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- (71) **Applicant (for all designated States except US):**
MONIER TECHNICAL CENTRE GMBH [DE/DE];
Frankfurter Landstrasse 2-4, 61440 Oberursel (DE).
- (72) **Inventors; and**
- (75) **Inventors/Applicants (for US only):** **CAI, Zhixiang** [CN/DE]; Frankfurter Landstrasse 2-4, 61440 Oberursel (DE). **SHAO, Jingfu** [CN/DE]; Frankfurter Landstrasse 2-4, 61440 Oberursel (DE). **XU, Yongsen** [CN/DE]; Frankfurter Landstrasse 2-4, 61440 Oberursel (DE). **WANG, Wenhan** [CN/DE]; Frankfurter Landstrasse 2-4, 61440 Oberursel (DE). **LUO, Huaxiang** [CN/DE]; Frankfurter Landstrasse 2-4, 61440 Oberursel (DE).
- (74) **Agent:** **SHANGHAI PATENT & TRADEMARK LAW OFFICE, LLC**; 435 Guiping Road, Xuhui, Shanghai 200233 (CN).

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(54) **Title:** APPARATUS AND METHOD FOR PRODUCING TILES

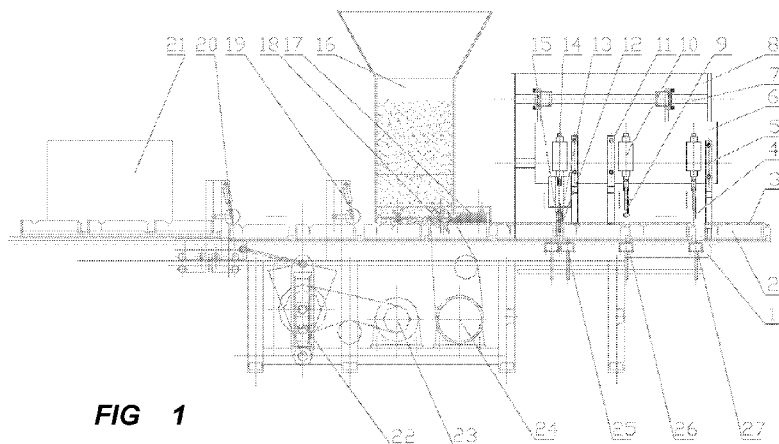


FIG 1

(57) **Abstract:** Apparatus and method for producing tiles with ladder profile interlocker on an extruded shaping line are provided. The apparatus comprises a tile machine and a shaping device. The tile machine makes consecutive concrete tiles(3) on a series of tile pallets(2).The shaping device comprises: a concrete scraping device for cutting the consecutive tiles at the predetermined positions of the ladder profile interlocker and scraping redundant concrete; an interlocker shaping device for pressing the predetermined position to shape the ladder profile interlocker, and the shaping device is spaced from the scraping device by one tile length; a tile end knife device for cutting the ladder profile interlocker on a single tile and perfecting the shape of the interlocker.



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APPARATUS AND METHOD FOR PRODUCING TILES

Field of invention

The present invention relates to concrete tile producing techniques used in the construction industry, more particularly, relates to techniques of shaping concrete tiles with ladder profile interlocker on an extruded shaping line.

Background

Extruded shaping and pressed shaping are widely used techniques for producing concrete tiles. Extruded shaping technique has a high efficiency, but it only can produce tiles with the same longitudinal surface dimensions. Though pressed shaping technique can produce tiles with different surface shapes, the efficiency of the pressed shaping technique is very low.

Main tiles and ridge tiles are used together when laying concrete tiles to a roof. The main tiles are used to cover the plain parts of the roof while the ridge tiles are placed on the boundary of the adjacent planes of the roof (for example, the boundaries of the planes of a slope roof that is in fashion) to joint the main tiles laid on the planes respectively. The main tiles jointed by the ridge tiles are in different planes, so the longitudinal surface of the ridge is not level. Some clients request that the top surface of the ridge tiles should be kept in the same plane, then interlockers are necessary for concatenating ridge tiles in such conditions. Particularly, vertical interlocking is applied for concrete ridge tiles, the longitudinal surface of the ridge tiles with the interlocker is ladder profile. Thus, extruded shaping is not able to be used for producing ridge tiles, only pressed shaping can be used. Such a condition has resulted the following problems:

- 1) The efficiency of pressed shaping is very low, far away from that

of the extruded shaping line.

2) The main tiles are produced on extruded shaping lines, while the ridge tiles with ladder profile interlocker are produced by pressed shaping technique. The final colors of the tiles produced by these two shaping techniques are different, even the same color recipe is provided. The color difference between the main tiles and the ridge tiles often incur quality complaint from the clients.

Summary of Invention

The present invention provides a novel tile shaping technique for producing ridge tiles with ladder profile interlocker on an extruded shaping line, so as to increase the production efficiency. Both main tiles and ridge tiles are made on the same type of shaping lines, their colors will properly match each other.

The present invention provides a tile making and shaping apparatus for producing tiles with ladder profile interlocker on an extruded shaping line, the apparatus comprises a tile machine and a shaping device that are adjacently mounted on a base frame. The tile machine makes consecutive concrete tiles on a series of tile pallets that are positioned sequentially. The shaping device comprises: a concrete scraping device for cutting the consecutive tiles at predetermined positions and scraping redundant concrete, wherein the predetermined positions correspond to the positions of the ladder profile interlocker on each single tile; an interlocker shaping device for pressing the predetermined position to shape the ladder profile interlocker, the interlocker shaping device is spaced from the concrete scraping device by one tile length, when the apparatus pushes forward by one tile, the interlocker shaping device presses downward on the predetermined position; a tile end knife device for cutting the ladder profile interlocker on a single tile and perfecting

the shape of the interlocker, the tile end knife device is spaced from the interlocker shaping device by one tile length, when the apparatus pushes forward by one tile, the tile end knife device cuts and perfects the interlocker to obtain a single tile with ladder profile interlocker on a separate tile pallet.

