity on the basis of the pallet's dead weight (25 - 30 kg) can be utilized. To that the apparatus for manufacturing pallets can be mounted on a platform to make it possible that the completed pallets can be taken out downwards.

In a preferred embodiment of the invention, the flaps are mounted as holding devices lateral to the insertion frame and/or in the slots between the skid of the pallet. The slots between the skid can be used favourably because the holding devices do not hinder there a vertical transportation of the pallets.

The insertion frame can be equipped with vertical guides on its back for receiving the bottom elements and/or the blocks. These guides made of e.g. angle sheet or other sectional steel facilitate an exactly

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defined position of the pallet elements.

The connecting devices arranged on the front and back of the insertion frame can preferably be moved in horizontal as well as in vertical direction so that it is possible to choose every desired nailing position within the insertion frame.

In a preferred arrangement, it is provided that the nailing devices are mounted on mobile carriers at both sides of the insertion frame and that these carriers clamp the pallet elements before the nailing process. This clamping the pallet elements prevents a slipping of the pallet elements reliably during they are nailed.

With a preferred further development of the present invention, it is provided that at the bottom of the insertion frame, a trapdoor is mounted to release the pallet after the nailing process. The trapdoor is a specific form of holding device for retaining the pallet elements at the bottom of the insertion frame and in its locking position, it forms the bottom of the insertion frame. After the nailing process, the trapdoor releases the pallet for free fall downwards and at the same time, all the other holding devices must release the respective pallet elements which are not lying on the trapdoor. Therefore, it is useful to synchronize the release of the trapdoor with the release of all the other holding devices.

In a preferred embodiment of the invention, a chute for the transportation of the pallets is mounted below the trapdoor. This chute may have a bent form to direct the pallet into a horizontal position and to brake the motion of the pallet in the course of this.

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At the upper end of the insertion frame, it is favourable to mount a sprung clamping device for each cover element of the pallet so that the cover elements are temporarily retained in their position until they are clamped by the nailing devices.

The insertion frame may have a back which is left blank up to the height/level of the blocks. The nailing devices arranged on the back of the insertion frame can then nail the pallets from the back straight through the gap.

In the following, a preferred embodiment of the present invention is exemplarily and more detailed explained referring to the drawings.

Brief description of the drawings:

Fig. 1 shows a side view of an apparatus for manufacturing pallets which is mounted on a platform,

Fig. 2 shows a rear view of an apparatus for manufacturing pallets comprising a frame element for guiding the nailing devices on both sides and an insertion frame for the pallet elements,

Fig. 3 shows a top view of the carrier frame for the nailing unit,

Fig. 4 shows a side view of the nailing unit and

Fig. 5 shows a top view of a trapdoor from below for the release of the pallet downwards.

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Fig. 1 shows the general structure of the apparatus for manufacturing pallets 1 mounted on a platform 2 to release the completed pallet 3 to the space 4 under the platform 2 for further transportation.

After the nailing process is finished, the pallets fall out of the insertion frame 5 when the trapdoor 6 is opened. They fall into a chute 7 which is arranged under the trapdoor 6 and diverts the pallets 3 from a vertical position into a substantially horizontal position for further utilization.

The platform 2 stands on supporting columns 8 and may be equipped with a safety railing or protecting bars 9.

The insertion frame 5 is enclosed by a gate frame 10 where a nailing unit 11 with nailing devices 12,13 arranged on both sides at the level of the gate frame 10 respectively of the insertion frame 5 can be driven up and down vertically.

In the upper position of the nailing unit 11, the insertion frame 5 can be reached for being fed with pallet elements namely three bottom boards 14, nine blocks 15, three cross boards 16 and five cover boards 17.

Fig. 2 shows the gate frame 10 in detail preferably consisting of a pipe frame with a removable top element 18 and two vertical pipe columns which are fixed into each other at the top element 18 by adapter couplings and secured by a safety pin. In the middle of the top element 18, a lifting device 20 for the nailing unit 11 is mounted and consists of e.g. a winch in which a wire cable 21 is connected across steering pulleys 22 with

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the nailing unit 11. With the winch, the nailing unit 11 can be moved up and down in any desired direction.

Fig. 2 shows as well the insertion frame 5 which is set up for UIC-pallets. The gaps between the skids of the pallets as required by DIN 15146, page 2, are normally used for the engagement of the transport forks by the fork-lift-truck and serve in the insertion frame 5 for placing the holding devices 24 which fix the blocks 15 of the pallet 3. These holding devices 24 are based on folding or turning mechanism and placed in one position they break off their horizontal locking and release with that the pallet elements, here the blocks 15, vertically downwards.

