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(54) **Metal roofing sheets and the method of their manufacture**

Metalleindeckbleche und Verfahren zu deren Herstellung

Feuilles de couverture métallique et procédé de leur fabrication

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EP 2 824 252 B1

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Description

[0001] The subject of the invention is the method of manufacture of metal roofing sheets and metal roofing sheets intended for roofings imitating ceramic roofings (the so-called fish scale tiles).

[0002] There are known various methods of manufacture of longitudinally corrugated metal roofing sheets.

[0003] A device for manufacturing metal components from a metal sheet shifted by a press that separates metal sheets from the waste is known from the state of the art. The metal sheet is transported between processing operations by means of an advancing unit along determined coordinates and processed in consecutive sequences. The second operation is carried out in order to cut off the waste part by angle cutting so that a truncated side edge is made.

[0004] From invention JP2001225132 there is known a method of manufacture of metal roofing sheets by unwinding of metal sheet coils (1), moulding (station 2) and embossing (station 3) the metal sheet, the method of manufacture being automatic with the use of an electronic control system (implicit), with the possibility of manual control, whereby the shaped metal roofing sheet is cut off (station 4) and piled (implicit).

[0005] A few method of manufacturing metal roof tile sheets starting from a coil and forming the required structural features of the tiles on the metal sheet by a sequence of forming operations is known from the inventions CN101952063, JPS5646052 and US6957558.

[0006] From invention CN101952063 there is known the method of moulding of corrugated metal roofing sheets with convex and concave corrugations, in which, during the phase of moulding by rolling, a metal sheet goes between rolls of the rolling moulding machine and, as a result, a longitudinal structure is moulded on the metal roofing sheet.

[0007] From invention JPS5646052 there is known large format roofing metal sheet moulded from one metal sheet, which is moulded simultaneously into a large format roofing metal sheet in such a way that it looks like many S-shaped roof tiles arranged one by one vertically or horizontally. According to this invention, the process of manufacture of a large format roof tile covering consists of the following steps: a metal sheet of the length and width corresponding to the length and width of many single roof tiles is run lengthwise through a moulding machine in such a way that its section resembles a row of S-shaped roof tiles arranged one by one horizontally. Then, the metal sheet moulded in such a way is run through a press with stepping moulds in such a way that, from the front edge of the metal sheet, steps of the length corresponding to one S-shaped roof tile are moulded consecutively; as a result, in its cross section, a large format roof tile covering looks like many single S-shaped roof tiles arranged one over another vertically. When the unrolled metal sheet reaches a unit controlling its length, it starts a cutting machine and is cut to an adequate

length. Then the metal sheet moves to a moulding machine that moulds its horizontal section in a prescribed way; then the press shapes its vertical section, until a large format roof covering that looks like many single tiles arranged one by one vertically and horizontally is obtained. The metal sheet manufactured in this way has the shape of traditional Japanese roof tiles. The method according to this invention allows to widen and elongate the roof covering in an unrestricted way, reducing places of contact between the roof tiles or roof tile covering on one roof area and, thus, minimizing the risk of leakage.

[0008] From US6957558 there is known device for the manufacture of a metal sheet, which incorporates guide rolls, a mechanism for making a shape, and a cutting unit for cutting a ready metal sheet to an adequate size.

[0009] The object of the invention is to propose a method of manufacture of roof tiles similar to fish scale tiles, corresponding to a traditional model of roofing made from flat ceramic tiles called "fish scale tiles".

[0010] This object is achieved with a method according to claim 1. A flat roofing sheet with mouldings manufactured by the method of the invention is defined in claim 2.

[0011] The unwound metal sheet is moulded of one edge, making a system of small run-off gutters and capillary grooves covering up the place of the connection of the two stretches, with a place for placing the sealing tape at the first capillary groove, at which the screwing together (joining) of the two stretches is recommended. In the solution according to the invention this method of manufacture allows to produce metal roofing sheets of flat form with semicircular ending after embossing, with alternately placed outlines of the edges of the tiles with rows mutually shifted by a half of the width of the tile.

[0012] The metal roofing sheet according to the invention resembles a traditional model by imitating the roofing called "fish scale roofing". The method according to the invention allows to manufacture metal roofing sheets of different shape and form. The method allows to place the sealing on a flat underside metal sheet surface when joining two sheets, thus allowing to fix it among others by a seal stuck from the underside of the metal sheet.

[0013] In the method according to the invention, in the moulding unit there takes place the moulding of the metal sheet from one side by making a system of small run-off and capillary, with a place for placing the sealing tape used during fixing of the fish scale sheets on a roof stretch.

