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(54) **PROCESSING LINE FOR PRODUCING MULTILAYER BUILDING BLOCKS PROVIDED WITH A DECORATIVE FACE**

(57) Processing line comprises sand hoppers, concrete hoppers, water reservoir, surface-active agents reservoir with meters, mixer, mixture preparation section, roll type contours with vibrotable, loading hoppers, heat chamber, forms for blocks, press-down mechanism, release section. Line is made in the form of two roll type "II"-contours: enclosed and enclosing ones, free ends of which are connected by common transversal section. Transversal sections are equipped with carriers moved by means of reversible winches. Loading section is made in form of vibrotable and is fixed on separate frame. Form

is multi-celled with inserted bottom and with gap between walls of cells. Platform's base has crossbars and cantilevered wings throughout whole perimeter. Platform moves along vibrotable with help of step movement mechanism connected with rod of pneumatic cylinder. Press-down mechanism is made in form of bent shank ends of clumps interacting with wings. Loading hoppers have two unloading apertures, and each cell has mark located at end surface. Frame of line is equipped with columns having I-shaped section to accommodate heat insulating elements forming tube-heat chamber interacting with heater.

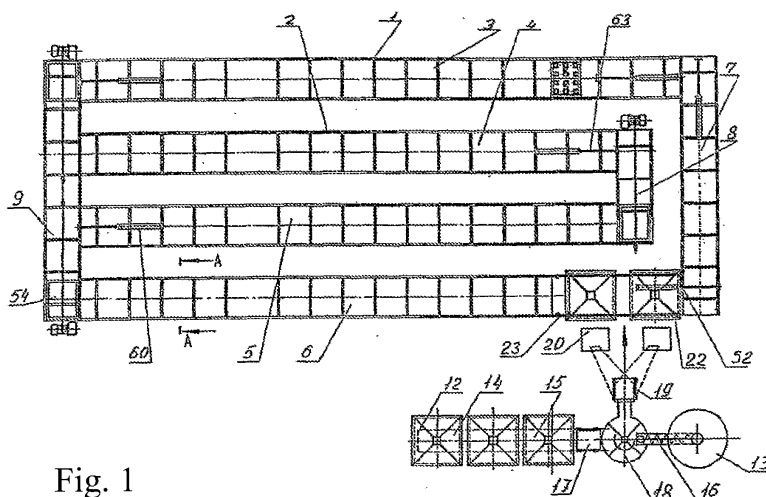


Fig. 1

Description

[0001] This invention relates to equipment used in building industry for building materials manufacturing namely multilayer ready for use wall blocks without need for additional plastering.

[0002] "Conveyed line for manufacturing small piece concrete products" is known in Russian Federation patent 2000200, B 28 B 5/00, 1990. Said conveyed line comprises a supporting frame with a roll table and a vibro-press, forming equipment, equipment for palettes accumulating and stripping, a stepping palettes moving mechanism, a concrete mixture feeding mechanism, limit switch control system, a contact switch control system, sound and light alarms control mounted in the processing order along the roll table. However said technical decision can not provide mass production required for large scale housing construction.

[0003] The known technical decision "Conveyer line for production of concrete articles" (Russian Federation patent № 2150378, B 28 B 5/00, 1998) comprises palettes with electric drive dead weight wagonettes mounted on conveyer lines, a concrete spreader, a vibrating plate and a heat treating post installed along conveyer lines in processing order. To preheat the goods in wagonettes the different phases of alternative current are applied to the wagonettes' pallets. However said technical decision is economically inefficient. It is material and energy intensive and requires complying with special safety rules in the course of manufacturing. Besides it does not provide manufacturing large volumes of products.

[0004] "Conveyer line for manufacturing small reinforced concrete and concrete products" is described in Russian Federation patent № 2015010, B 28 B 5/04, 1991. Said line comprises an endless conveyer with a revolving table, a heat camera fed from evaporator, cooling zone - a multilayer container, a vibropressing machine, different manufacturing equipment for blocks release from palettes and moving into next cycle. However said technical decision doesn't allow the building materials to comply with modern requirement without additional aesthetic treatment of ready made blocks in order to get beautiful walls with minimal plastering.

[0005] The nearest prior art is "Line for manufacturing expanded-clay concrete blocks" (Russian Federation patent №2078690, B 28 B 5/00, 1995). Said technical decision comprises a conveyer line made in the form of several roll tables where magazine forms are moving and interacts with vibrotables. The magazine forms are filled with keramzit and foam-concrete produced in the section of mixture preparation where the hoppers with sand, cement, water and surface-active agents are located. A part of roll table conveyer is enclosed into a heat chamber. The line is equipped with mechanisms and elevators providing magazine forms handling. However said decision is too complex and ineffective in technical execution, and doesn't provide continuous manufacturing of ready for use building materials for continuous construction of cot-

tages and homes without need for additional interior and exterior plastering.

[0006] The technical problem of said invention is to create the simpler processing line for continuous production of building blocks ready for use in home construction without additional hand work in order to finish inner and outer layers, said blocks provide required level of heat and sound insulation.

