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(54) Vacuum packaging machine

(57) A vacuum packing machine provided with two circular conveyors situated in parallel planes above each other and spaced from each other wherein the lower conveyor (1) is longer than the upper one and caries means for receiving packing opened upwardly and spaced at regular intervals from each other, while the upper conveyor (2) is shorter in length and both conveyors (1,2) have sectors identical as to their geometry and character of their motion, whereby the upper conveyor (2) carries individual vacuum devices spaced at regular intervals from each other, which intervals are the same as the intervals between the means for receiving of the packing and a rotary distributor of a vacuum system, and the machine is also provided with a packing bag welding unit where the essential features of the machine are that the means for receiving of the packing consist of exchangeable forming pockets (3), the vacuum device includes vacuum heads (6) connected to a rotary distributor of the vacuum system consisting of an exchangeable revolving distribution head (7) and the welding unit comprises a welding station (5) located at the end portion of the track of a common geometric motion of both conveyors (1,2).

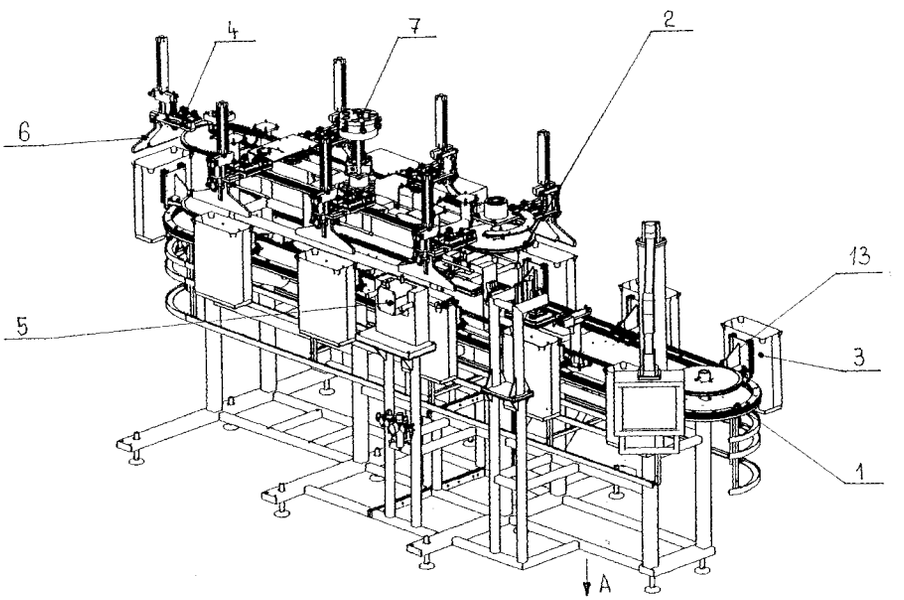

Fig.1

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Description

Field of the invention

[0001] The invention relates to a vacuum packing machine using vacuum packing means preferably bags that are filled by various materials and subsequently vacuumed to a high degree of vacuum. The packing machine is provided with two circular conveyors situated in parallel planes above each other and spaced from each other wherein the lower conveyor is longer than the upper one and caries means for receiving of packing opened upwardly and spaced at regular intervals from each other, while the upper conveyor is shorter in length and both conveyors have sectors identical as to their geometry and character of their motion, whereby the upper conveyor carries individual vacuum devices spaced at regular intervals from each other, which intervals are the same as the intervals between the means for receiving of the packing and further a rotary distributor of a vacuum system, and the machine is also provided with a packing welding unit.

Description of prior art

[0002] The current vacuum packing machines operates on two basic principles. The first principle consists in clasping the upper portion of a packing bag by special vacuum creation jaws that seals the space around the upper open end of the bag. Subsequently, the inner space of the jaws and consequently the inner space of the bag are vacuumed. After reaching the degree of vacuum required the bag is closed by welding jaws in the area below the vacuum jaws. The vacuum creation process continues also during the bag welding process. In this way certain degree of vacuum but not a high vacuum degree inside the bag may be achieved within a relatively favorable and short time. The higher degree of vacuum is required the longer time for reaching the desired value thereof is necessary, what is the cause for which this method of vacuum creation is not practicable.

