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(54) **EQUIPMENT FOR HEMP FIBER PROCESSING**

(57) The invention relates to a mobile equipment with electromechanical drive intended for processing hemp stalks, from experimental plots, for fibre.

The equipment for hemp fibre processing, according to the invention, consists of the support (1) constructed of assembled parts and having four wheels for movement (2), a handle (3) and two adjustable legs (4) for its positioning during work.

On the support (1) is mounted a stalk processing module (5) comprising a housing (6) with two rollers (7) and (8) for driving hemp stalks and two profiled blade rollers (9) and (10) that will defoliate the stalks introduced into the inlet only with the upper part of the stalk. Simultaneous drive of this set of rollers is done by an electric motor (11) and a V-belt drive (12), the electric motor is controlled by means of a frequency converter mounted in the electrical control panel (13). The two rollers (7) and (8), having on the outer surface a jacket (14), will drive the hemp stalks and are positioned by means of fixed bearings (15) and two adjustable bearings (16) which are actuated by two adjustable springs (17) and two threaded rods (18).

The rollers (7) and (8) are driven together by two cylindrical pulley wheels (19) and (20) and the rollers (9) and (10) are driven together by two cylindrical pulley wheels (21) and (22) and between the two pairs of rollers the Gall chain drive (23) is used. The blade rollers (9) and (10) which are used to remove the leaves from the stalks are constructed of a single body (24) provided with

special grooves (25) in which the profiled blades (26) are positioned by means of wedges (27) and screws (28).

On the same support and in the immediate vicinity of the defoliation roller housing (6) is mounted a housing (29) with six rollers (30) which hull the hemp stalks to obtain fibre. These rollers are simultaneously driven by a coaxial gear motor (31) and a Gall chain drive (32). In this processing block, the woody part of the stalks is fragmented and the hemp fibre is partially separated.

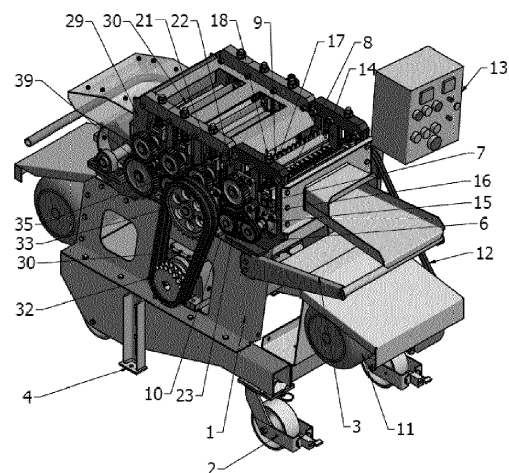


Fig.1

Description

[0001] The invention relates to a mobile equipment with electromechanical drive intended for processing hemp stalks, from experimental plots, for fibre.

[0002] In the present state of the art, it is known the patent document EP2018447A1 (A4, B1) which presents an apparatus for processing at least one plant stalk, having a fibrous outer part (fibre) and an inner section (hurds), the apparatus comprising: one or more toothed rollers and a bending element, in which the toothed roller has one or more teeth on the outside, each tooth comprising a guide part and a transport part, wherein the guide part extends over a smaller portion than the transport one so that on contact of the stalk with the bending element, the fibrous part is divided and the woody inner part is substantially separated from the fibrous outer part.

[0003] Patent document US 2018103591 A1 is also known, which relates to systems for processing fibrous crops in bales, such as hemp, and especially to systems that extract the stalks from their initial baled state, separate the outer fibres from the core of the stalks and remove the core residues from separate fibres.

[0004] Patent document WO 2016179681 is also known, which relates to the processing of baled material including a bale opening step, a hulling step and a separation step. The bale opener has a conveyor that moves the bales from the entrance to a toothed extractor, with a series of teeth driven on a revolution path moving upwards, passing the adjacent end of the conveyor to rake the bale and extract the material from it. The conveyor tilts upwards, reducing the working angle between the conveyor and the toothed extractor, to direct the bale of hemp towards the moving teeth. A separating stage has several sets of vertically mounted rollers, with different characteristics from one set to another. A huller has an outer housing, an inner rotating drum, supported in the casing and a series of teeth on the drum. The driven rotation of the inner drum rotates the fibrous stalks around the inner drum and leads the fibrous stalks to the inner surfaces of the outer housing walls.