The insertion frame 5 is stocked up in the following way:

First of all, the operator inserts the middle and two lateral bottom boards 14 vertically in the insertion frame 5 to which corresponding vertical guides or in profile on the back 26 of the insertion frame 5 are provided.

After inserting the vertically running bottom boards 14, the flaps 27 of the holding devices 24 for the top and middle lines of blocks as shown in Fig. 3 are brought into their horizontal position so that the topmost and the middle line of blocks 15 can be laid on the holding devices 24.

Moreover, the holding devices 25 for the middle and top of the three cross boards 16 which must be laid horizontally on the respective lines of blocks are brought into their locking position by bringing the holding

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pins 29 to the height/level of the cross boards 16 from the frame edge into the insertion frame 5.

When all holding devices are put into their locking position, e.g. by automatic or mechanic steering, the operator can insert the nine blocks 15 into the exactly fitting insertion frame 5 and afterwards lay the three horizontal cross boards 16 on the block lines meanwhile the upper and the middle cross board 16 are held at their lower edge on both sides by holding pins 29.

The three vertical bottom boards 14, the lower line of blocks 15 and the lower cross board 16 as well as the five vertical cover boards 17 put on the cross boards 16 lie together on the trapdoor 6 which constitutes a common holding device for these pallet elements.

After all pallet elements are positioned, the nailing unit 11 can be moved vertically downwards to nail the pallet line by line each at the height/level of the blocks 15 from both sides and at the same time.

Instead of nailing the pallets in three steps line by line, all nailing positions of the pallet 3 may be nailed simultaneously with a nailing unit 11 appropriately adapted.

After finishing the nailing process, all the holding devices 24,25 and the trapdoor 6 are unlocked by a steering command or by operating a mechanic device and the pallet 3 leaves the apparatus 1 in free fall over the chute 7.

Fig. 2 shows a mechanic solution for the operation of the holding devices 24,25 consisting of several verti-

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cal pulling poles 28 which make it possible to steer the flaps 27 as well as the holding pins 29 at the same time.

The pulling poles 28 are taken in a guide 30 and connected together at the lower end with a pivoted crossbar 31 by a lever mechanism. The crossbar 31 can be moved in two directions by a pedal, a manual lever or a pneumatic cylinder and the turning motion of the crossbar 31 can be converted into the turning motion of the flaps 27. The lever mechanism of the crossbar 31 is connected with the trapdoor 6 and is adjusted in such a way that first of all, the trapdoor 6 is opened and only then, the flaps 27 of the holding devices 24, to avoid that the flaps become stuck.

At the upper end of the insertion frame clamping devices 32 consisting of springs with pins are provided for the cover boards 17 and are pressed up when the cover boards are put into the insertion frame so that the clamping devices 32 take on fixing the aligned but still not nailed cover boards.

Fig. 3 shows the nailing unit 11 in a top view. The nailing unit 11 has a carrier frame 33 which shows a four-sided cross section. This carrier frame contains the aligned pallet elements and is guided along the gate frame 10 by two rolls on each side.

Fig. 4 shows a side view of the nailing unit 11 with nailing devices 12,13 arranged in two lines. At the upper end of the carrier frame 33, two pipes 35 run in parallel to the pallet 3 taking two removable mobile carriers 36 of nailing devices by claws. When the carrier frame 33 reaches the desired nailing position,

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the nailing carriers 36 are pressed against each other by pneumatic or hydraulic cylinders so that the pallet elements are firmly pressed together at these points. Now, the nailing machines run by compressed air nail the front and the back of the pallet 3 simultaneously. A slipping of the pallet elements is reliably avoided by pressing the nailing carriers 36 together. Here it is at any rate substantial that the position of the nailing devices can freely be chosen on the mobile carrier 36, too. Fig. 5 shows a top view of a trapdoor 6 from below. The trapdoor 6 is swivelling mounted in hinge joints 37 and is held in horizontal position by locking mechanism 38 which can be released mechanically by the crossbar 31 per linkage or tackle, otherwise in an electromagnetic, a pneumatic or a hydraulic way. For the locking motion and the releasing motion, a for example hydraulic or pneumatic cylinder unit 39 as shown in Fig. 5 may also be used.