[0003] According to a second method the vacuuming of a bag is carried out in divided vacuum chambers in which individual bags or groups of bags filled with an article are closed. After the bags are clasped in vacuum chambers the whole such closed inner space of chambers is vacuumed including the inner bag space up to the required vacuum degree. The chambers are provided inside by welding jaws that after reaching the required vacuum degree clasp the upper portion of the bag, and close it by welding. Thereafter, the vacuum chambers are opened and the vacuumed bags are placed outside the chamber space. In this way a desired high vacuum degree may be reached together with a higher machine output nevertheless such packing machine is complicated and subject to high production costs. Therefore this method is not suitable for vacuuming larger bags.

[0004] The CZ patent No. 279 055 discloses a packing machine for bag vacuuming or for packing under protective atmosphere. The main feature of the machine is a continuous conveyor track with a system of upper end opened, with closing means provided chambers into which individual bags are inserted. The chambers are moving step by step or continuously during the operation and are in certain part of the track closed from above by a system of sealing covers, in which welding jaws for welding the vacuumed bags are located. At the time the chambers are closed by covers the air is evacuated from the chamber inner space and also from the bags through the hoses that connect the chamber to a rotary vacuum distributor. Upon achieving the desired degree of vacuum the upper portions of bags are welded by the welding jaws and consequently hermetically closed. By means of another source also an inert gas may be supplied into the inner space of bags.

[0005] Another device for creation of vacuum in bags appears from EP patent No. 761 544, which device comprises a first movable exhausting tube with a lower end for insertion from above into the opened upper portion of a bag, a pair of clasping bars to close the bag tightly around said exhausting tube while the air is exhausted from the bags and means for welding the bag placed below the clasping bars and under the lower end of the first exhausting tube in its extending position. The essential features of the device are that it contains a second exhausting tube disposed within the first exhausting tube along its axis and movable between its extending position when it projects downwardly from the first tube and its retracted position when positioned inside the first tube, whereby both tubes have extremely flat shape with a wider front and back wall and the clasping bars are situated in parallel to the wider walls of the first exhausting tube. The second exhausting tube has grooves provided on the narrower side walls thereof extending over the whole width of said side walls and partially projecting into said front and back wall. In the operation cycle of the device first the upper portion of the bag is opened by means of opening suction heads in which the first exhausting tube is inserted to remain in the position in the area between the clasping forming bars. Thereafter, the opening suction heads are released and the upper portion of the bag is clasped by the clasping forming bars. In this way the bag is sealed and the second inner exhausting tube is inserted into its inner space. Thereafter the inner space of the bag is vacuumed to reach the predetermined degree of vacuum. After reaching the vacuum required the inner tube is again placed into its upper position. In this configuration the space for welding jaws becomes free and the jaws may clamp over the upper portion of the bag to weld it in the area below the forming bars. After the completion of the welding process the forming bars are opened and the outer exhausting tube moves out of the upper bag portions upwardly. According to this method it is difficult to reach a high degree of vacuum due to a complicated sealing of the

movable mechanisms of the outside and inside exhaustion tubes and due to a substantially long time that is necessary to reach a high degree of vacuum, which delay is caused by clasping the upper unfilled portion of the bag around the exhaustion tubes by the effect of the ambient atmospheric pressure. This principle is therefore unusable for vacuuming big bags.

[0006] The object of the present invention is to provide a packing machine designed to produce a high degree of vacuum inside the bags while adhering to the principles of simple construction that should enable quick machine adjustment when the size of packing is changed and to achieve a sufficient machine hourly efficiency.

Summary of the invention

[0007] The vacuum packing machine according to the invention is provided with two circular conveyors situated in parallel planes above each other and spaced from each other wherein the lower conveyor is longer than the upper one and caries means for receiving of packing opened upwardly and spaced at regular intervals from each other, while the upper conveyor is shorter in length and both conveyors have sectors identical as to their geometry and character of their motion, whereby the upper conveyor carries individual vacuum devices spaced at regular intervals from each other, which intervals are the same as the intervals between the means for receiving the packing and a rotary distributor of a vacuum system, and the machine is also provided with a packing bag welding unit wherein the essential features of the machine are that the means for receiving of the packing consist of exchangeable forming pockets, the vacuum device includes vacuum heads connected to a rotary distributor of the vacuum system consisting of an exchangeable revolving distribution head and the welding unit comprises a welding station located at the end portion of the track of a common geometric motion of both conveyors.

