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(54) Apparatus for sawing cured slipform cast concrete products

Vorrichtung zum Sägen Gleitschalungsgussbetonprodukte

Appareil de sciage de produits en béton coulé à coffrage glissant

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Description

[0001] The present invention relates to an apparatus used for sawing cured slipform cast concrete products on a slipform casting bed before moving the cut concrete products from the casting bed, and in particular to an apparatus for sawing cured slipform cast concrete products according to the preamble of claim 1. In slipform casting, concrete products are cast on a casting bed in one continuous casting process with slipform casting machine. After casting the one continuous concrete casting is left to cure on the casting bed. After the concrete is cured, the casting is cut to predetermined lengths defining the final concrete products, after which the final concrete products are lifted from the casting bed and transported either to storage or to their construction sites.

[0002] The removal of the cut concrete products or elements from the casting bed takes place immediately after the cutting, so that when the last cutting is done and the last element is lifted from the casting bed, the casting bed is ready for cleaning and refurnishing for a new slipform casting.

[0003] The cutting of the cured concrete casting is generally done by a diamond bladed saw, which is supported by a frame comprising wheels, which allows the saw to be moved along and over the casting bed. The sawing process generally creates wet slurry, comprising of cooling water and concrete dust and cuttings, which slurry spreads on the casting bed as well as on the area next to or between the casting beds. This slurry needs to be cleaned before new slipform casting process on the casting bed may begin.

[0004] The cleaning and refurnishing of the casting bed is generally done, especially in the larger concrete element manufacturing factories, with a separate machine, which usually cleans the casting bed with a rotating brush, oils the casting bed for protecting the metal parts of the casting bed, and draws pretensioning strands or wires from one end of the casting bed to another. The machine can be also equipped with side brush or brushes, which clean the area next to or between the casting beds. One this kind of machine is BedMaster manufactured by Elematic Oy Ab.

[0005] After the casting bed is cleaned and the pretensioning strands are drawn on the length of the casting bed, the casting bed is ready for tensioning of the pretensioning strands and starting of the slipform casting process.

[0006] The machines used in the cleaning and refurnishing are somewhat expensive and tie capital in machines, and thus are not used in many smaller concrete element manufacturing factories. These smaller concrete element manufacturers carry out the cleaning and refurnishing manually, which is hazardous to the employees' health due to the fine concrete and rock dust created in the sawing processes.

[0007] Publication EP 2 476 531 A1 from the same applicant discloses an apparatus according to the preamble of claim 1, in particular a concrete element saw comprising a frame with wheels and a concrete saw connected movably to the frame, wherein the torque of at least one feed motor of a saw blade and/or the torque of the drive motor moving the concrete element saw is measured, and the feed rate of the saw blade in adjusted on the basis of said measurement of the torque.

[0008] Publication CN 201 202 077 Y discloses an expansion joint trimming machine for maintenance of cement concrete roads and airfield pavements of airports, which comprises a saw disc for removing dirt and calking from the expansion joint and a brush for collecting the removed debris to a container included in the machine. The brush can be raised from the surface to be cleaned.

[0009] The present invention provides an apparatus for sawing cured slipform cast concrete products defined by the features of claim 1. The apparatus according to the present invention allows two consecutive manufacturing steps in the slipform cast concrete product manufacturing process to be carried out by the same machine thus lowering the capital tied to machinery of the manufacturing factory. This makes the apparatus appealing also to smaller manufacturing plants, which raises their level of automation and lower the health hazards to their personnel. As the apparatus comprises means for attaching ends of the pretensioning strands to the apparatus, said means comprising a strand pulling comb, the same machine can also be used to pull pretensioning strands on a slipform casting bed at the same time when the machine cleans the casting bed. Further, the additional weight of the concrete saw allows all of the required pretensioning strands to be pulled on the casting bed simultaneously, which is not usually possible with the cleaning machines of the prior art due to their low weight. This lowers the amount of passes to be made on the casting bed with machines, which also increases the work safety.