[0007] The above-mentioned technical problem is achieved by processing line for manufacturing multilayer concrete blocks with decorative face side comprising sand hoppers, concrete hoppers, a water reservoir and a surface-active agents hopper with meters, a mixer, a mixture preparation section, roll type contours with a vibro table, loading hoppers, a heat chamber, forms for blocks, a press-down mechanism, a forms release section, wherein the section of concrete mixture preparation is autonomous, the mixer is equipped with a revolving outlet channel interacting with the loading hoppers by means of a suspended dumping bucket, the line is made in the form of two roll-type Π -contours: enclosed and enclosing ones, free ends of which are connected by a common transversal section, the contours are mounted on a frame structure, a transversal roll type section of the enclosed contour and a common transversal roll type section are equipped with carriers moved by means of reversible winches, an upper support surface of carriers' rollers and an upper support surface of roll type transverse section rollers are formed at the same horizontal level, a loading section of the roll type contour is made in the form of a vibrotable and is fixed on a separate frame, the form is multi-celled with an inserted bottom for each the cell and with a gap between the cells' walls, the forms are fixed at a platform, a base of the platform has cross-bars and cantilevered wings throughout the whole perimeter, the platform is moved along the vibrotable with the help of a step movement mechanism made in the form of a self spreading catch hooking to the cross-bars and hinged on the carrier connected with a rod of a pneumatic cylinder, the press-down mechanism is made in the form of bent shank ends of clumps interacting with the wings, one end of which is hinged to the frame and the other one is hinged to a balancing lever interacting with the pneumatic cylinder, the loading hoppers are installed above the vibrotable in series at the distance equal at least the width of the platform, each the loading hopper has two unloading apertures, and each the cell of the form has a mark located at the end surface, mechanisms for platform moving along lengthwise sections of the contours and along transverse section of the enclosing contour are made in the form of pneumatic cylinders, the frames of the enclosed contour, the lengthwise sections of the enclosing section, and the common transverse section are equipped with columns having I-shaped cross-section to accommodate heat insulating elements forming with shutters at the end surface a tube - the heat chamber interacting with heater.

[0008] Fig.1 presents a processing line, plan view, Fig.

2 is section A-A in Fig.1, Fig.3 presents loading section with vibrotable, Fig.4 is part A in Fig.3, Fig.5 presents step movement mechanism for platform moving on loading section, Fig.6 is section A in Fig.5, Fig.7 presents catch position variant of Fig.6, Fig.8 is platform with cells, Fig.9 is view B in Fig.8, Fig.10 presents common transversal section of Fig 1, plan view, Fig.11 is view A in Fig. 10, Fig.12 is view B in Fig.10 with displaced carrier.

[0009] V.A.Leshikov's processing line for manufacturing of multilayer concrete blocks with decorative front face consists of two closed roll type "II"-contours. One of the contours is an enclosing one, the other is an enclosed contour. The counters comprise lengthwise sections 3, 4, 5, 6 and transversal sections 7, 8. Free ends of lengthwise sections 3, 4, 5, 6 are connected with common transversal section 9. All sections are fixed on main frame 10 made in the form of a frame structure. The processing line also comprises several processing sections. The concrete preparation section is equipped with water source 11, sand reservoir 12, concrete reservoir 13, filler reservoir 14, surface-active agents reservoir 15. Said reservoirs are connected with mixer 18 equipped with revolving outlet channel 19 by means of conveyors 16, 17. Said section can be located outside the common manufactory in order to eliminate dust pollution of the manufactory, and to facilitate raw materials delivery, and to provide corporate culture of block manufacturing. Revolving outlet channel 19 of mixer 18 loads suspended dumping buckets 20, which feed loading hoppers 21, 22 of the loading section. The buckets are suspended on a beam and are moved from the revolving channel to hoppers 21, 22 by means of a telfer crane (not shown in figs.). Frame 23 of the loading section of the roll type contour is autonomous, i.e. it is not connected with main frame 10 and represents vibrotable 24. Frame 25 is rigidly fixed to the floor by mean of dampers 27 installed in sleeves 26. Said frame 25 accommodates intermediate frame 28 where frame 23 of the loading section of the roll type contour is fixed with the help of additional dampers 29. Platform 31 with multicellular form 32 with cells is installed on rollers 30 of the roll type contour. The base of platform 31 is equipped with crossbars 33 and cantilever wings throughout the whole perimeter. These wings interact with bent shank ends 35 of clamps 36, one end of which is equipped with rigidly fixed bushing 37. Pivot pin 38 of said bushing is rigidly fixed on frame 23 and the other end of clumps 36 is hinged by means of short 39 and long 40 rods with a beam 41 hinged on cantilever bracket 42, said beam is controlled by pneumatic cylinder 43 whose body is fixed on frame 23 equipped with vibrator 44.