The forming pocket is of a square or oblong cross-section and is provided with a lower cover provided for lifting by a tilting and closing mechanism whereby the forming pocket is on it side adjacent to the lower conveyor provided by two vertically disposed guides adapted for insertion into a carriage bearer mounted on the lower conveyor.

The vacuum head is mounted on a carriage of the upper conveyor and comprises a pair of closing jaws for clamping the opened upper portion of the packing and having sealing surfaces on their inner walls the closing jaws being connected to a mechanism for closing and releasing the jaws, wherein between the jaws a vertically movable telescopic suction tube with a smooth outer surface and connected to mechanism for controlling the motion of the suction tube is provided.

[0008] The revolving distribution head comprises connections to several vacuum sources and further couplings of individual suction tubes for their connection to various vacuum sources.

[0009] In another embodiment of the invention the revolving distribution head may be provided by connections to a vacuum source and by a connection to a protecting gas atmosphere source.

[0010] The design of the packing machine and its individual parts according to the invention is simple what enables a quick adjustment of the machine, which is characterized by a great variability. The vacuum produced by the machine is high so that 90 % vacuum degree may be achieved by simple means and in a relatively short time. The machine represents an adjustable and exchangeable system adaptable to the size of bags to be packed and may operate in both the vacuum and the protection atmosphere regime. Several vacuum sources may be used so that for example a first air pump type may be used for production of a lower vacuum degree and a second air pump type for a high vacuum degree.

Brief description of the drawings

[0011] The invention is further described by way of examples and in more details with reference to the accompanying drawings where:

Fig. 1 - shows a perspective view of main parts of a packing machine according to the invention;
Fig. 2 - shows a forming pocket;
Fig. 3 - is a view of a vacuum head; and
Fig. 4 - is a view of a rotary distribution head.

Detailed description of embodiments of the invention

[0012] The vacuum packing machine according to the invention is composed of two main portions. A first portion of the packing machine is designed to hold and guide a pocket together with respective packing means, specifically in the form of a bag, and a second portion includes individual air exhausting devices and a rotary distributor of an air exhausting system. The bags are produced in a vertical packing device (not shown in the drawings) from which the bags with a folded bottom pass one after other inter forming pockets of the first portion of the machine. Thereafter, an article to be packed is weighed and dosed into the bags in usual manner. Subsequently, the vacuum is produced in the second portion of the machine over an exhausting tube, which is inserted inside the bag where the article is stored. The bag is then clasped at its upper opened portion by movable closing jaws provided by sealing surfaces so that the bag is hermetically closed and the vacuuming process may start. Upon completion of the vacuuming process the bag is closed by welding, a superfluous part of the bag sheet is cut off and finally the bag is closed by pressing against the upper surface of the bag a flap carrying a melting adhesive. At the machine outlet the completed bag is shifted to a removing trans-

porter that carries the bags away.

[0013] The substantial parts of the packing machine include two conveyor tracks of various lengths located in parallel planes above each other and spaced apart from each other so that the distances between the tracks complies with the size range of packing bags. Said conveyor tracks consist of a lower conveyor 1 and an upper conveyor 2. The lower conveyor 1 is greater in length and carries means for receiving bags, which means are opened upwardly and spaced in regular intervals from each other, while the upper conveyor 2 is shorter than the lower one and carries individual vacuum devices spaced in regular intervals from each other, which intervals are the same as the intervals between the bag receiving means on the lower conveyor 1 and further it carries a rotary distributor of a vacuum system. Certain parts of the conveyor track of both conveyors 1,2 are identical as to their geometry and character of their motion. Either conveyor track is operated by independent driving means and adapted to provide the same step by step motion in the area of the common geometric motion of both conveyor tracks. The conveyor tracks further carry special carriages that support certain parts of the packing machine as specified below.