[0010] The apparatus according to the inventions is advantageously first used in the sawing process moving along the casting bed and sawing the cured slipform cast concrete product to a predetermined length, and after the concrete product is sawed to its predetermined length, the ready concrete product is lifted from the casting bed. After the last cut and removal of the last product from the casting bed the apparatus goes through the same casting bed, advantageously ends of pretensioning strands connected to the apparatus, and cleans the casting bed with the brushing unit. This single machine operation removes the need to change machines on the casting bed between the operations thus eliminating machined lifts on the manufacturing plant, which simplifies the manufacturing process and removes the hazards to the personnel caused by these machine lifts. The use of a single machine for these consecutive manufacturing steps also lowers the amount of machines to be operated simultaneously in the manufacturing plant, which significantly lessens the danger of personnel to get squeezed between two machines operating on adjacent casting

beds.

[0011] The apparatus according to the invention also allows the use of the brushing unit during the sawing process, whereby the brushing unit can be used to clean the upper surface of the slab from any leftover cuttings and dust.

[0012] The apparatus according to an embodiment may advantageously also comprise a single suction unit for removing dust from both the concrete sawing process and the casting bed brushing process. This simplifies the construction of the apparatus.

[0013] In the apparatus according to the invention the means for attaching the ends of the pretensioning strands to the apparatus are advantageously carried out with a strand pulling comb, which may extend at one end of the apparatus substantially horizontally.

[0014] The apparatus according to a further embodiment may also be equipped with additional brushing unit for cleaning area next to and/or between adjacent slipform casting beds.

[0015] The apparatus according to a further embodiment may also be equipped with means for oiling the slipform casting bed. This oiling helps to remove cured concrete from the surface of the casting bed and protects the metal parts of the casting bed.

[0016] The apparatus according to a further embodiment may also be provided with a motor for moving the apparatus.

[0017] Exemplifying embodiment of the invention and its advantages are explained in greater detail below in the sense of example and with reference to accompanying drawing, which

Figure 1 shows schematically as a side view an apparatus according to the invention.

[0018] Apparatus 1 shown in figure 1 comprises a frame 2 with wheels 3, 3' and a concrete saw 4 with a saw blade 5. The concrete saw 4 is connected to the frame 2 movably, so that the height and sideways orientation of the saw, or at least the saw blade 5, can be changed during sawing of the slipform cast concrete product. The orientation of the concrete saw 4 or saw blade 5 in relation to the vertical axis can also be changed, so that a slipform cast concrete product can be sawed to have a skewed or slanted edge, or so that a slipform cast concrete product or slab can be cut in half in length direction.

[0019] The wheels 3, 3' of the apparatus 1 are set on rails extending on both sides of a slipform casting bed. These same rails are used by a slipform casting machine, as well as other finishing machines operating on the slipform cast concrete product. In the embodiment of figure 1, the wheels 3' are driven by a motor 6 in order to move the apparatus 1 along the casting bed.

[0020] At one end of the apparatus 1 is located an outwards extending platform 7, where an operator can operate the apparatus. The platform 7 is equipped with two cable reels 8, one for electric cable for providing operating electric power for the apparatus 1, and one for water hose for providing water for the apparatus. The same water feed providing water to the apparatus 1 can be advantageously used both for the sawing process and for the cleaning and brushing process.

[0021] In the opposite end of the apparatus 1 in relation to the platform 7 is connected a brushing unit 9 comprising a rotatable brush 10, which brush extends sideways from one end of the casting bed to another, thus covering and being able to clean the width of the casting bed. The brushing unit 9 is connected to the frame 2 of the apparatus 1 vertically adjustably, which allows the brushing unit to be used for brushing and cleaning the upper surface of a concrete product while the concrete product is still located on the casting bed. When the concrete product or products are removed from the casting bed, the brushing unit 9 is used for cleaning the casting bed.

[0022] The brushing unit 9 is also equipped with a suction unit (not shown) for removing dust from the brushing and cleaning process of the casting bed as well as the upper surface of a concrete product. Advantageously the apparatus 1 is equipped with a single suction unit for removing dust both from the sawing process and well as from the brushing and cleaning process. Further, the apparatus 1 advantageously also comprises means (not shown) for spreading water on the casting bed during the brushing and cleaning process, which enhances the cleaning of the casting bed.