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CLAIMS

1. An apparatus for manufacturing pallets comprising at least one connecting device and an insertion frame set for receiving pallet elements - namely bottom elements, blocks, cross elements and cover elements - and
c h a r a c t e r i z e d b y
 - the insertion frame (5) arranged vertically;
 - connecting devices (12,13) positioned on the front and the back of said insertion frame (5) to connect said pallet elements (14-17) aligned in said insertion frame (5) from both sides simultaneously;
 - flaps or something similar (24,25) with a vertical locking function arranged at the insertion frame and on the one hand retaining the pallet elements (14-17) to the desired position during the insertion process as well as on the other hand releasing these pallet elements (14-17) after the joining process for transporting the pallet (3).
2. Apparatus according to claim 1, characterized by said flaps (24,25) mounted lateral to the insertion frame (5) and/or in the slots between the bottom elements (14) of the pallet (3).
3. Apparatus according to claim 1 or 2, characterized by said insertion frame (5) equipped with vertical guides on its back for taking the bottom elements (14) and/or the blocks (15).
4. Apparatus according to one of claims 1-3, characterized by connecting devices (12,13) arranged at

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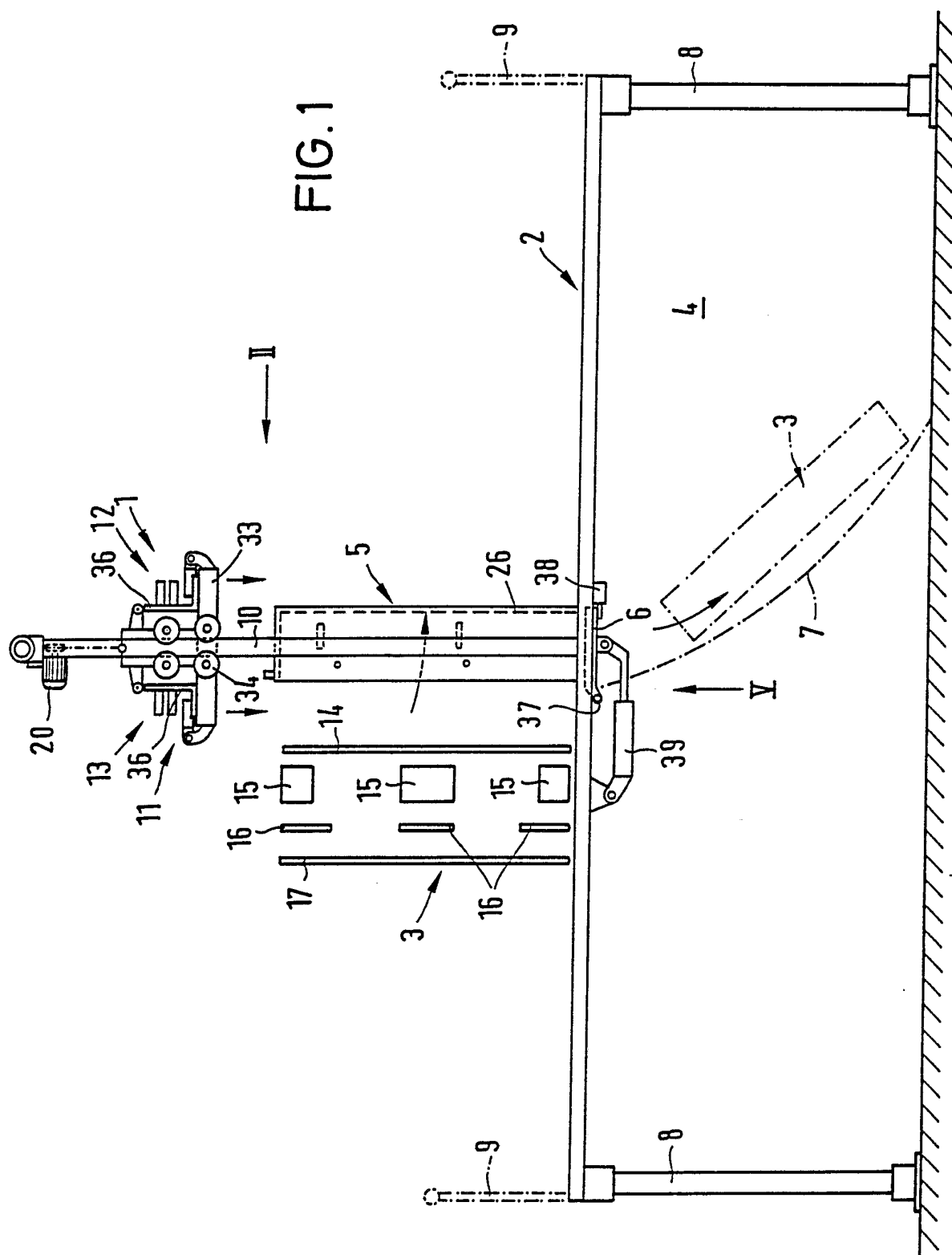
the front and back of the insertion frame (5) and vertically as well as horizontally movable.