[0014] Moreover, the moulding machine rolls up the extreme edges of the metal sheet on both sides in order to strengthen them and protect the metal sheet against scratching during transport or assembly. In the method according to the invention in the pressing unit there is used a multistage stamping die which allows to emboss consecutive rows of tiles in an alternate arrangement. In the method according to the invention the metal sheet varnish, or any other special anticorrosive finishing substituting varnish, is not damaged. Due to the fact that the metal sheet is held in a flexible and delicate way during

embossing, it is possible in practice to use the pressed metal sheet with any kind of anticorrosive coating without any fear of its damaging. Each row of "tiles" is shifted in relation to the adjacent one by a half of the width of the "tile" in the stamping die, which gives a unique impression of using ceramic tiles (the so-called fish scale tiles). The construction of the stamping die allows to firmly run the metal sheet during the gradual embossing, in spite of a high degree of difficulty connected with that kind of procedure, simultaneously guaranteeing high quality of the embossed metal sheet.

[0015] The production line operating by the method according to the invention is intended mainly for work in an automatic cycle, in which the manufacture of metal roofing sheets takes place automatically. The control is exercised by an electronic system. For preparation purposes, adjustment of the production cycle and service and repair works the manual control of particular working movements of the line is possible in single procedures from the control panel. It is possible only when the automatic cycle is turned off. The line for the manufacture of the metal sheet in accordance with the invention is intended for metal sheets of the thickness of 0.4-0.6mm delivered in coils.

[0016] In the method according to the invention the moulding unit moulds the system of run-off and capillary grooves on one side of the metal sheet with a place for placing the sealing tape used during fixing of the fish scale sheets on a roof stretch. The moulding machine rolls up the extreme edges of the metal sheet on both sides in order to strengthen them and protect the metal sheet against scratching during transport or assembly. In the pressing unit there is used a multistage stamping die. Consecutive tiles are embossed in an alternate arrangement, without damaging varnished metal sheets or any other anticorrosive finishing substituting varnish.

[0017] A preferred embodiment of the invention is presented on the enclosed illustrations, Fig. 1 and Fig. 2, where:

Fig. 1 shows the metal roofing sheet manufactured with the method according to the invention.

Fig. 2 shows the production line operating by the method according to the invention.

[0018] The solution according to the invention is shown by means of a preferred embodiment thereof.

Example 1:

[0019] The production line of the metal roofing sheet is intended mainly for work in an automatic cycle, in which the manufacture of metal roofing sheets takes place automatically and the control is exercised by an electronic system.

[0020] The metal sheet of the thickness of 0.5mm (in positive or negative tolerance) to be processed is first

unwound from the coil by an unwinding device, and then by means of an inserting roller unit with line guides it is delivered to the working area of the moulding machine which makes the rolling up and grooving. After the moulding the metal sheet is transferred to the working area of the hydraulic stamping die shaping consecutive modules of transverse outlines of tile edges together with grooves symbolizing side edges of points of contact of tiles. In the course of its shaping the metal roofing sheet is supported on shoulders of a device that puts it away; after the finished metal sheet achieves the planned length, it is cut off by means of hydraulic guillotine shear and piled on other ready metal sheets by a mechanical device. After shaping of the set number of metal sheets and the completion of the task the machine stops so that the pile of ready metal sheets may be taken away outside the scope of its operation by means of a lift truck or a crane. The embossing of the metal sheet has from 12mm to 30mm.

[0021] The line for the production of metal sheets has a device (1) unwinding the metal sheet from the coil. From the unwinding device the metal sheet (1) is transported to the mechanical rotary shear (2) that cuts it off after the completion of the moulding, and then it is transferred into the metal sheet inserting and conducting unit (3). The mechanical rotary shear (2) and the metal sheet inserting and conducting unit (3) are embedded in a hydraulic system (9) with a power supply unit for the drive of the motor operator of the stamping die, guillotine shear and the putting-away device. Then the metal sheet is transported to a feeding unit (4) with a moulding machine rolling off the endings of the metal sheet and shaping longitudinal capillary grooves and small run-off gutters. From the feeding unit (4) the metal sheet is sent by the power supply and control system (8) with an electrical cabinet and a control panel to a hydraulic stamping die (5) that embosses alternately arranged outlines of tiles and grooves imitating places of contact of tiles. From the hydraulic stamping die (5), through the hydraulic guillotine shear (6) for cutting of the ready metal roofing sheets, metal sheets reach the machine collecting and piling them (7).

Example 2:

[0022] The line for the production of metal roofing sheets may be controlled manually, after the automatic cycle is turned off.