[0023] In the area of the platform 7 is connected a strand pulling comb 11, which extends substantially horizontally from one side of the casting bed to another, substantially perpendicularly in relation to the length direction of the casting bed. The strand pulling comb 11 is equipped with grooves extending upwards from the lower edge of the comb, and which grooves extend from the front surface of the comb to the back surface of the comb in the lengthwise direction of a casting bed. In these grooves of the strand pulling comb 11 are set ends of pretensioning strands to be pulled on the length of a casting bed. The strand pulling comb 11 is also connected to the apparatus 1 height adjustably so that it can be raised above the upper surface of a slipform cast concrete product during cutting processes.

[0024] The apparatus 1 is also advantageously equipped with suitable means (not shown) for feeding oil to the casting bed and for spreading the oil on the casting bed. These means may include an oil container for providing the oil and a suitable wiper blade for spreading the oil on the casting bed.

[0025] When the apparatus 1 is used, it is first lifted on a slipform casting bed and on a cured continuous slipform cast concrete product or slab so, that the wheels 3, 3' set on rails extending on both sides of the casting bed. Then the apparatus 1 is moved, by means of the motor 6, to a first cutting point where the continuous slipform cast product is to be cut, and the cutting is carried out with the concrete saw 4. After the sawing process is done, the apparatus proceeds forward so that the brushing unit 9 can be used to brush and clean any leftover cuttings

and dust from the upper surface of the concrete product in the area of the cutting. Then the apparatus 1 starts to proceed to a next cutting point, and proceeds to cut the concrete product. Once the apparatus 1 has cleared and cleaned the area of the cut concrete product, the ready cut concrete product is lifted from the casting bed. After the apparatus 1 has proceeded from one end of the casting bed or from one end of the continuous slipform cast slab and carried out all the required sawing processes, the apparatus is moved to the end of the casting bed, where pretensioning strands are connected to the strand pulling comb. After the pretensioning wires are connected to the strand comb 11, the apparatus 1 proceeds to cleaning of the casting bed with the brushing unit 9 and simultaneously moving and pulling the pretensioning strands to the other end of the casting bed. When the apparatus 1 reaches the other end of the casting bed, the pretensioning wires are detached from the apparatus, apparatus is lifted from the casting bed, and the casting bed is ready for tensioning of the pretensioning strands and for a new slipform casting process.

[0026] The apparatus 1 according to an embodiment may also be advantageously equipped with side or gutter brushing unit (not shown), which extends to the area next to the casting bed. This way the apparatus 1 can also clean simultaneously areas next to the casting bed or the gutters between casting beds.

[0027] In the apparatus 1 according to the invention, the weight of the concrete saw 4 provides advantageously enough weight for the whole apparatus, so that it is heavy enough for the cleaning process as well as for pulling the pretensioning strands. In the prior art cleaning machines the weight of the machine needs to be raised by robust and heavy construction for these purposes, which raises the price of these prior art machines.

[0028] Regarding the embodiment illustrated in the figure and discussed above, it should be appreciated that it is just an example of a solution according to the invention and, hence, by no means limiting the invention. It is evident to a person skilled in the art that the disclosed embodiment can be modified in many different ways within the scope of the appended claims.

Claims

1. An apparatus (1) for sawing cured slipform cast concrete products, which apparatus comprises a frame (2) with wheels (3, 3') for moving the apparatus along a casting bed, and a concrete saw (4) connected movably to the frame, **characterized in that** the apparatus (1) comprises a brushing unit (9) for cleaning slipform casting bed, wherein the brushing unit (9) is connected to the frame (2) of the apparatus vertically adjustably for allowing the brushing unit to be used in cleaning the upper surface of a cast concrete product on a slipform casting bed, and **in that** the apparatus further comprises means (11) for attaching ends of pretensioning strands to the apparatus, said means comprising a strand pulling comb.