The concrete scraping device, the interlocker shaping device and the tile end knife device are mounted on a board, which is assembled on a plate frame through an adjusting screw, the plate frame is fixed on the base frame, wherein the board moves forward or backward relative to the plate frame by adjusting the adjusting screw to process the interlocker at a predetermined position on the tile.

The tile machine comprises: a propulsion motor for driving the brace and connecting rod mechanism to force a propulsion bat, the propulsion bat pushes a series of tile pallets that are positioned sequentially to move forward on the base frame; a hopper for receiving and storing concrete for making the concrete tiles, the hopper is mounted above the base frame and follows the propulsion bat; a roll motor for driving a pack shaft at the bottom of the hopper to rotate, after the concrete is added into the hopper, when the apparatus pushes the tile pallets to move forward, the pack shaft continuously rotates to extrude the concrete into the space between the tile pallets and a slipper to form the concrete tiles therein, the propulsion bat pushes the tile pallet to produce consecutive tiles.

The present invention implements production of ridge tiles with ladder profile interlocker on an extruded shaping line. The production efficiency is increased and the colors of main tiles and ridge tiles are properly matched.

Brief Description of Drawings

The above or other features, natures or advantages of the present invention will be more obvious to the skilled person in the art by the following descriptions of the embodiments accompanying with the drawings, the same sign reference indicates the identical features throughout the description, and wherein:

Fig. 1 illustrates the structure of the tile making and shaping apparatus according to an embodiment of the present invention;

Figs. 2A, 2B and 2C illustrate the structure of the concrete scraping device according to an embodiment of the present invention;

Fig. 3 illustrates the profile of the first cutting knife;

Figs. 4A and 4B illustrate the profile of the first drawknife;

Figs. 5A and 5B illustrate the profile of the press head in the interlocker shaping device;

Figs. 6A and 6B illustrate the profile of the second cutting knife in the tile end knife device;

Fig 7 illustrates the flowchart of the process for making and shaping the tiles according to the present invention.

Detailed Description of Preferred Embodiments

The present invention provides a tile making and shaping apparatus for producing tiles with ladder profile interlocker on an extruded shaping line, especially for continuously producing ridge tiles with ladder profile interlocker on an extruded shaping line. As shown in Fig.1, the making and shaping apparatus includes two main parts: a tile machine and a shaping device, the two parts are adjacently mounted on a base frame 1.

The tile machine makes consecutive concrete tiles 3 on a series of tile pallets 2 that are positioned sequentially. The tile machine comprises: a propulsion motor 23 disposed below the base frame 1, the

propulsion motor 23 drives a brace and connecting rod mechanism 22 that is also disposed below the connecting rod mechanism 22 to force a propulsion bat 20. The propulsion bat 20 is disposed above the base frame 1 and pushes a series of tile pallets 2 that are positioned sequentially to move forward on the base frame 1. Each of the tile pallets 2 comprises a ladder shaped structure at the front end for shaping the ladder profile interlocker on the tile. A hopper 16 is mounted above the base frame 1 at a position follows the propulsion bat 20. The hopper 16 is used for receiving and storing concrete for making the concrete tiles 3. A roll motor 24 disposed below the base frame 1 drives a pack shaft 18 at the bottom of the hopper 16 to rotate. After the concrete is added into the hopper 16, when the apparatus pushes the tile pallets 2 to move forward, the pack shaft 18 continuously rotates to extrude the concrete into the space between the tile pallets 2 and a slipper 17 to form the concrete tiles 3 therein. The propulsion bat 20 pushes the tile pallets 2 to produce consecutive tiles 3. To prevent the concrete tiles 3 from adhering on the tile pallets 2, a pallet oil spraying device 21 is provides preceding the propulsion bat 20. The pallet oil spraying device 21 is mounted above the base frame 1 and sprays pallet oil above the surface of the tile pallets 2, thus the tiles 3 formed on the tile pallets 2 will not adhere thereon. Also, to prevent the tile pallets 2 from dashing out, a press wheel device 19 is provided between the propulsion bat 20 and the hopper 16, the press wheel device is mounted above the base frame 1, pressed the tile pallets 2 and keeps them to stably move forward on the base frame 1. The concrete tiles 3 produced by the tile machine are consecutive and without the ladder profile interlockers. The following shaping device will separate each single tile and shape the ladder profile interlocker thereon. The above action made by the tile machine is represented as step S102 in Fig. 7.