[0010] Loading hoppers 21, 22 are installed above vibro table 24 in series. The hoppers are installed at "L" distance equal at least the width of platform 31 where cells 32 with inserted bottoms 45 for multilayer concrete blocks casting are placed. In the claimed technical decision three rows of cells 32 are installed on the platforms along the direction of movement, and in each row two

cells 32 are installed in transversal direction, there is gap 46 between the walls of all cells. In this way six blocks are manufactured simultaneously. Moving of platform 31 for each cell loading with mortar from hoppers is made by a step movement mechanism made in the form of pneumatic cylinder 48 fixed in columns 47. Cylinder's rod 49 is equipped with a holder 50 with a self-spreading catch 51 operating as a ratchet-gear engaging crossbar 33 of platform 31. Strike of rod 49 of pneumatic cylinder 48 is equal to the distance between the axis of the neighboring cells 32, in this case the pair of transversal cells spread under unloading apertures of the hoppers. To ensure precious spreading of the cells 32 under the unloading apertures each cell has mark 52 located, for example, along axis of symmetry on the end side, which is connected with pneumatic cylinder switch on/off control system to move platform 31. Movement of platform 31 with all filled cells 32 along longwise sections of the roll type contours is effected by pushing of the platforms by pneumatic cylinder 53. After filling up of all lengthwise section 6 by platforms 31 they are moved on carrier 54 of common transversal section 9, the upper support surface of rollers 55 of carrier 54 is placed at the same horizontal level as the upper support surface of rollers 30 of lengthwise sections. Carrier 54 in its turn moves along rollers 56 of common transversal section 9 by means of rope 58 connected with reversible winch 57, said rope 58 is connected by means of clump 59 with carrier 54. As soon as platform 31 reaches the zone of lengthwise section 5, pneumatic cylinder 60 moves them into this section and pulls platforms 31 up to transversal section 8 where the platforms are moved into section 4 by means of ropes 61 and winch 62 made as in the common transversal section. Then platforms 31 move to section 4 where pneumatic cylinder 63 moves them onto said section and, having passed the whole path of enclosed "II"- contour 2, the platforms reach section 9. Then platforms 31 are moved by rope 58 and winch 57 from section 9 to section 3. At the end of section 3 the ready-made products are released.

[0011] Forced drying of filled cells is used in order to intensify the process of multilayer concrete blocks manufacturing. For this frame 10 is equipped with I-shaped columns 64 accommodating heat-insulating elements 65. Said elements 65 form drying chambers in the form of a tube with shutters 66 placed on the butt-ends of said chambers.

[0012] The processing line operates as follows. Working mixture of required content and consistence is prepared in mixer 18 at the concrete mixture preparation section. Then said mixture is loaded into hopper 22. At the same time the first pair of cells 32 of platform 31 is placed under the unloading apertures of the hopper 22. A synthetic matrix is placed on the inserted bottom of the cells 32. The cells 32 are filled with at least 50 mm of concrete mixture. As the processing line previews two loading hoppers, one of them fills all the cells of one platform with the first layer of concrete. Then said platform moves from under the first hopper into "L" inter-hopper

space where the first layer of concrete is compacted with the help of the vibrotable, whereupon said layer of concrete is covered with heat insulating layer, and said two layers are pierced by dowel bars. At the same time next platform 31 is filled. Inserted bottom of all paired transversal cells is filled in series by concrete mixture from hopper 22. Mark is used for precise placement of the cells. As far as the next platform moves forward the previous one move under second hopper 21 from which the mixture is placed on the heat-insulating layer. Simultaneously vibrotable 24 is switched on periodically, the platforms previously has been fastened with the holders. The process goes on until section 6 is filled with loaded platforms. Then the platforms in series move along sections 9, 5, 8, 4, 9, 3 which are placed in drying chambers, and then to the section where ready made multilayer blocks are released from cells. Thanks to gap 46 between walls of all cells dry air dries all sides of the cells that promotes quick concrete mixture cure in cells, and thus speeds up the process of multilayer concrete blocks manufacturing. The platforms without blocks are moved by means of pneumatic cylinders 67 and 68 into transversal section 7, from which they are moved under hopper 22 again, and the process starts from the beginning.