[0014] The lower conveyor bears carriages 13 for exchangeable forming pockets 3 to receive individual bags. The forming pockets 3 are exchangeable and their size is dependent on the size of a bag to be vacuumed. Each forming pocket 3 is of a square or oblong cross-section and is provided with a lower tilting cover 9. When the cover is lifted the bag that has been vacuumed is free to move out of the forming pocket 3 downwardly in the direction of arrow A at the respective point of the track of the lower conveyor 1 to a removing conveyor (not shown in the drawings) for further processing. The forming pocket 3 is on its side adjacent to the lower conveyor 1 provided with vertical guides 8 for insertion into complementary members located on a bearer of the carriage 13 fixed to the lower conveyor 1. The cover 9 is operated by a closing mechanism 10 that includes in this embodiment of the invention a roller 11 and a spring 12.

[0015] The upper conveyor 2 is provided with carriages 4 each of which bears a vacuum head 6 connected to a respective vacuum system. The vacuum head 6 comprises an exhausting tube 16 having a smooth external surface, which tube is movable in a vertical direction by means of a mechanism 17 for insertion of the exhausting tube 16, in this embodiment having cylindrical shape, into the bag into the area where the article is stored and for subsequent retraction thereof from the bag. The vacuum head 6 is further provided with a pair of closing jaws 14 arranged along its wider front walls and provided with inner sealing surfaces for clasping the upper open portion of the bag so that the bag is hermetically closed (when the exhausting tube 16 is inserted into the bag in the area, where the article is stored at the starting stage of the common geometrical motion of both conveyor tracks) and the vacuum process may be initiated. The closing jaws 14 are operated for their clasping and releasing by a closing jaw mechanism 15 in this embodiment being of cylindrical shape. The exhausting tube 16 is connected to a rotary distribution head 7 of a vacuum system arranged in the area inside the upper conveyor 2, which head connects the exhausting tube 16 with various vacuum sources by means of a connection 20. The motion of the rotary distribution head 7 agrees with the common motion of both conveyor tracks so that between the starting stage and the final stage of the common motion of both conveyor tracks the desired degree of vacuum is attained.

[0016] In this embodiment of the invention the rotary distribution head 7 comprises two various vacuum sources coupled with the connections 18, 19, for example so that a primary vacuum pump as a first source of a lower degree of vacuum is coupled with the connection 18 and a secondary vacuum pump as a second source of a high decree of vacuum is coupled with the connection 19. In addition, the distribution head 7 is provided with individual connections 20 of said vacuum sources via the distribution chambers of the head 7 to the individual exhausting tubes 16. The distribution chamber of the distribution head 7 may be arranged so that various vacuum sources may be used as shown in this example. Nevertheless, also another distribution head 7 may be used having the chambers arranged in a fashion that several vacuum sources as well as a source of a gas may be used in the manner that first the air from the bag is exhausted and at the final stage of the operation the bag is filled up with a predetermined amount of another gas. The vacuuming of the inner bag space is executed in a conventional manner by means that are not shown in the drawings, for example through piping connecting individual vacuum heads 6 to the distribution head 7, to exhausting piping and vacuum pumps.

[0017] In the final part of the common geometric motion of both conveyor tracks a welding station 5 is situated, which, after the retracting of the exhausting tube 16 from the bag where the article is stored, welds the bag in the area below the tube 16. The upper superfluous portion of the bag is then cut off. This cut-off portion continues to be clasped by the closing jaws 14 of the vacuum head 6 and after opening thereof in the area outside the common motion trajectory of the forming pockets 3 and vacuum head 6 is thrown away into a waste disposing ditch.

Industrial applicability

[0018] The machine according to the present invention is applicable in the field of packing technology for vacuum packing specifically where bags and sacks for articles weighing 0.5 kg and more are used.

Claims

1. A vacuum packing machine provided with two circular conveyors situated in parallel planes above each other and spaced from each other wherein the lower conveyor (1) is longer than the upper one and caries means for receiving packing opened upwardly and spaced at regular intervals from each other, while the upper conveyor (2) is shorter in length and both conveyors (1,2) have sectors identical as to their geometry and character of their motion, whereby the upper conveyor (2) carries individual vacuum devices spaced at regular intervals from each other, which intervals are the same as the intervals between the means for receiving the packing and further a rotary distributor of a vacuum system, whereby the machine is also provided with a packing welding unit **characterized in that**
the means for receiving the packing consist of exchangeable forming pockets (3), the vacuum device includes vacuum heads (6) connected to a rotary distributor of the vacuum system consisting of an exchangeable revolving distribution head (7) and the welding unit comprises a welding station (5) located at the end portion of the track of a common geometric motion of both conveyors (1,2).