The shaping device of the tile making and shaping apparatus comprises three devices: a concrete scraping device, an interlocker shaping device and a tile end knife device. The concrete scraping device for cutting the consecutive tiles at predetermined positions and scraping redundant concrete, wherein the predetermined positions correspond to the positions of the ladder profile interlocker one each single tile. As mentioned above, when the tile 3 is extruded from the tile machine, the longitudinal surface dimension of the tile is consistent and the ladder profile interlocker has not been shaped. Redundant concrete at the position of the interlocker must be removed before shaping the interlocker. Referring to Fig. 1, the concrete scraping device comprises first cutting knives 12, 15 for cutting off the consecutive tiles and defining the range of the interlocker, and first drawknives 13, 14 for scraping the redundant concrete outward. The first cutting knives 12, 15 are disposed at the separate position of each tile, thus the first cutting knives 12, 15 cut the consecutive tiles into separate tiles while each tile covers on a single tile pallet 2. The positions of the first drawknives 13, 14 correspond to the position of the ladder profile interlocker on the tile 3. As mentioned above, each tile pallet 2 has a ladder shaped structure at the front end for shaping the ladder profile interlocker thereon. The positions of the first drawknives 13, 14 also correspond to the ladder shaped structure at the front end of the tile pallet 2. The shaped interlocker is lower than other parts on the tile 3, so redundant concrete will incur at this area. The first drawknives 13, 14 are used to remove these redundant concrete. In one embodiment, the first drawknives 13, 14 scrape the concrete outward. Figs. 2A-2C have shown the whole structure of the concrete scraping device, while Fig. 3, Fig. 4A and Fig. 4B have shown the profile of the first cutting knives 12, 15 and first drawknives 13, 14 respectively. The action made by the concrete

scraping device is represented as step S104 in Fig. 7.

The interlocker shaping device is mounted following the concrete scraping device. The interlocker shaping device is spaced from the concrete scraping device by one tile length, when the tile machine pushes forward by one tile, the interlocker shaping device presses downward on the predetermined position (the position of the ladder profile interlocker) to shape the ladder profile interlocker. As shown in Fig.1, the interlocker shaping device comprises a press head 9 and a cylinder 10 disposed along a first directing frame 11. The press head 9 is driven by the cylinder 10 to press downward twice along the directing frame 11 to shape the interlocker. The previous concrete scraping device has cut off the consecutive tiles and scrapped the redundant concrete at the area of the ladder profile interlocker, the interlocker shaping device shapes the interlocker by pressing the position of the interlocker using the press head 9. Referring to Fig. 5A and 5B, the profile of the press head 9 is shown. The action made by the interlocker shaping device is represented as step S106 in Fig. 7.

Following the interlocker shaping device, is the tile end knife device, which is also spaced from the interlocker shaping device by one tile length, when the apparatus pushes forward by one tile, the tile end knife device cuts the ladder profile interlocker on a single tile and perfects the shape of the interlocker to make the interlocker glazed and complete. After the process of the tile end knife device, a single tile with ladder profile interlocker 3 is obtained on a separated tile pallet 2. As shown in Fig.1, the separated tile pallet 2 and the tile 3 thereon are parted by a belt conveyer. Referring to Fig.1, the tile end knife device comprises a second cutting knife 4 disposed along a second directing frame 5, the second cutting knife 4 moves downward along the second directing frame 5 to cut the ladder profile interlocker on a single tile and perfect

the shape of the interlocker. The previous concrete scraping device and the interlocker shaping device have cut off the tiles and completed the shaping of the ladder profile interlocker, the tile end knife device will make the complete ladder profile of the interlocker and perfect the edges of the profile. After the process of the tile end knife device, a single tile with ladder profile interlocker 3 is obtained on a separated tile pallet 2. Referring to Fig. 6A and 6B, the profile of the second cutting knife is shown. The action made by the tile end knife device is represented as step S108 in Fig. 7.

As shown in Fig.1, the concrete scraping device, the interlocker shaping device and the tile end knife device are mounted on a board 6, which is assembled on a plate frame 8 through an adjusting screw 7, the plate frame 8 is fixed on the base frame 1, wherein the board 6 moves forward or backward relative to the plate frame 8 by adjusting the adjusting screw 7 to process the interlocker at a predetermined position on the tile. That means, the predetermined positions that the concrete scraping device, the interlocker shaping device and the tile end knife device work on can be adjusted so as to make the accurately corresponding to the position of the interlockers on the tile.

The concrete scraping device, the interlocker shaping device and the tile end knife device are spaced to each other by one tile length, when the tile machine of the apparatus continuously pushes the tile pallets 2 and extrudes tiles 3, the three devices can process simultaneously, the production efficiency is thus increased.

For further improving the quality of the surface of the interlockers, each of the concrete scraping device, the interlocker shaping device and the tile end knife device comprises a respective auto water-spraying device, which are denoted by the numerals 25, 26 and 27 in the figures respectively.

The present invention implements production of ridge tiles with ladder profile interlocker on an extruded shaping line. The production efficiency is increased and the colors of main tiles and ridge tiles are properly matched.

The previous description of the disclosed embodiments is provided to enable any person skilled in the art to make or use the present invention. Various modifications to these embodiments will be readily apparent to those skilled in the art and the generic principles defined herein may be applied to other embodiments without departing from the spirit or scope of the invention. Thus, the present invention is not intended to be limited to the embodiments shown herein but is to be accorded the widest scope consistent with the principles and novel features disclosed herein.

What is claimed is:

1. A tile making and shaping apparatus for producing tiles with ladder profile interlocker on an extruded shaping line, comprising a tile machine and a shaping device that are adjacently mounted on a base frame (1), the tile machine makes consecutive concrete tiles (3) on a series of tile pallets (2) that are positioned sequentially, wherein the shaping device comprises:

a concrete scraping device for cutting the consecutive tiles at predetermined positions and scraping redundant concrete, wherein the predetermined positions correspond to the positions of the ladder profile interlocker one each single tile;

an interlocker shaping device for pressing the predetermined position to shape the ladder profile interlocker, the interlocker shaping device is spaced from the concrete scraping device by one tile length, when the apparatus pushes forward by one tile, the interlocker shaping device presses downward on the predetermined position;

a tile end knife device for cutting the ladder profile interlocker on a single tile and perfecting the shape of the interlocker, the tile end knife device is spaced from the interlocker shaping device by one tile length, when the apparatus pushes forward by one tile, the tile end knife device cuts and perfects the interlocker to obtain a single tile (3) with ladder profile interlocker on a separate tile pallet (2).