2. An apparatus (1) according to claim 1, wherein the apparatus comprises a suction unit for removing dust from both the concrete sawing process and the casting bed brushing process.

3. An apparatus (1) according to any of claims 1 or 2, wherein the apparatus comprises a brushing unit for cleaning area next to and/or between adjacent slipform casting beds.

4. An apparatus (1) according to any of claims 1-3, wherein the apparatus comprises means for oiling the slipform casting bed.

5. An apparatus (1) according to any of claims 1-4, wherein the apparatus comprises a motor (6) for moving the apparatus.

Patentansprüche

1. Vorrichtung (1) zum Sägen von Gleitschalungsgussbetonprodukten, wobei die Vorrichtung einen Rahmen (2) mit Rädern (3, 3') zum Bewegen der Vorrichtung entlang eines Gussbetts und eine mit dem Rahmen beweglich verbundene Betonsäge (4) aufweist, **dadurch gekennzeichnet, dass** die Vorrichtung (1) eine Bürsteneinheit (9) zum Reinigen des Gleitschalungsgussbetts aufweist, wobei die Bürsteneinheit (9) mit dem Rahmen (2) der Vorrichtung vertikal einstellbar verbunden ist, um ein Verwenden der Bürsteneinheit bei der Reinigung der Oberseite eines Gussbetonprodukts auf einem Gleitschalungsgussbett zu ermöglichen, und dass die Vorrichtung zusätzlich ein Mittel (11) zum Anbringen von Enden von Vorspannsträngen an der Vorrichtung aufweist, wobei die Mittel einen Strangzugkamm beinhalten.

2. Vorrichtung (1) nach Anspruch 1, wobei die Vorrichtung eine Saugeinheit zum Entfernen von Staub sowohl von dem Betonsägevorgang als von dem Gussbettbürstungsvorgang aufweist.

3. Vorrichtung (1) nach einem beliebigen der Ansprüche 1 oder 2, wobei die Vorrichtung eine Bürsteneinheit zum Reinigen eines Bereichs in Nähe und/oder zwischen benachbarten Gleitschalungsgussbetten aufweist.

4. Vorrichtung (1) nach einem beliebigen der Ansprüche 1-3, wobei die Vorrichtung Mittel zum Ölen des Gleitschalungsgussbetts aufweist.

5. Vorrichtung (1) nach einem beliebigen der Ansprü-

che 1-4, wobei die Vorrichtung einen Motor (6) zum Bewegen der Vorrichtung aufweist.

Revendications

1. Dispositif (1) pour le sciage de produits en béton coulé à coffrage glissant durcis, ledit dispositif comprenant un cadre (2) avec des roues (3, 3') pour déplacer le dispositif le long d'un lit de coulage, une scie à béton (4) reliée de façon mobile au cadre, **caractérisé en ce que** le dispositif (1) comprend une unité de brossage (9) destinée à nettoyer le lit de coulage à coffrage glissant, dans lequel l'unité de brossage (9) est reliée au cadre (2) du dispositif verticalement de façon réglable, pour permettre à l'unité de brossage d'être utilisée dans le nettoyage de la surface supérieure d'un produit en béton coulé sur un lit de coulage à coffrage glissant, et **en ce que** le dispositif comprend en outre des moyens (11) destinés à fixer des extrémités de brins de pré-tension audit dispositif, lesdits moyens comprenant un peigne de tirage de brins.

2. Dispositif (1) selon la revendication 1, dans lequel le dispositif comprend une unité d'aspiration destinée à éliminer la poussière au cours de l'opération de sciage de béton et de l'opération de brossage du lit de coulage.

3. Dispositif (1) selon l'une quelconque des revendications 1 et 2, dans lequel le dispositif comprend une unité de brossage destinée à nettoyer une zone adjacente à des lits de coulage à coffrage glissant et/ou située entre des lits de coulage à coffrage glissant adjacents.

4. Dispositif (1) selon l'une quelconque des revendications 1 à 3, dans lequel le dispositif comprend un moyen pour le graissage du lit de coulage à coffrage glissant.