2. A vacuum packing machine of claim 1 **characterized in that** the forming pocket (3) is of a square or oblong cross-section and is provided with a lower cover (9) provided for lifting by a tilting and closing mechanism (10) whereby the forming pocket (3) is on it side adjacent to the lower conveyor (1) provided by two vertically disposed guides (8) adapted for insertion into a carriage bearer (13) mounted on the lower conveyor (1).

3. A vacuum packing machine of any of the preceding claims **characterized in that** the vacuum head (6) is mounted on a carriage (4) of the upper conveyor (2) and comprises a pair of closing jaws (14) for clamping the opened upper portion of the packing and having sealing surfaces on their inner walls the closing jaws (14) being connected to a mechanism (15) for closing and releasing the jaws (14), wherein between the jaws (14) a vertically movable telescopic suction tube (16) with a smooth outer surface and connected to mechanism (17) for controlling the motion of the suction tube (17) is provided.

4. A vacuum packing machine of any of the preceding claims **characterized in that** the revolving distribution head (7) comprises connections (18,19) to several vacuum sources and further couplings (20) of individual suction tubes (16) for their connection to various vacuum sources.

5. A vacuum packing machine of claims 1 to 3 **characterized in that** the revolving distribution head (7) is provided by the connections (18, 19) to a vacuum source and a connection to a protecting gas atmosphere source.