[0005] Disadvantages of the known solutions consist in the following:

- the equipment presented has a complex construction which is not justified as investment for the processing of hemp stalks from experimental plots;
- low degree of manoeuvrability and adjustments for small batches of products;
- high energy consumption for driving the equipment;
- the equipment does not allow the processing of freshly harvested hemp stalks with leaves.

[0006] **Technical problem** solved by the invention consists in the realization of a mobile equipment with electromechanical drive that allows the flexible processing of freshly harvested hemp fibres with leaves by defoliating (breaking off) the leaves from the stalks before

they enter the technological process of fibre processing.

[0007] The equipment, **according to the invention**, consists of a mobile support on four wheels that can be locked by means of two adjustable systems that are attached to the floor. On this mobile support is mounted a housing with two rollers for driving the hemp stalks and two profiled blade rollers that will defoliate the stalks introduced into the inlet only with the upper part of the stalk. Simultaneous drive of this set of rollers is done by an electric motor controlled by means of a frequency converter and a V-belt drive. On the same support and in the immediate vicinity of the support with rollers for defoliation is mounted a housing with 4 or 6 rollers that hulls the hemp stalks to obtain fibre. These rollers are simultaneously driven by a coaxial gear motor and a Gall chain drive. In this processing block, the woody part of the stalks is fragmented and the hemp fibre is partially separated. For the final cleaning of the fibre, the processed material reaches the surface of a rotating drum with wooden rods that drive the stalks and they come into contact with the top cover on which is mounted another set of wooden rods for cleaning woody pieces also from the upper surface of fibres. This cleaning drum is driven by an electric motor controlled by a frequency converter.

[0008] The equipment for hemp fiber processing, according to the invention, has the following advantages:

- the main advantage is the increase of the degree of manoeuvrability and adjustments depending on the variety and size of the hemp stalks;
- has an autonomous operating system and allows the separate adjustment of the three technological sections with specific equipment for each technological operation;
- allows the use for small batches of products with different technical characteristics;
- allows easy access to working rollers but is also protected by guards in areas with rotating kinematic parts;
- easy transport of the equipment in the work area.

[0009] An embodiment of the invention is shown in connection with Fig. 1-7 which represent:

- Fig.1 - Equipment for hemp fiber processing - main view;
- Fig.2 - Equipment for hemp fiber processing - rear view;
- Fig.3 - Stalk processing module- main view;
- Fig.4 - Stalk processing module - rear view;
- Fig.5 - Module for removing leaves from hemp stalks - main view;
- Fig.6 - Module for removing leaves from hemp stalks - rear view;
- Fig.7 - Construction of the roller for removing hemp leaves.

[0010] The equipment for hemp fiber processing, ac-

cording to the invention, consists of the support (1) constructed of assembled parts and having four wheels for movement (2), a handle (3) and two adjustable legs (4) for its positioning during work.

[0011] On the support (1) is mounted a stalk processing module (5) comprising a housing (6) with two rollers (7) and (8) for driving hemp stalks and two profiled blade rollers (9) and (10) that will defoliate the stalks introduced into the inlet only with the upper part of the stalk. Simultaneous drive of this set of rollers is done by an electric motor (11) and a V-belt drive (12), the electric motor is controlled by means of a frequency converter mounted in the electrical control panel (13). The two rollers (7) and (8) have on the outer surface a jacket (14) which will drive the hemp stalks and are positioned by means of fixed bearings (15) and two adjustable bearings (16) which are actuated by two adjustable springs (17) and two threaded rods (18).

[0012] The rollers (7) and (8) are driven together by two cylindrical pulley wheels (19) and (20) and the rollers (9) and (10) are driven together by two cylindrical pulley wheels (21) and (22) and between the two pairs of rollers the Gall chain drive (23) is used. The blade rollers (9) and (10) which are used to remove the leaves from the stalks are constructed of a single body (24) provided with special grooves (25) in which the profiled blades (26) are positioned by means of wedges (27) and screws (28).