5. Apparatus according to one of claims 1-4, characterized by said connecting devices (12,13) mounted at both sides of said insertion frame (5) and together vertically movable as a connecting unit (11).
6. Apparatus according to one of claims 1-4, characterized by said connecting devices (13) mounted at the front of said insertion frame (5) and together movable by means of a slide or something similar.
7. Apparatus according to one of claims 1-6, characterized by said connecting devices (12,13) mounted to mobile carriers (36) on both sides of said insertion frame (5) and clamping said pallet elements (14-17) before the joining process by these carriers (36).
8. Apparatus according to one of claims 1-7, characterized by a trapdoor (6) mounted as a holding device at the lower end of said insertion frame (5) and releasing the pallet (3) after the joining process is finished.
9. Apparatus according to claim 8, characterized by a chute (7) positioned below said trapdoor (6) for transporting the pallet (3).
10. Apparatus according to one of claims 1-9, characterized by a sprung clamping device (32) for each cover element (17) of the pallet (3) mounted at the upper end of said insertion frame (5).

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11. Apparatus according to one of claims 1-10, characterized by said insertion frame (5) with a back (26) left blank up to the height of the blocks (15).
12. Apparatus according to claim 11, characterized by said back (26) which is replaceable.
13. Apparatus according to one of claims 1-12, characterized by pallets made of wood or alternative materials and connecting devices comprising nailing devices (12,13), wire staplers or screwing devices.
14. Apparatus according to one of claims 1-12, characterized by pallets made of metal and by welding devices as connecting devices.
15. Apparatus according to claim 14, characterized by laser welding devices as connecting devices.
16. Process for manufacturing pallets by inserting pallet elements in an insertion frame and by joining the inserted pallet elements by connecting elements and characterized by the following steps:
 - in a first step, all pallet elements - namely bottom boards, blocks and cross boards - are inserted in an insertion frame where they are retained by flaps or something similar;
 - in a second step, the pallet elements inserted in the insertion frame are joined from the back and the front of the pallet simultaneously;
 - and in a third step, the completed pallet is transported by unlocking the flaps.