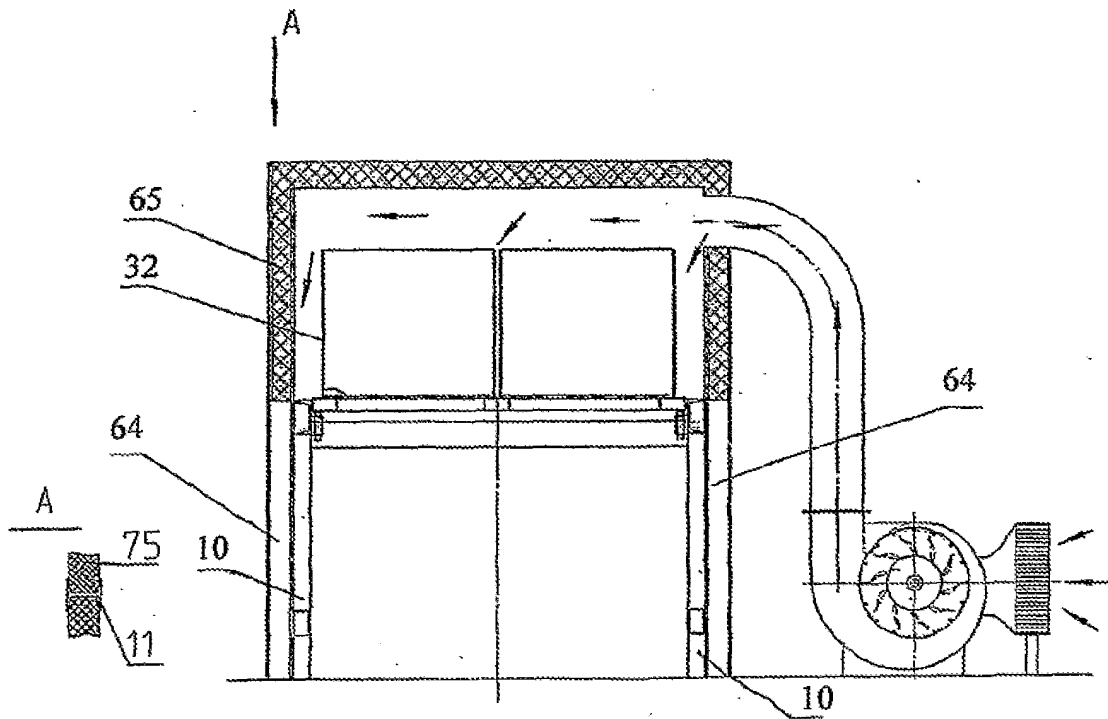
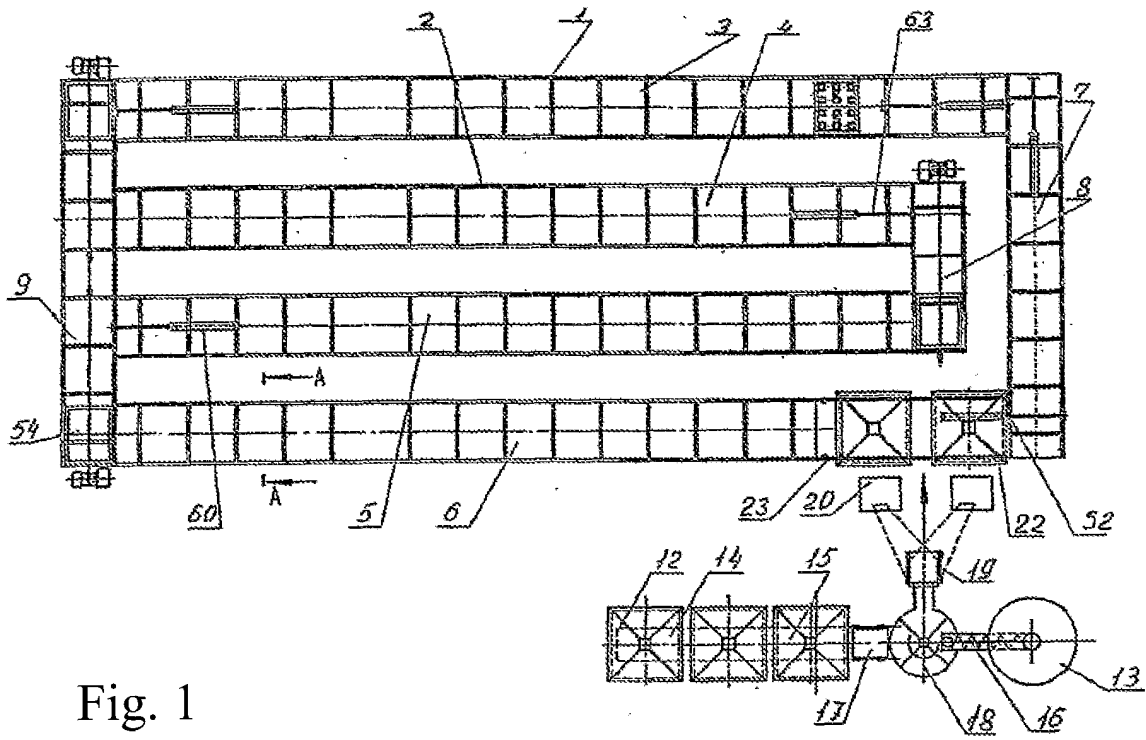
[0013] The claimed processing line can be executed as multitier, i.e. the platforms can be installed in two or more tiers in sections 3, 4, 5, 6, 9, 8.

[0014] The claimed processing line has a simple design, efficient arrangement, doesn't require large expenses and space. The absence of complex mechanisms provides the reliability of usage. The processing line has been tested and has shown high level of efficiency and reliability of multilayer concrete blocks manufacturing for simultaneous construction of several homes and cottages.