[0013] On the same support and in the immediate vicinity of the defoliation roller housing (6) is mounted a housing (29) with six rollers (30) which hull the hemp stalks to obtain fibre. These rollers are simultaneously driven by a coaxial gear motor (31) and a Gall chain drive (32). In this processing block, the woody part of the stalks is fragmented and the hemp fibre is partially separated. It was found experimentally that a number of six rollers with different numbers of profiles and different heights, allow to obtain an optimal fragmentation of the hemp stalks and to increase the efficiency of the fibre hulling technology.

[0014] Each pair of two rollers is mounted by means of two fixed bearings (33) and (34) and two adjustable bearings (35) and (36) which are adjusted by means of threaded rods (37) and helical springs (38). A pair of cylindrical pulley wheels (39) is mounted on the ends of each pair of rollers (30) to synchronize the rotational movement between the rollers and to transmit the rotational movement from one set of rollers to another using a V-belt drive (40). An adjustable roller tensioner (41) is used to tension the belts. The angular velocities of the three sets of rollers are correlated by the appropriate sizing of the pulley wheels for V-belts so that the angular velocity increases by a predetermined value from one set of rollers to the next. The coaxial gear motor is also controlled by the electrical panel (13) which ensures the simultaneous control of the three electric motors that serve this equipment. Hulling rollers are made either monobloc with the active working part made by milling the teeth, with teeth welded in grooves or with removable

teeth.

[0015] A specific module ensures the final cleaning of the fibre, so that the processed material reaches the surface of a rotating drum (42) with wooden rods (43) that drive the stalks and they come into contact with the top cover (44) on which is mounted another set of wooden rods (45) for cleaning woody pieces also from the upper surface of fibres. This cleaning drum is driven by an electric motor (46) controlled by a frequency converter located in the control panel (13). The processed fibre is collected on the adjustable support (47).

Claims

1. Equipment for hemp fiber processing , consisting of a mobile support (1) on four wheels for movement (2), a handle (3) and two adjustable legs (4) for its positioning during work, **characterized by the fact that**, is made of a stalk processing module (5) which performs in a first stage hemp stalk driving through a housing (6) with two rollers (7) and (8) driven together by two cylindrical pulley wheels (19) and (20), having on the outer surface a jacket (14), in a second stage leaf removing from the stalks in specific module provided with two rollers (9) and (10), simultaneous drive of this set of rollers being done by an electric motor (11) and a V-belt drive (12), the Gall chain drive being used between the two pairs of rollers (23), in a third stage hemp stalk hulling to obtain fibre, made by a housing (29) with six rollers (30), simultaneously driven by a coaxial gear motor (31) and a Gall chain drive (32), the woody part of the stalks being fragmented and the hemp fibre being partially separated, while the angular velocities of the three sets of rollers are correlated by the appropriate sizing of the pulley wheels for V-belts so that the angular velocity increases by a predetermined value from one set of rollers to the next, and respectively the final cleaning of the processed material within a specific module.
2. Equipment for hemp fiber processing , according to claim 1, **characterized by the fact that**, the module for leaf removing from the stalks includes two profiled blade rollers (9) and (10), driven together by two cylindrical pulley wheels (21) and (22), will defoliate the stalks introduced into the inlet only with the upper part of the stalk, simultaneous drive of this set of rollers being done by an electric motor (11) and a V-belt drive (12), the electric motor being controlled by means of a frequency converter mounted in the electrical control panel (13).
3. Equipment for hemp fiber processing , according to claim 1 and 2, **characterized by the fact that**, the set of blade rollers (9) and (10) made of a single body (24) provided with special grooves (25) in which the

profiled blades (26) are positioned by means of wedges (27) and screws (28).

4. Equipment for hemp fiber processing , according to claim 1, **characterized by the fact that**, in the module for the final cleaning of the fibre, the processed material reaches the surface of a rotating drum (42) with wooden rods (43) that drive the stalks and they come into contact with the top cover (44) on which is mounted another set of wooden rods (45) for cleaning woody pieces also from the upper surface of fibres, this cleaning drum being driven by an electric motor (46) controlled by a frequency converter located in the control panel (13).