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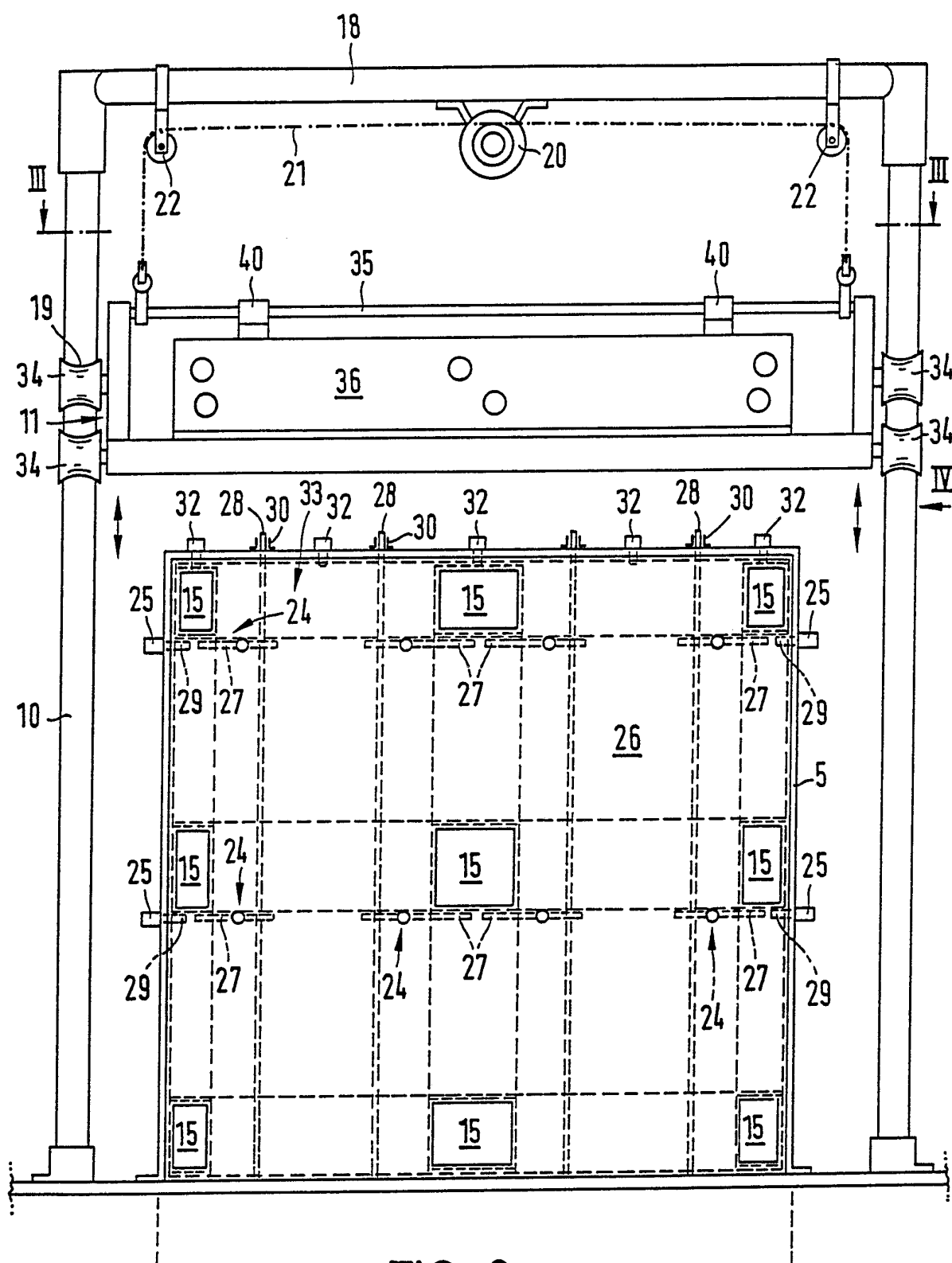