Claims

1. technological line for manufacturing multilayer concrete blocks with decorative face side comprising sand hoppers, concrete hoppers, a water reservoir and a surface-active agents hopper with meters, a mixer, a mixture preparation section, roll type contours with a vibrotable, loading hoppers, a heat chamber, forms for blocks, a press-down mechanism, a forms release section, **characterized in that** the concrete mixture preparation section is autonomous, the mixer is equipped with a revolving outlet channel interacting with the loading hoppers by means of a suspended dumping bucket, the line is made in the form of two roll- type "IT"- contours: enclosed and enclosing ones, free ends of which are connected by a common transversal section, the contours are mounted on a frame structure, a transversal roll type section of the enclosed contour and a common transversal roll type section are equipped with carriers, moved by means of reversible winches,

an upper support surface of carriers' rollers and an upper support surface of roll type transverse section rollers are formed at the same horizontal level, a loading section of the roll type contour is made in the form of the vibrotable and is fixed on a separate frame, the form is multi-celled with an inserted bottom for each the cell and with a gap between the cells' walls, the form is fixed at a platform, a base of the platform has cross-bars and cantilevered wings throughout the whole perimeter, the platform moves along the vibrotable with the help of a step movement mechanism made in the form of a self spreading catch engaging to the cross-bars and hinged on the carrier connected with a rod of a pneumatic cylinder, the press-down mechanism is made in the form of bent shank ends of clumps interacting with the wings, one end of which is hinged to the frame and the other one is hinged to a balancing lever interacting with the pneumatic cylinder, the loading hoppers are installed in series above the vibrotable at the distance equal at least the width of the platform, each the loading hopper has two unloading apertures, and each the cell of the platform has a mark located at the end surface along axis of symmetry, mechanisms for platform moving along lengthwise sections of the contours and along transverse section of the enclosing contour are made in the form of pneumatic cylinders, the frames of the enclosed contour, the lengthwise sections of the enclosing section, and the common transverse section are equipped with columns having I-shaped cross-section to accommodate heat insulating elements forming with shutters at the end surface a tube - the heat chamber interacting with a heater.