2. The apparatus of claim 1, wherein the concrete scraping device comprising:

first cutting knives (12, 15) for cutting off the consecutive tiles and defining the range of the interlocker;

first drawknives (13, 14) for scraping the redundant concrete

outward.

3. The apparatus of claim 1, wherein the interlocker shaping device comprises: a press head (9) and a cylinder (10) disposed along a first directing frame (11), the press head (9) is driven by the cylinder (10) to press downward twice along the directing frame (11) to shape the interlocker.

4. The apparatus of claim 1, wherein the tile end knife device comprises: a second cutting knife (4) disposed along a second directing frame (5), the second cutting knife (4) moves downward along the second directing frame (5) to cut the ladder profile interlocker on a single tile and perfect the shape of the interlocker.

5. The apparatus of any one of claims 1-4, wherein the tile pallet (2) comprises a ladder shaped structure at the front end for shaping the ladder profile interlocker on the tile.

6. The apparatus of claim 5, wherein the concrete scraping device, the interlocker shaping device and the tile end knife device are mounted on a board (6), which is assembled on a plate frame (8) through an adjusting screw (7), the plate frame (8) is fixed on the base frame (1), wherein the board (6) moves forward or backward relative to the plate frame (8) by adjusting the adjusting screw (7) to process the interlocker at a predetermined position on the tile.

7. The apparatus of claim 5, wherein each of the concrete scraping device, the interlocker shaping device and the tile end knife device comprises a respective auto water-spraying device.

8. The apparatus of claim 5, wherein the tile machine comprises:

a propulsion motor (23) for driving the brace and connecting rod mechanism (22) to force a propulsion bat (20), the propulsion bat (20) pushes a series of tile pallets (2) that are positioned sequentially to move forward on the base frame (1);

a hopper (16) for receiving and storing concrete for making the concrete tiles (3), the hopper (16) is mounted above the base frame (1) and follows the propulsion bat (20);

a roll motor (24) for driving a pack shaft (18) at the bottom of the hopper (16) to rotate, after the concrete is added into the hopper (16), when the apparatus pushes the tile pallets (2) to move forward, the pack shaft (18) continuously rotates to extrude the concrete into the space between the tile pallets (2) and a slipper (17) to form the concrete tiles (3) therein, the propulsion bat (20) pushes the tile pallet (2) to produce consecutive tiles (3).

9. The apparatus of claim 8, further comprising:

a pallet oil spraying device (21) for spraying pallet oil above the surface of the tile pallets (2), the pallet oil spraying device (21) is mounted above the base frame (1) and precedes the propulsion bat (20).

10. The apparatus of claim 8, further comprising:

a press wheel device (19) for preventing the tile pallets (2) from dashing out, the press wheel device (19) is mounted above the base frame (1) and between the propulsion bat (20) and the hopper (16), the press wheel device keeps the tile pallets (2) to stably move forward on the base frame (1).

11. The apparatus of claim 1, wherein the concrete tiles (3) are concrete ridge tiles.

12. A method for producing tiles with ladder profile interlocker, wherein the tiles are produced on an extruded shaping line, the method comprising:

making consecutive concrete tiles on a series of tile pallets that are positioned sequentially by a tile machine;

cutting the consecutive tiles at predetermined positions and scraping redundant concrete, wherein the predetermined positions correspond to the positions of the ladder profile interlocker one each single tile;

pressing downward on the predetermined positions to shape the ladder profile interlocker;

cutting the ladder profile interlocker on a single tile and perfecting the shape of the interlocker.

13. The method of claim 12, wherein the step of cutting the consecutive tiles further defining the range of the interlocker, and the step of scraping redundant concrete scraps the redundant concrete outward.

14. The method of claim 12, wherein further comprising: adjusting the predetermined positions to process the interlocker at a predetermined position on the tile.

15. The method of claim 12, wherein further comprising: spraying water when cutting the consecutive tiles and scraping redundant concrete, pressing downward to shape the ladder profile interlocker, and

cutting and perfecting the ladder profile interlocker.