[0023] The metal sheet of the thickness of 0.6mm (in positive or negative tolerance) to be shaped is unwound from the coil, and then by means of an inserting roller unit with line guides it is delivered to the working area of the moulding machine which makes the rolling up and grooving. After the moulding the metal sheet is transported to the working area of the hydraulic stamping die shaping consecutive modules of transverse outlines of tile edges together with grooves symbolizing side edges of points of contact of tiles. In the course of its shaping the metal roofing sheet is supported on shoulders of a device that puts it away; after the finished metal sheet achieves

the planned length, it is cut off by means of hydraulic guillotine shear and piled on other ready metal sheets by a mechanical device. After shaping of the set number of metal sheets and the completion of the task the machine stops so that the pile of ready metal sheets may be taken away outside the scope of its operation by means of a lift truck or a crane. The embossing of the metal sheet has from 12mm to 30mm.

Claims

1. A method of manufacturing metal roofing sheets by unwinding a metal sheet coil and moulding and embossing the unwound metal sheet, wherein the extreme edges of the metal sheet (1) are rolled on both sides, wherein the modules of transverse outlines of roof tiles are shaped in a stamping die (5), together with grooves symbolizing side edges of the points of contact of the tiles, wherein the unwound metal sheet is moulded from one edge for shaping a system of longitudinal capillary grooves and small run-off gutters with a place for a sealing tape, the method being carried out automatically with the use of an electronic control system (8), with the possibility of manual control, and wherein the shaped metal roofing sheet is cut off and piled.
2. Flat metal roofing sheet (1) with mouldings manufactured by the method of claim 1, said metal roofing sheet being flat with semicircular ending, with alternately placed outlines of the edges of the tiles with rows mutually shifted by a half of the width of the tile, said roofing sheet being provided on its underside with a place for a sealing tape close to the rolled part of the metal sheet.

Patentansprüche

1. Verfahren zur Herstellung von Dachdeckungen aus Metall durch Entwicklung von Metallblechrollen, Formen und Prägen des entwickelten Metallbleches, wobei Außenkanten des Bleches auf beiden Seiten gewalzt werden, wobei Module der Querprofile von Dachplatten im Stanzwerkzeug (5) zum Stempeln geformt werden, zusammen mit Rillen, die Seitenkanten der Plattenberührungspunkte symbolisieren; in welchem das entwickelte Metallblech von einem Rand geformt wird, zwecks der Formens der Anordnung von länglichen kapillaren Rillen und kleinen Ablaufrinnen mit einem Platz für das Dichtungsband, wobei dieses Verfahren automatisch mittels eines elektronischen Steuersystems durchgeführt wird (8), mit der Möglichkeit einer manuellen Steuerung und in welchem das geformte Dachblech abgeschnitten und gestapelt wird.

2. Flaches Dachblech (1) mit Profilen, die nach Patentanspruch 1 hergestellt wird, wobei das Dachblech flach und halbgerundet ist, mit abwechselnd platzierten Konturen der Ränder von Dachplatten mit einer Reihe von zueinander um die Hälfte der Breite von Dachplatte verschobenen Dachplatten; die erwähnte Platte der Dachdeckung hat auf der Unterseite einen Platz für das Dichtungsband in der Nähe des aufgerollten Teiles des Metallbleches.

Revendications

1. La méthode de la production des toitures par le dépliement des rouleaux de la tôle métallique, le façonnage et gaufrage de la tôle métallique dépliée, dont les bords extrêmes de la tôle sont laminés de deux côtés, les modules transverses des contours des tuiles sont formés dans l'outil d'emboutissage (5) à timbrer avec les rainures qui symbolisent les bords du côté des points des contacts des plaques ; dans lequel la tôle métallique développée est formée d'un seul bord dans le but de former le système des rainures oblongues capillaires et les petites gouttières ruisselles avec la place pour la bande étanche, cette méthode est exécutée automatiquement à l'aide du système électronique de commandement (8), avec la possibilité de contrôle manuel et dans lequel la tôle de toiture est coupée et rangée en tas.
2. La tôle plate (1), avec les profils fabriqués par la méthode selon la réserve 1, la tôle de toiture est plate avec la finition demi-circulaire, avec les contours des bords des tuiles placés alternativement, avec les rangés déplacés réciproquement de la moitié de largeur de la tuile ; la feuille mentionnée de la toiture possède sur son côté inférieur la place pour la bande étanche près de la partie enroulée de la tôle métallique.