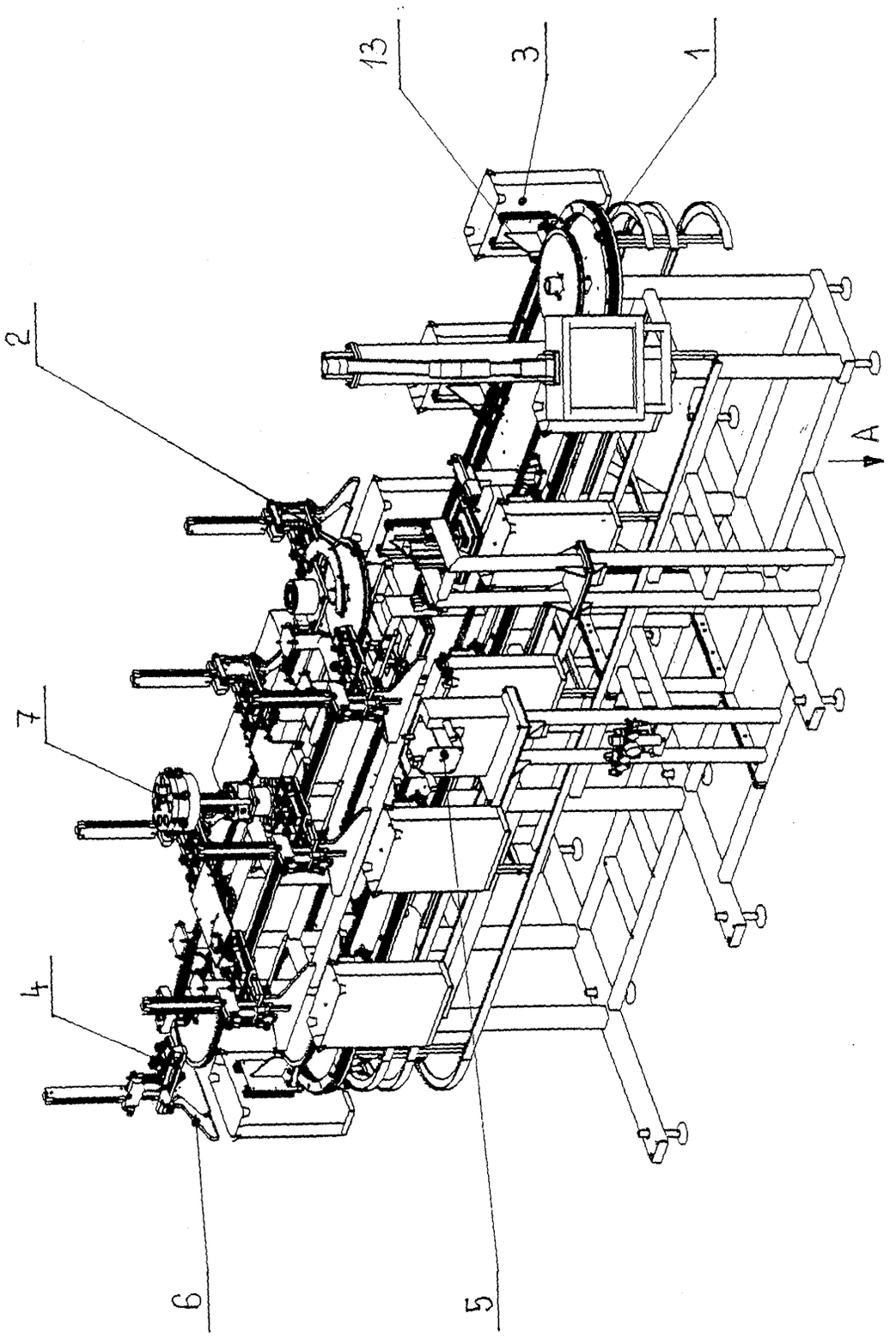

Fig.1

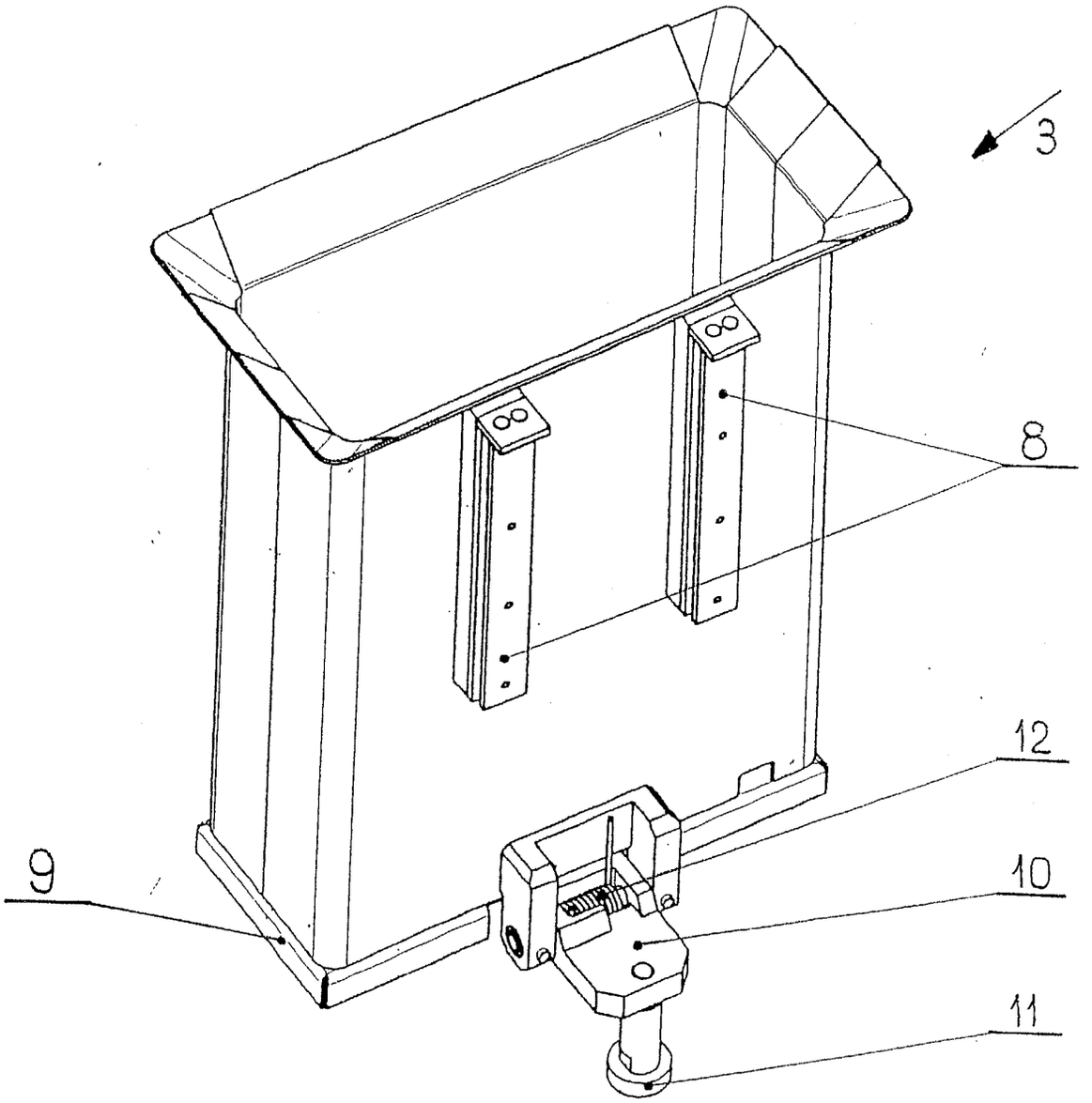

Fig. 2

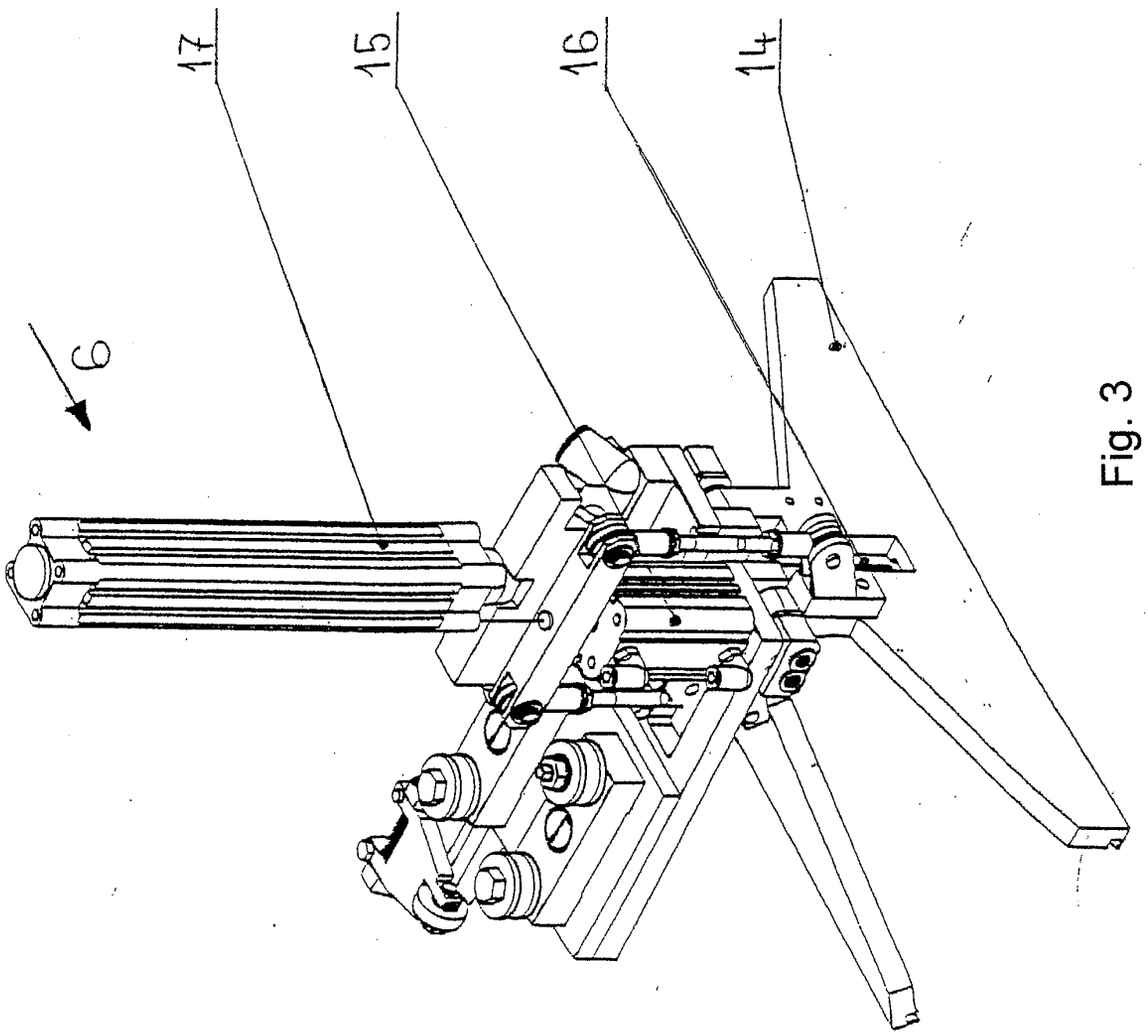

Fig. 3