16. The method of claim 12, wherein the concrete tiles (3) are concrete ridge tiles.

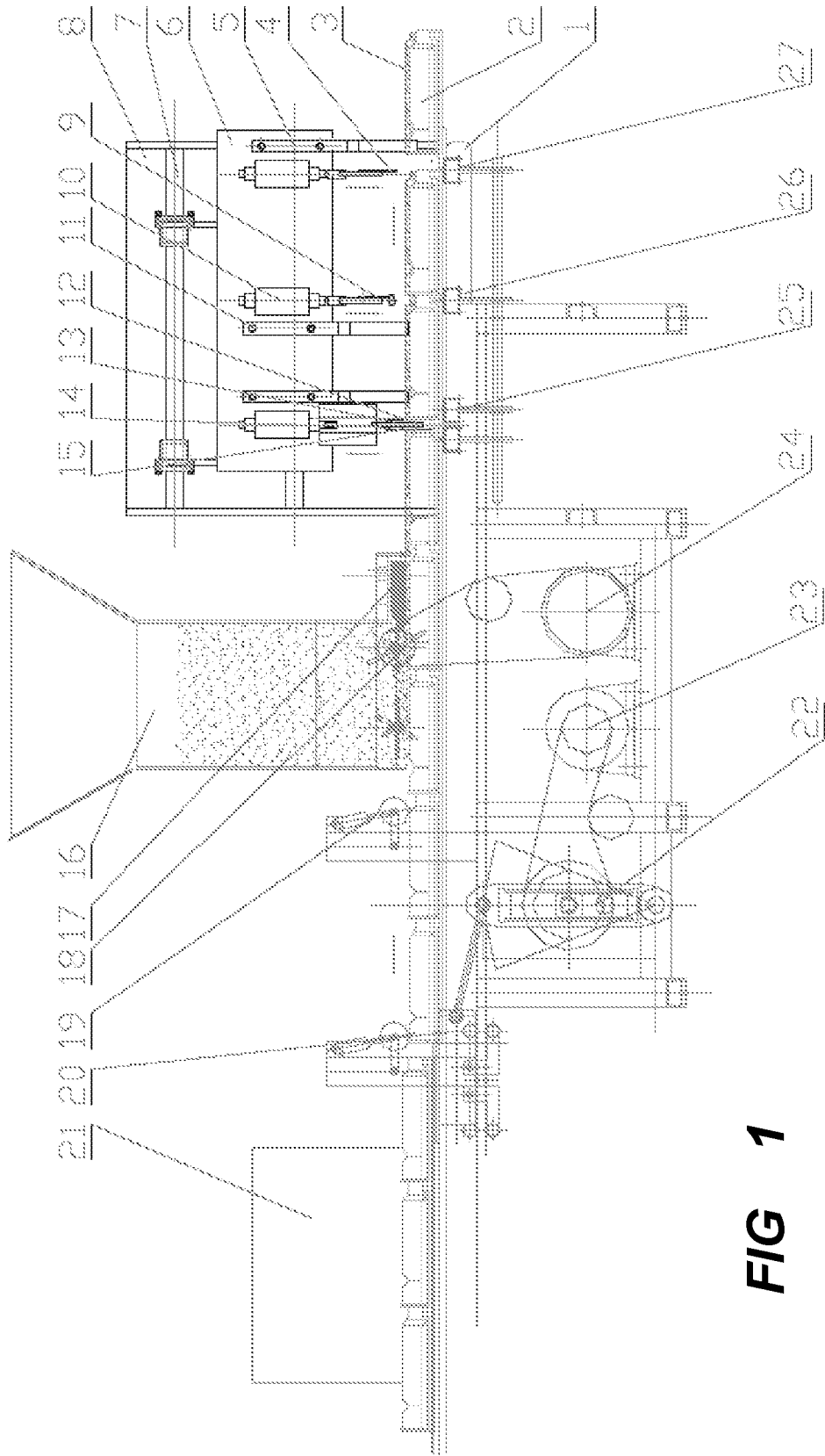


FIG 1

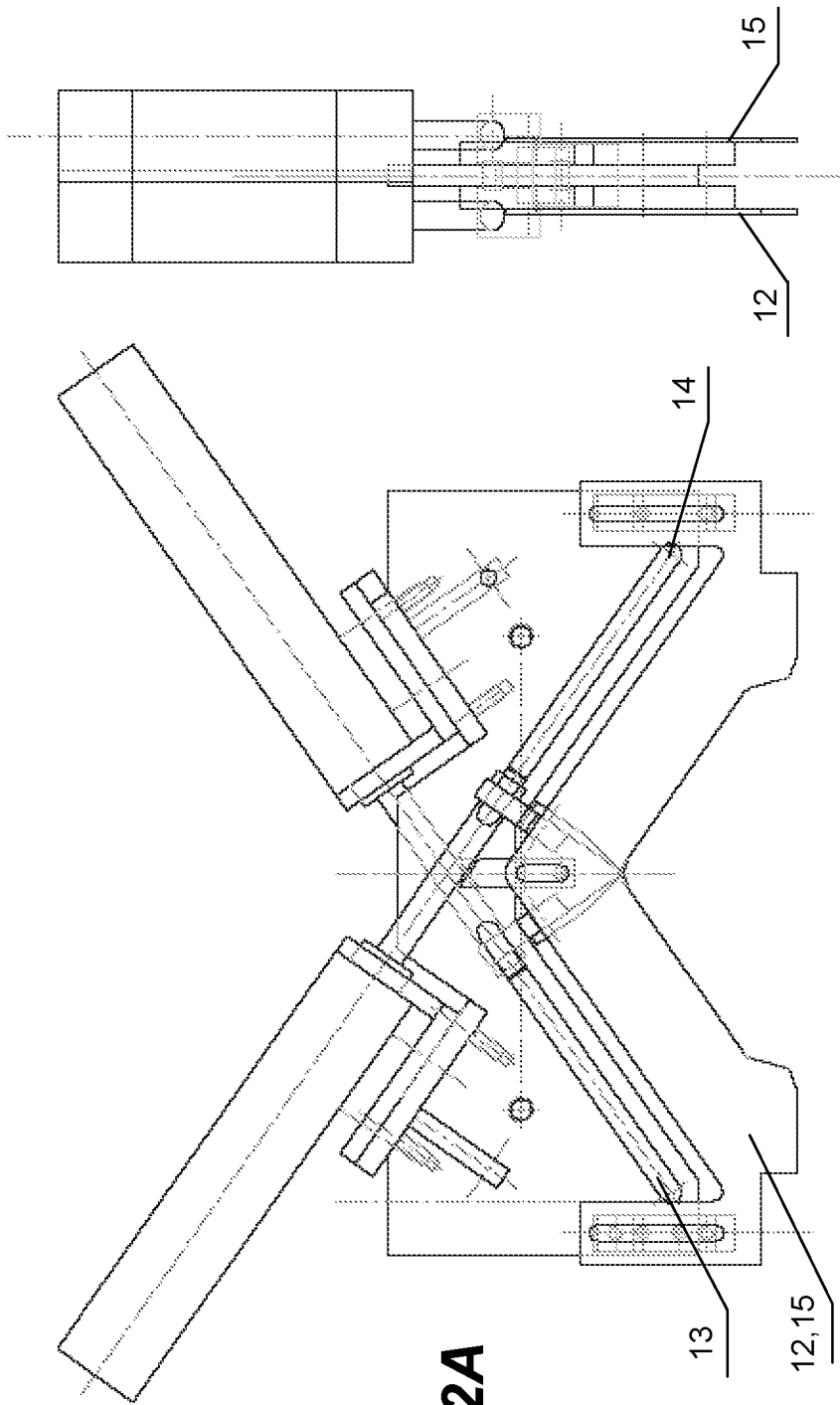


FIG 2A

FIG 2C

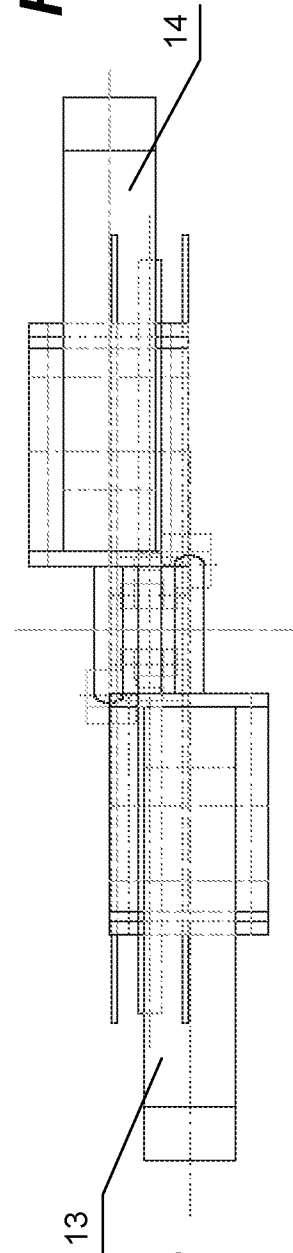


FIG 2B

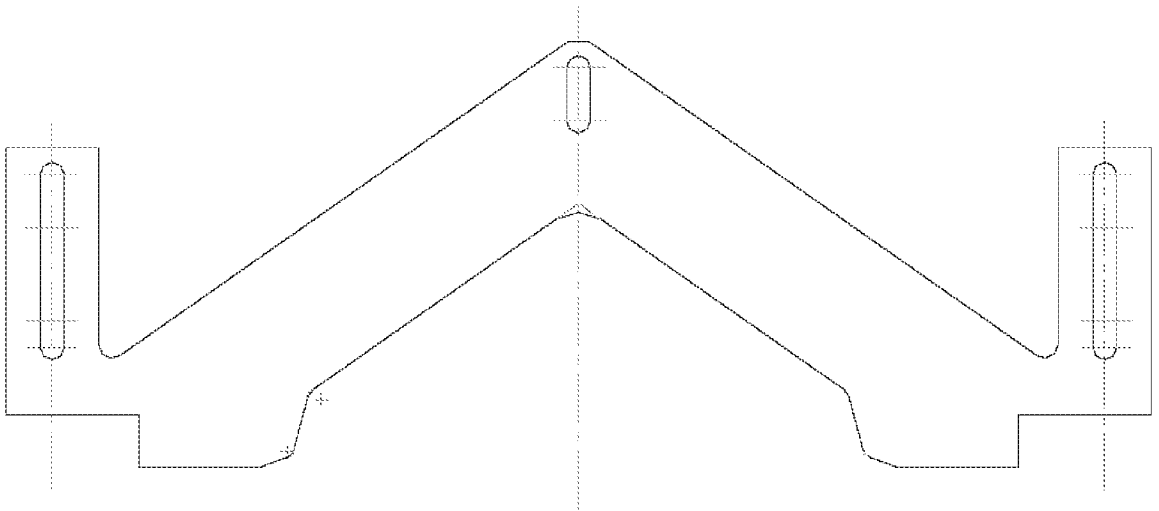


FIG 3



FIG 4A

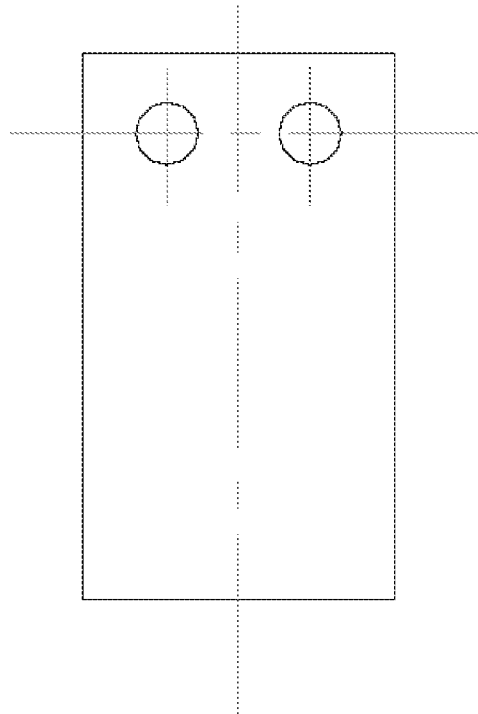


FIG 4B

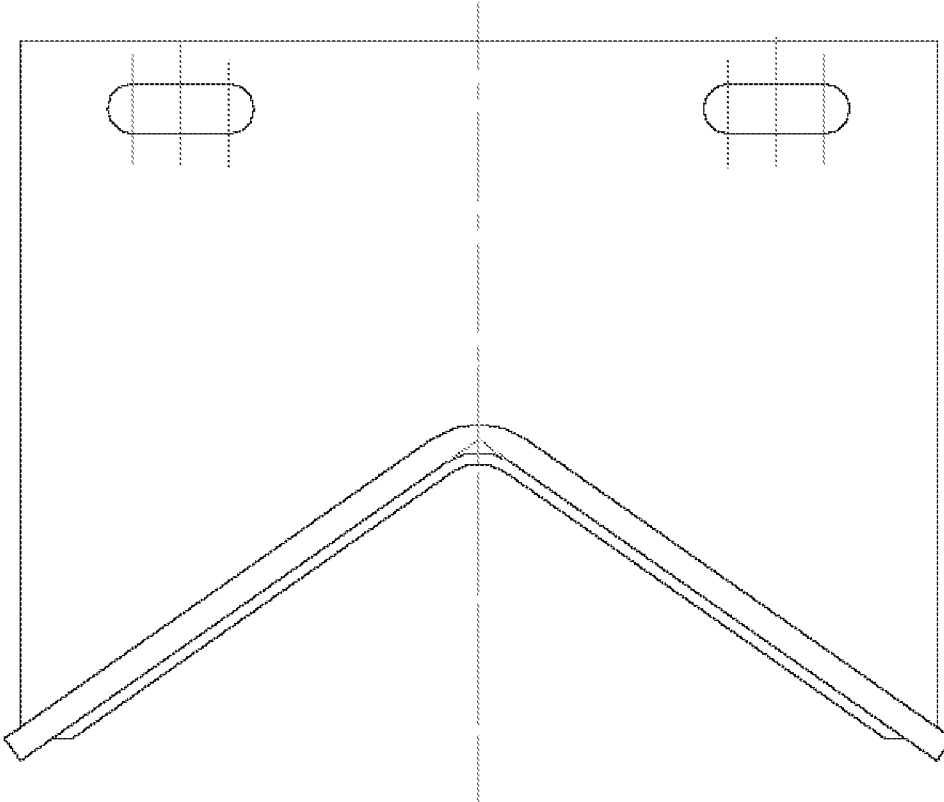


FIG 5A

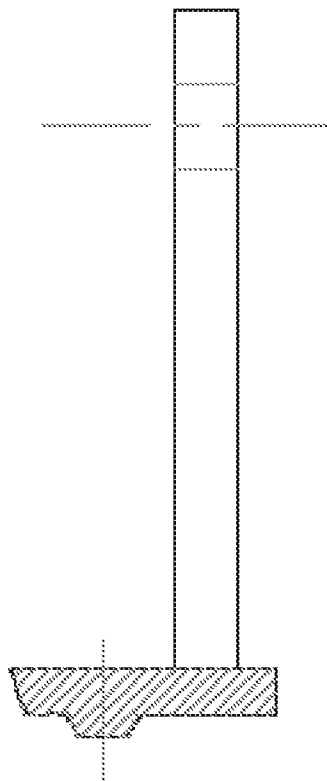


FIG 5B

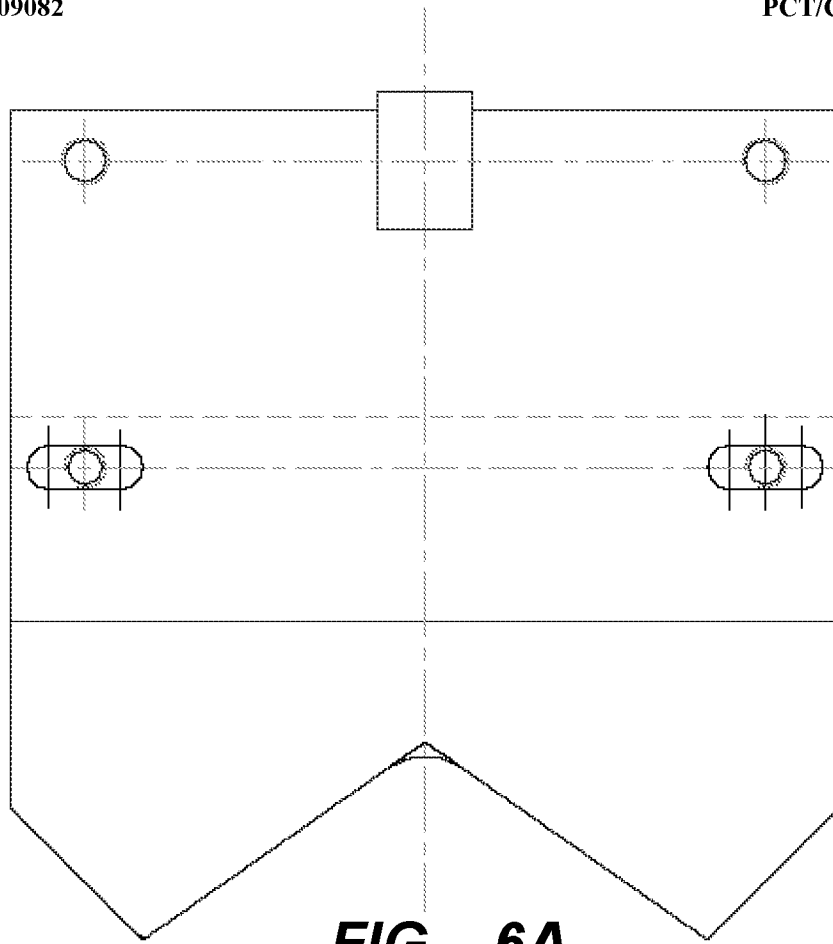


FIG 6A

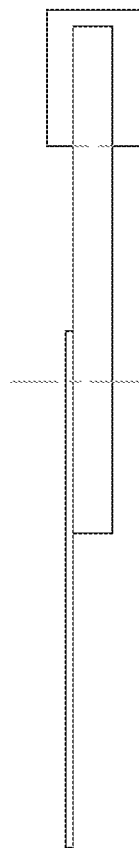
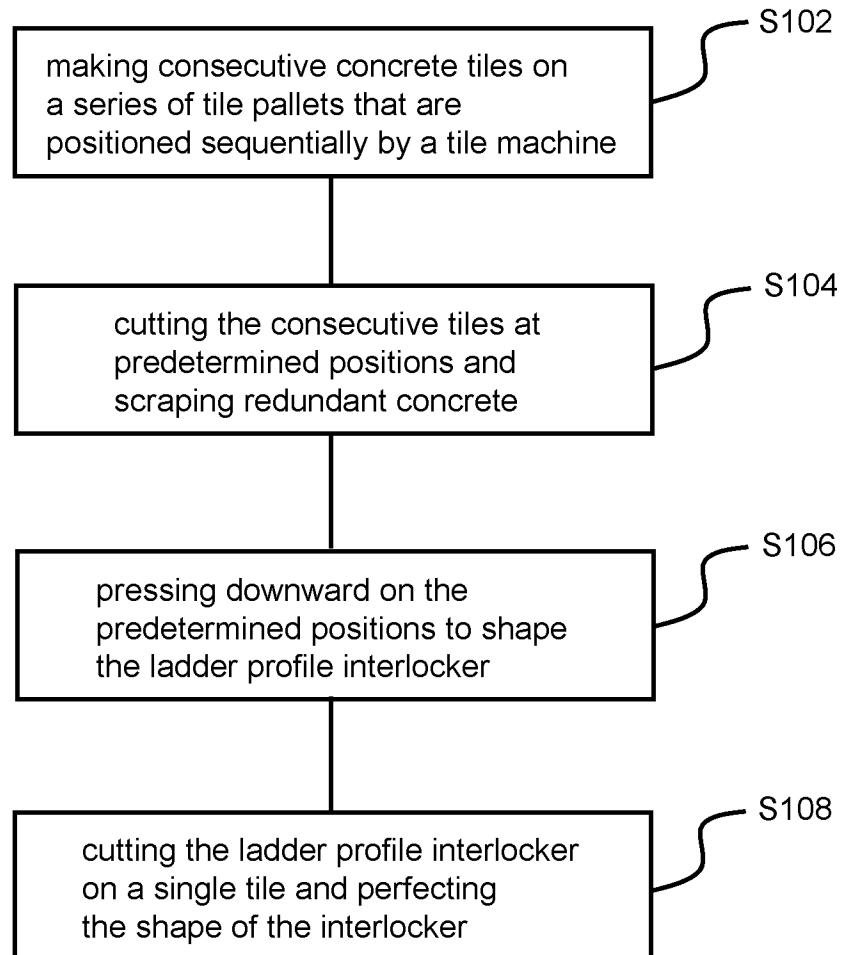


FIG 6B