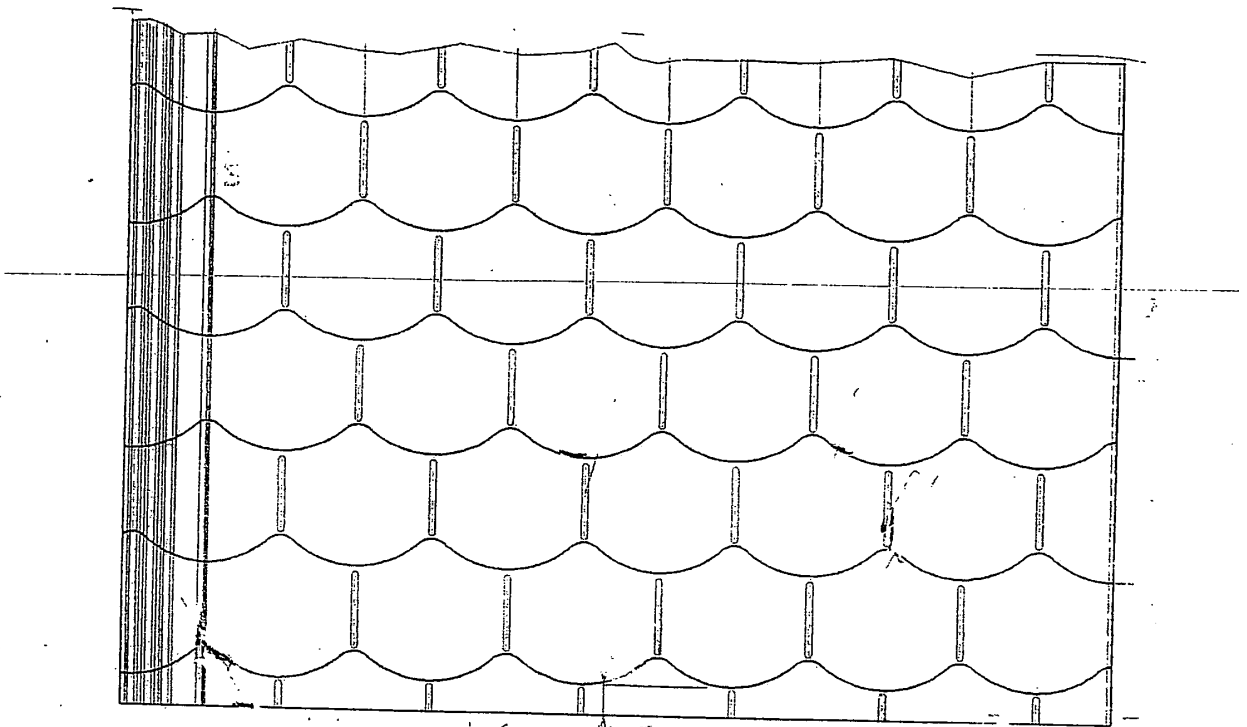


Fig 1

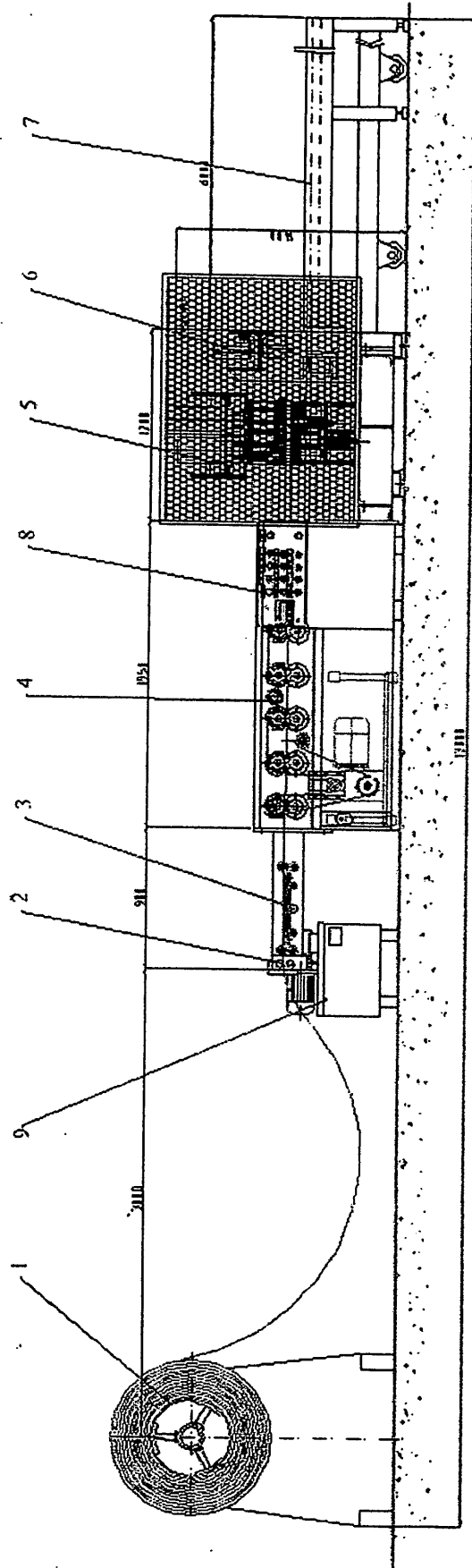


Fig 2

REFERENCES CITED IN THE DESCRIPTION

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