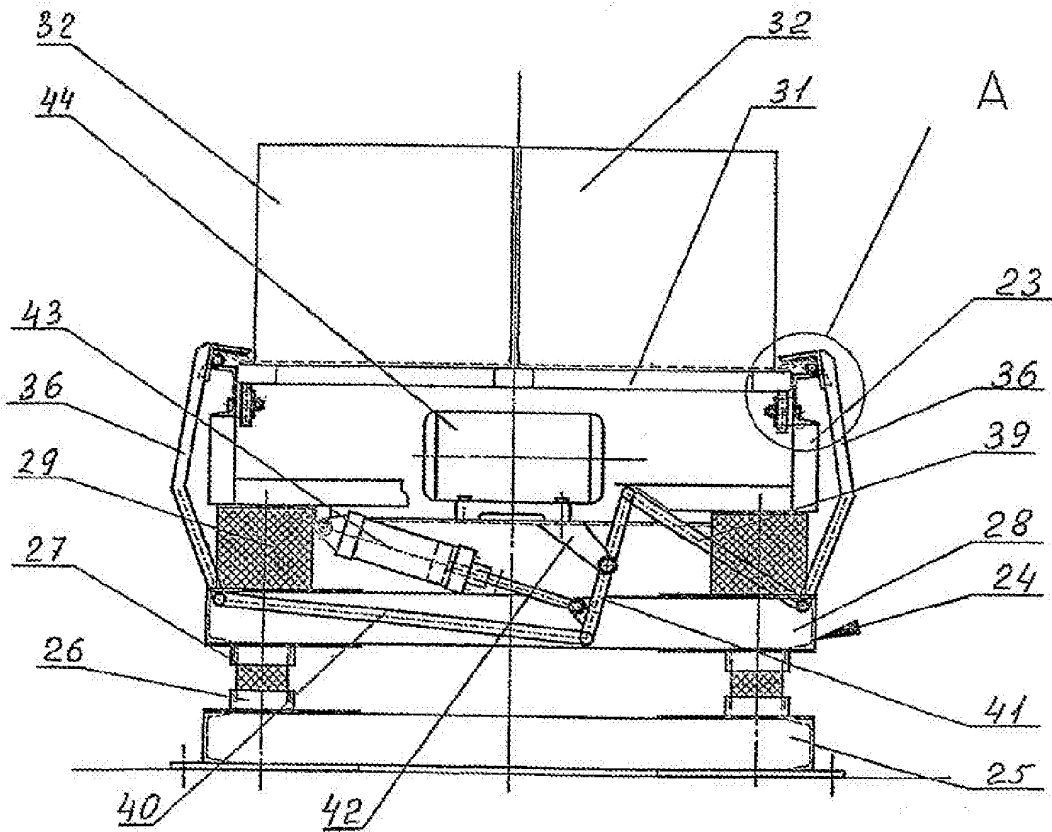


Fig. 3

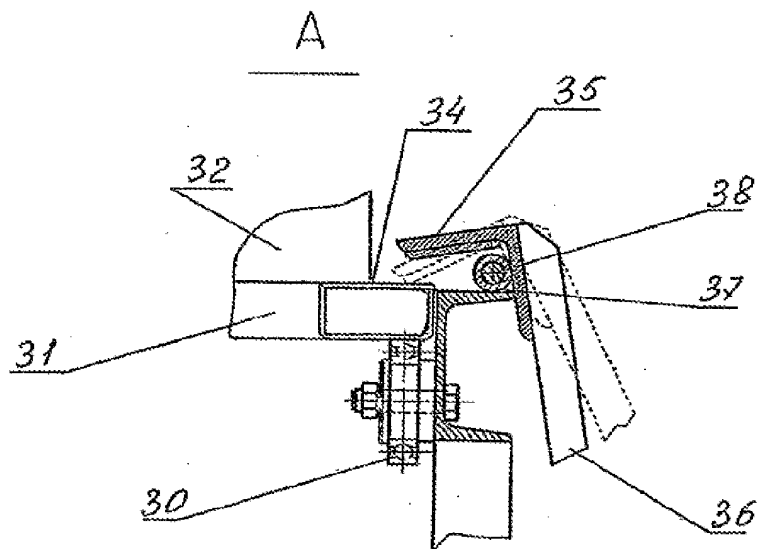


Fig. 4

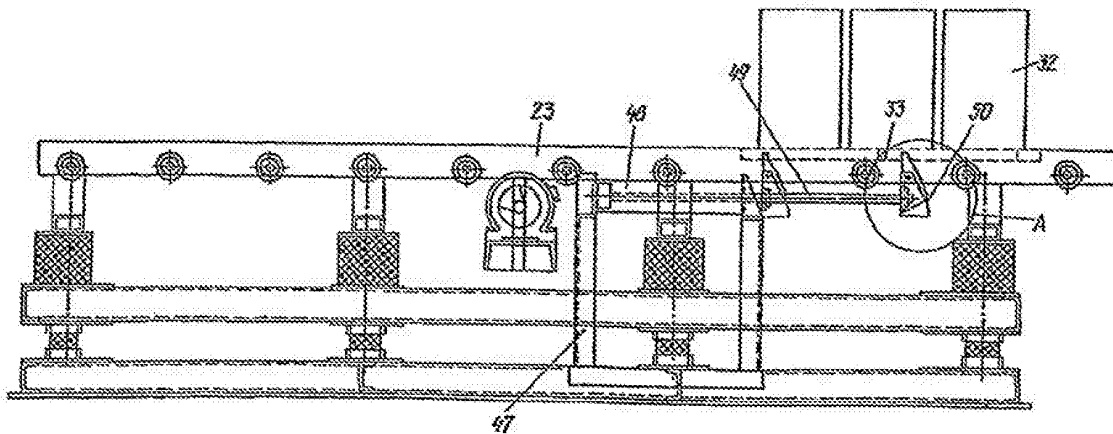


Fig. 5

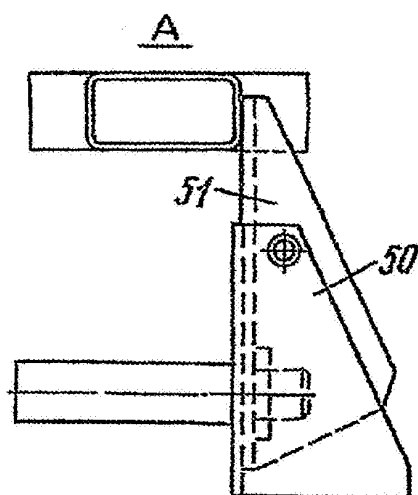


Fig. 6

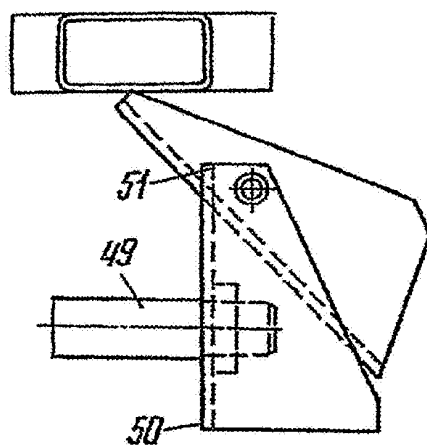


Fig. 7

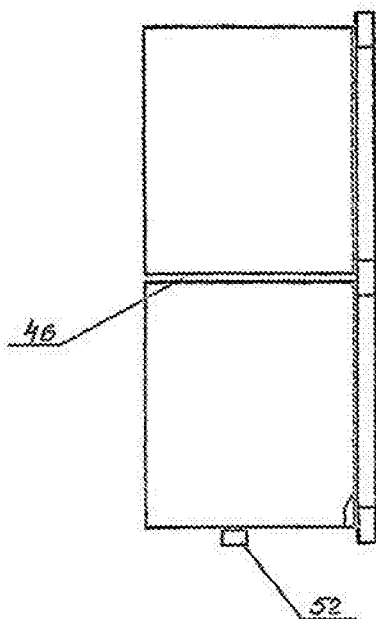


Fig. 8

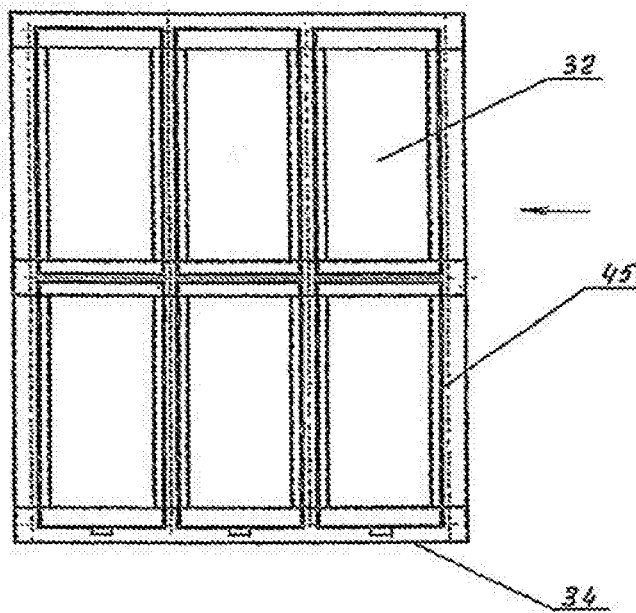


Fig. 9

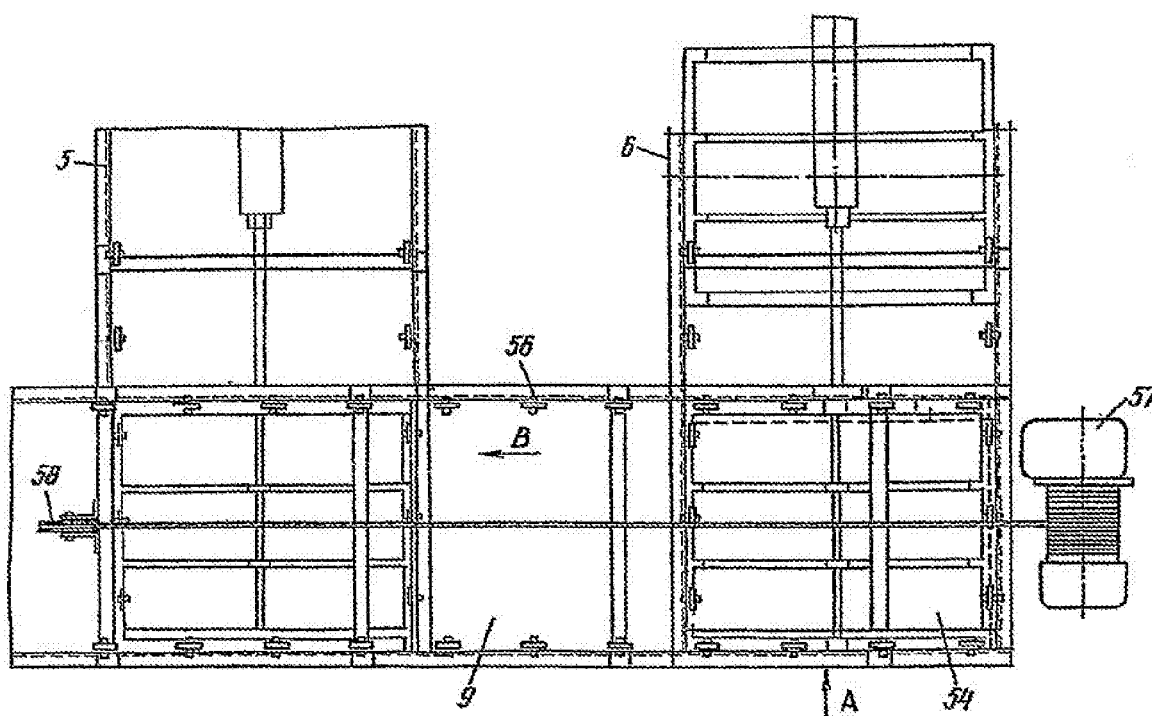


Fig. 10

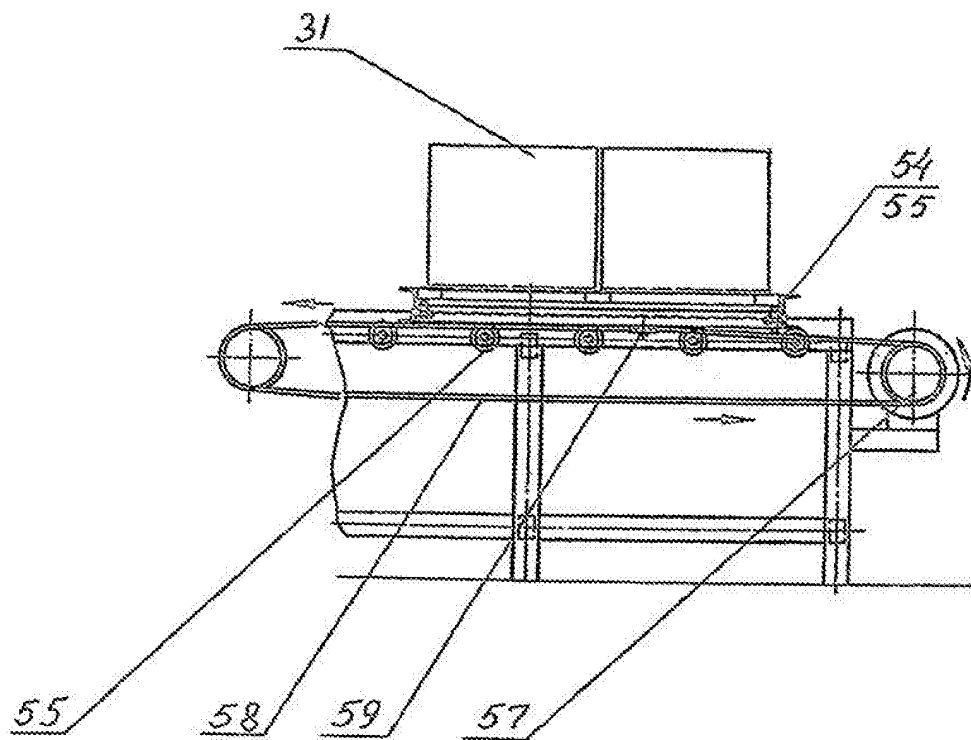


Fig. 11

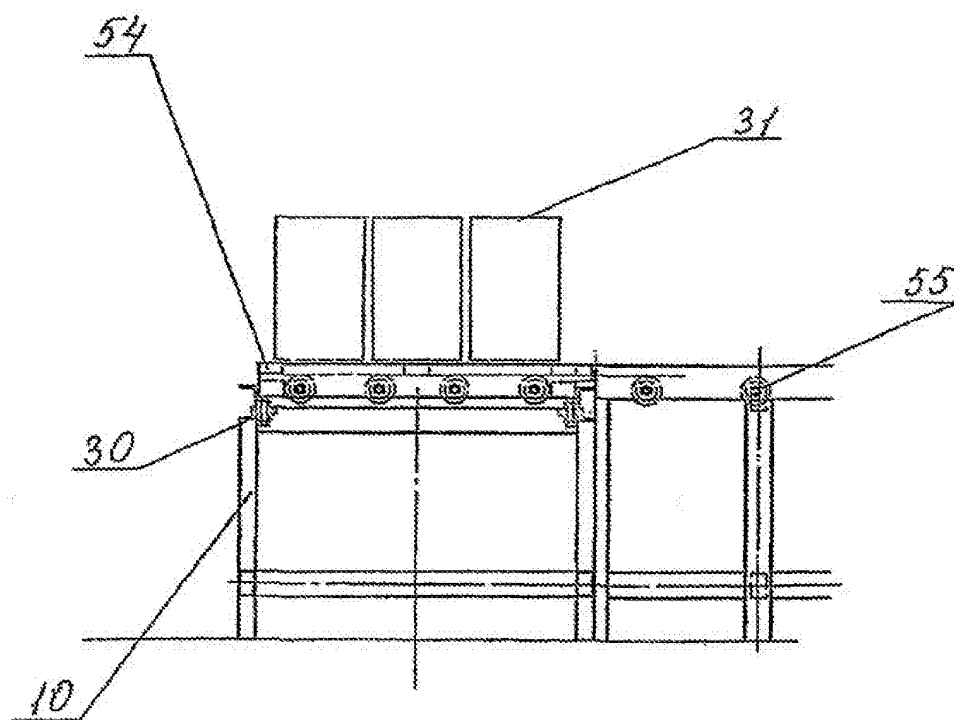