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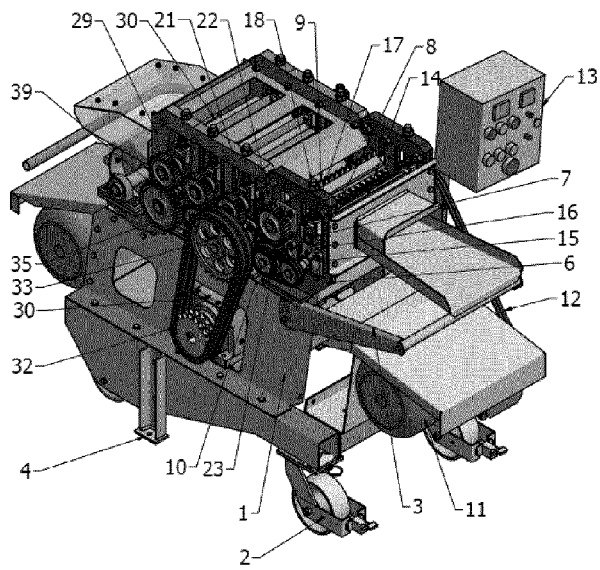


Fig. 1

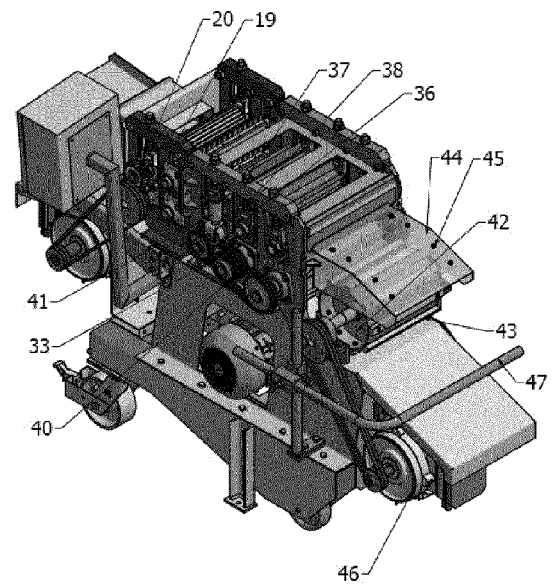


Fig. 2

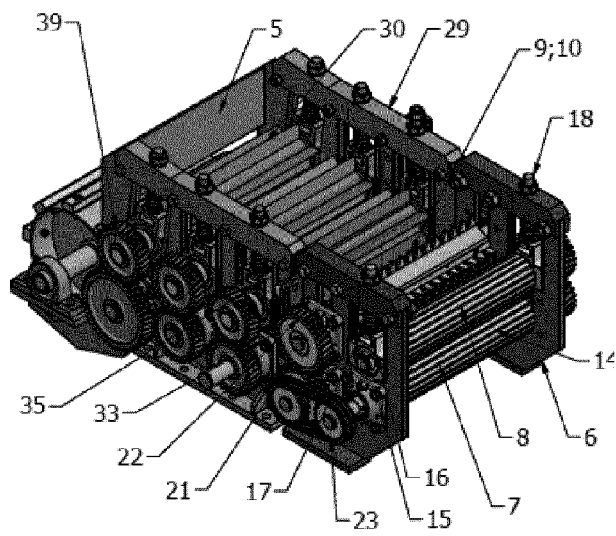


Fig. 3

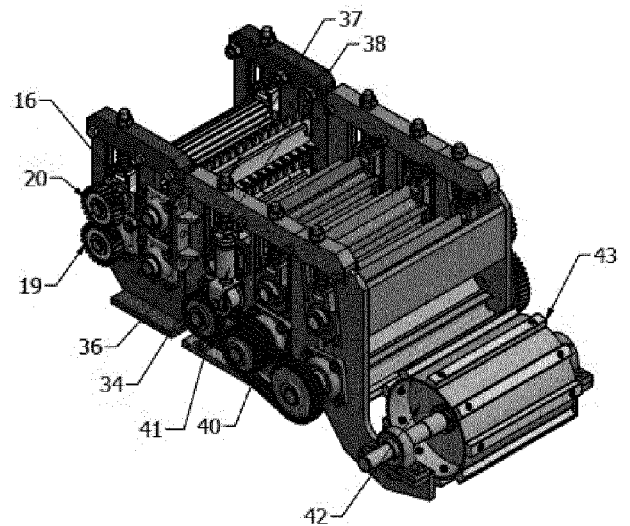


Fig. 4

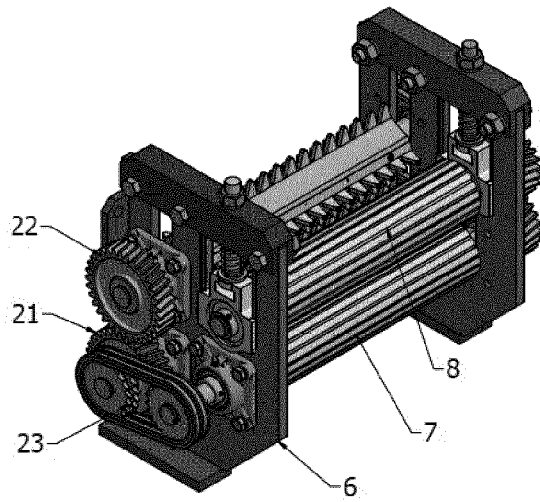


Fig.5

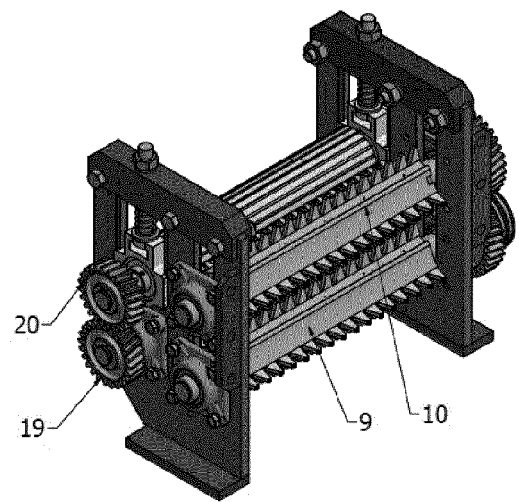


Fig.6

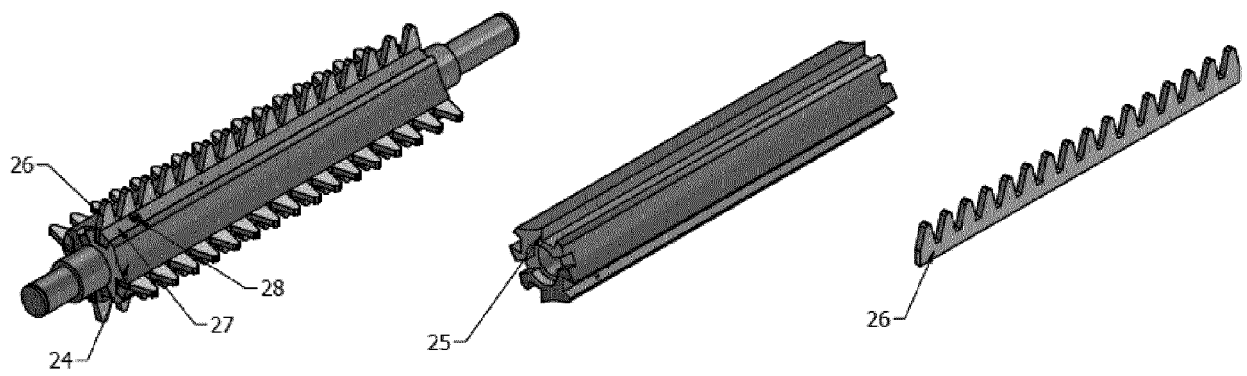


Fig.7



EUROPEAN SEARCH REPORT

Application Number

EP 22 02 0336

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EPO FORM 1503 03.82 (P04C01)

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Place of search Munich		Date of completion of the search 6 December 2022	Examiner Todarello, Giovanni
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ON EUROPEAN PATENT APPLICATION NO.**

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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