5. Dispositif (1) selon l'une quelconque des revendications 1 à 4, dans lequel le dispositif comprend un moteur (6) destiné à déplacer le dispositif.

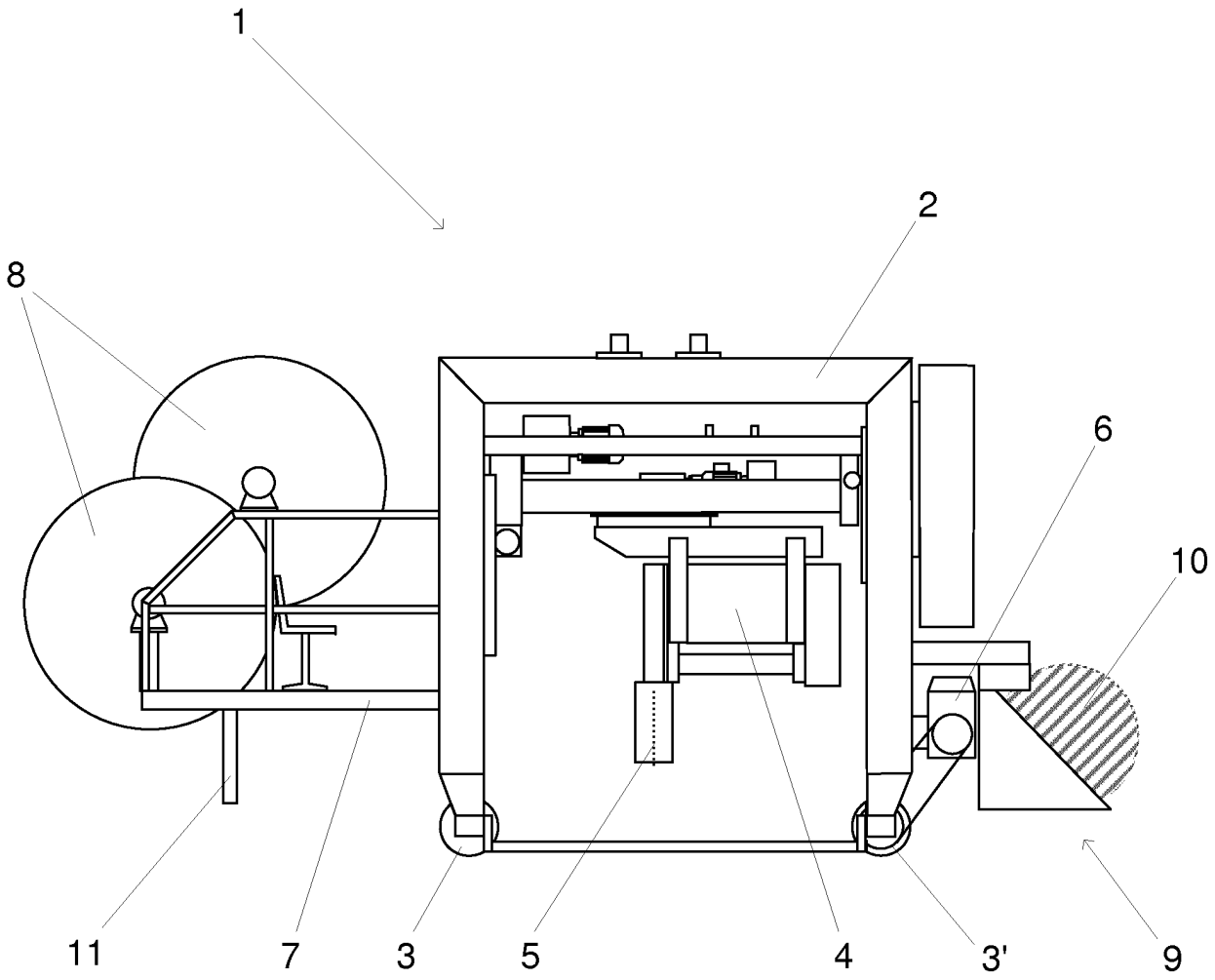

FIG. 1

REFERENCES CITED IN THE DESCRIPTION

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