Fig. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/RU 2005/000316

A. CLASSIFICATION OF SUBJECT MATTER		
B28B 5/00		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
B28B 5/00, 5/04, B22C 15/10		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	RU 2078690 C1 (KOVALENKO N.V. et al.) 10.05.1997	1
A	SU 1020247 A (SPETSIALNOE KONSTRUKTORSKOE BYURO PO AVTOMATIKE I NESTANDARTNOMU OBORUDOVANIYO "GLAVMOSPROMSTROIMATERIALY" PRI MOSGORISPOLKOME) 30.05.1983	1
A	SU 1324747 A1 (KHARKOVSKIY TRAKTORNYI ZAVOD IM. S. ORDZHONIKIDZE) 23.07.1987	1
A	GB 1309138 A (ALLGEMEINE STRASSENBAUBEDARFS-GESELLSCHAFT M. B. H.) 07.03.1973	1
A	RU 2000200 C (VASILEV A.E. et al.) 07.09.1993	1
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search		Date of mailing of the international search report
29 September 2005 (29.09.2005)		13 October 2005 (13.10.2005)
Name and mailing address of the ISA/		Authorized officer
Facsimile No.		Telephone No.

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Patent documents cited in the description

- RU 2000200 [0002]
- RU 2150378 [0003]
- RU 2015010 [0004]
- RU 2078690 [0005]