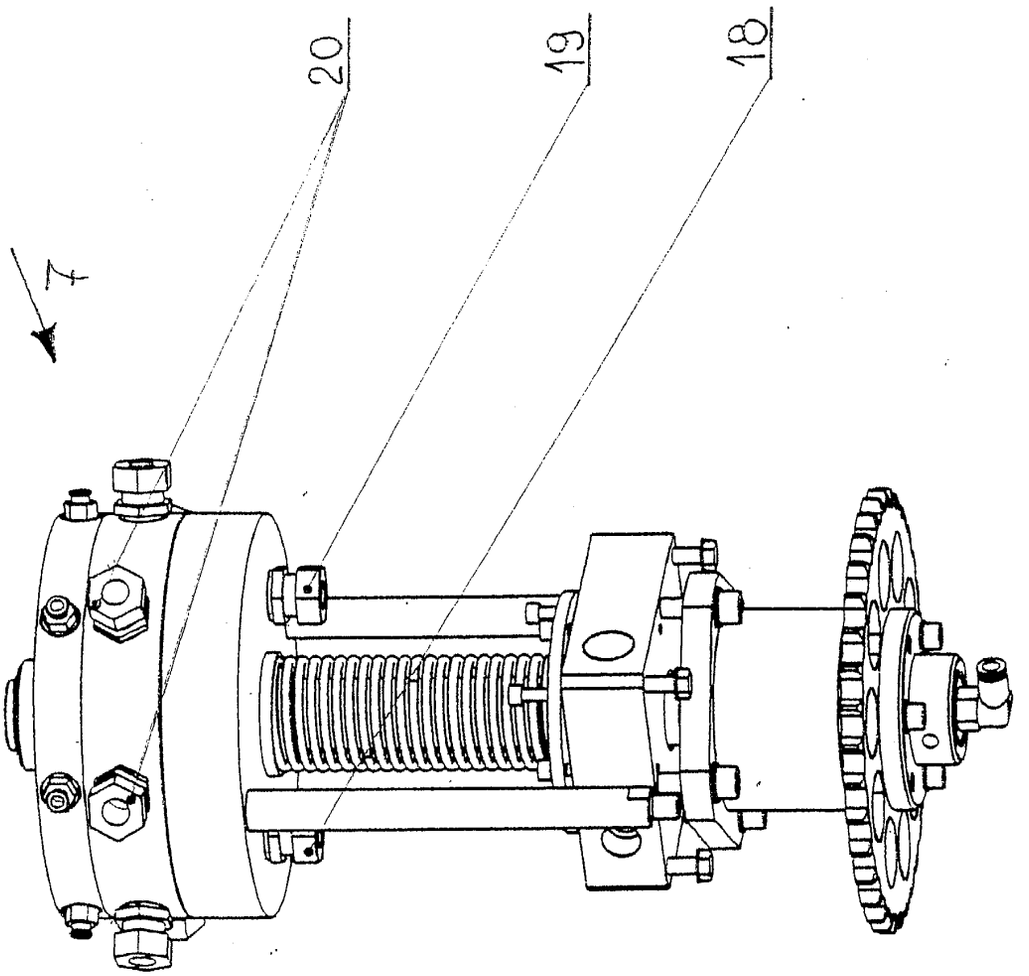

Fig.4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 46 6014

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	22 April 2004	Ungureanu, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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