**FIG 7**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2008/070411

A. CLASSIFICATION OF SUBJECT MATTER <p style="text-align: center;">See extra sheet</p> <p>According to International Patent Classification (IPC) or to both national classification and IPC</p>		
B. FIELDS SEARCHED <p>Minimum documentation searched (classification system followed by classification symbols)</p> <p>IPC: B28B E04D</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)</p> <p>EPODOC;WPI;PAJ;CNPAT: tile,roof,ridge,scrap+,cut+,press+,shap+,LAFE</p>		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP57-163512 A(MATSUSHITA ELECTRIC WORKS LTD) 07 Oct.1982(07.10.1982) page 2,figures. 1-3	12-16
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A	DE3712700 A1(DACHZIEGEL NELSKAMP) 03 Nov.1988(03.11.1988) the whole document	1-16
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
<p>* Special categories of cited documents:</p> <p>“A” document defining the general state of the art which is not considered to be of particular relevance</p> <p>“E” earlier application or patent but published on or after the international filing date</p> <p>“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)</p> <p>“O” document referring to an oral disclosure, use, exhibition or other means</p> <p>“P” document published prior to the international filing date but later than the priority date claimed</p> <p>“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</p> <p>“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</p> <p>“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</p> <p>“&”document member of the same patent family</p>		
Date of the actual completion of the international search 27 Nov.2008(27.11.2008)	Date of mailing of the international search report 11 Dec. 2008 (11.12.2008)	
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer CHEN, Xuxuan Telephone No. (86-10)010-62085883	

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Continuous of:

A. CLASSIFICATION OF SUBJECT MATTER

B28B 11/08(2006.01)i

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