FIG. 2

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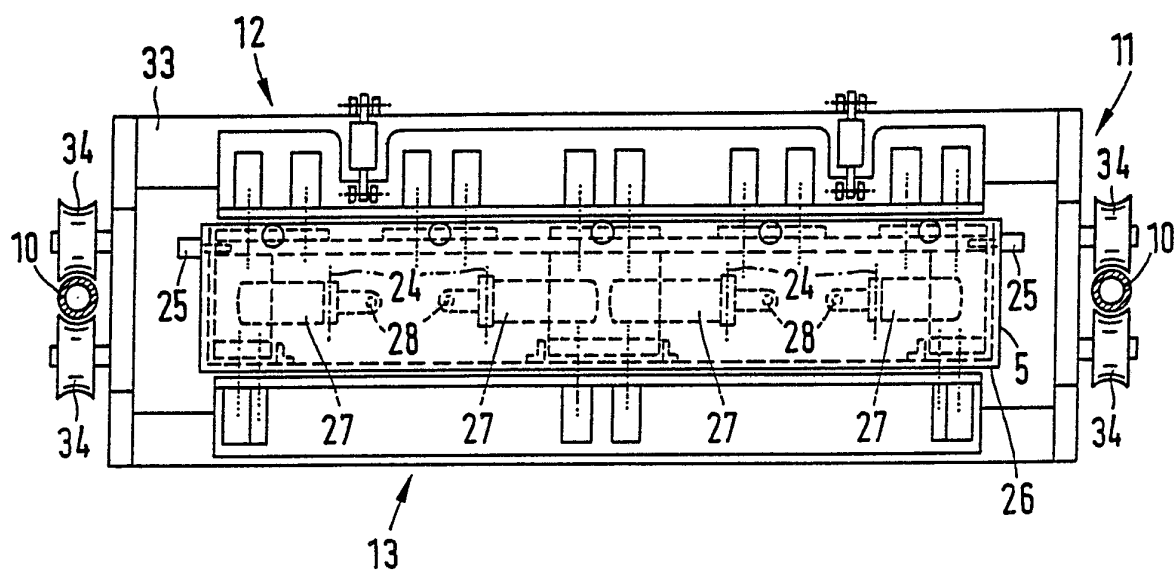
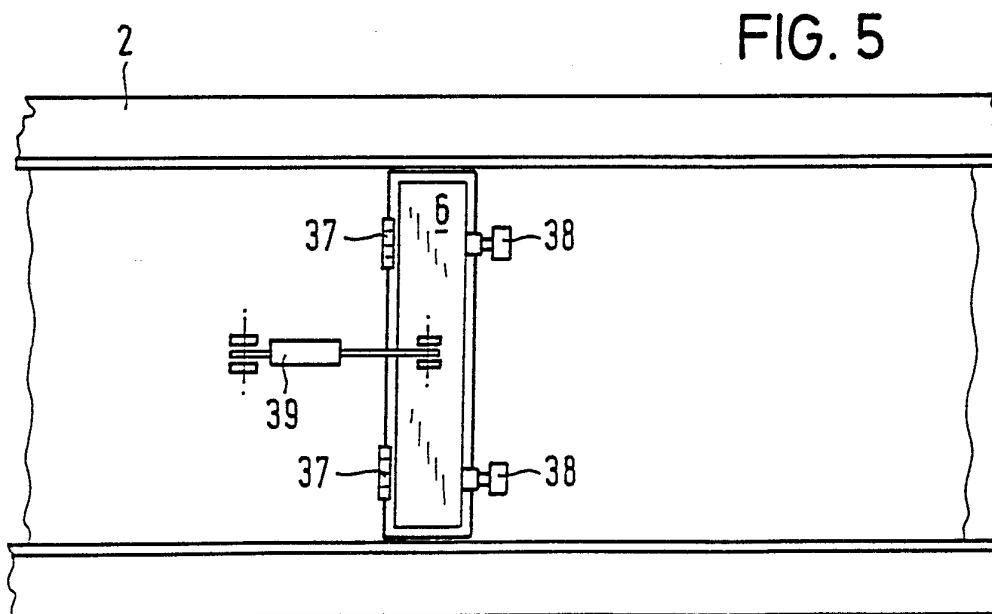
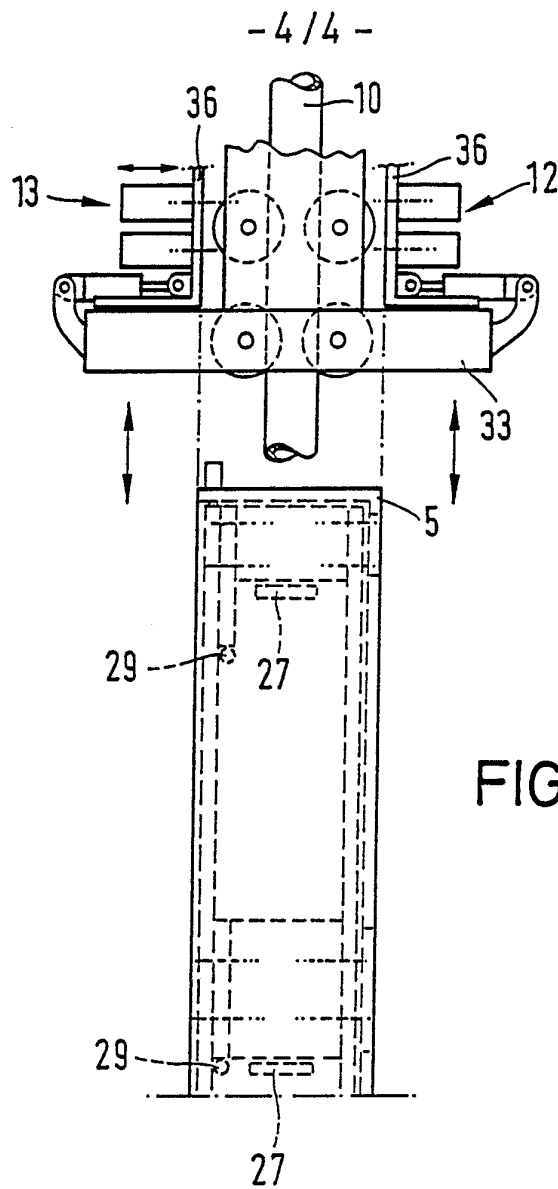


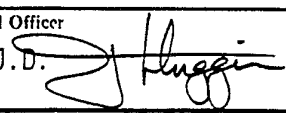
FIG. 3



INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 90/01507

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC Int.Cl. 5 B27M3/00 ; B27F7/00 ; B23P19/04		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
Int.Cl. 5	B27M	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	DE,A,3904805 (FLUSKE) 07 September 1989 see the whole document ---	1-16
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EP9001507

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A-3904805	07-09-89	DE-U- 8901864	24-05-89
