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(71) Applicant (for all designated States except US): **BETA SYSTEMS SRL** [IT/IT]; Via Leonardo da Vinci, 31, I-33010 Reana del Rojale (IT).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **TABOGA, Ermanno** [IT/IT]; Via Avilla, 45, I-33030 Buia (IT).

(74) Agents: **PETRAZ, Gilberto** et al.; Glp Srl, Piazzale Cavedalis, 6/2, I-33100 Udine (IT).

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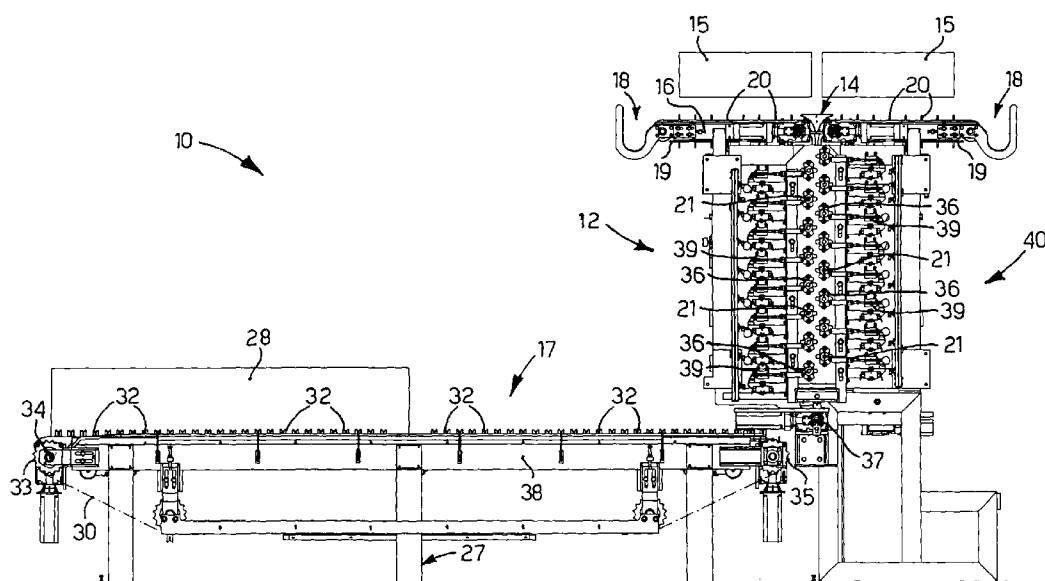
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(54) Title: ACCUMULATION AND FEED DEVICE FOR METAL BARS



(57) Abstract: Accumulation and feed device (10) for metal bars (11) able to be associated with an automatic machine (13) for working metal bars (11). The accumulation and feed device (10) comprises pick-up members (16) suitable to extract one or more metal bars (11) at a time from a shearing assembly (15) in which the metal bars (11) are pre-sheared to a desired size, and a translation assembly (40) comprising in turn at least a rack (12) disposed in an intermediate position between the shearing assembly (15) and the automatic machine (13), and provided with a plurality of retaining elements (21, 22) kinematically independent from each other and able to transfer on each occasion one or more metal bars (11) from the shearing assembly (15) towards the automatic machine (13), achieving a dynamic store for the accumulation of the metal bars (11).

WO 2007/110400 A1

"ACCUMULATION AND FEED DEVICE FOR METAL BARS"

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FIELD OF THE INVENTION

The present invention concerns an accumulation and feed
5 device for metal bars usable in association with
automatic machines, for example to make metal
reinforcement meshes. To be more exact, the invention
allows to create a dynamic accumulation store for a
plurality of metal bars so that they can be first
10 accumulated in a certain quantity and then can be fed to
the relative automatic machine, substantially eliminating
possible downtimes while waiting for loading, and
increasing the productivity of the machine itself.

BACKGROUND OF THE INVENTION

15 Automatic machines are known, which dispose and
reciprocally weld a plurality of transverse metal bars to
respective longitudinal metal bars, so as to form in
sequence, for example, metal reinforcement meshes, or
other type of product for the building trade.

20 In said automatic machines, while the transverse bars
are normally fed continuously from reels and sheared to
size immediately before welding, it is normally provided
that the longitudinal bars instead are sheared to size in
advance, and are picked up on each occasion, to be
25 disposed distanced from each other and sent
simultaneously to the automatic machine.

Example of known feeders for longitudinal bars in this
type of machines are disclosed in EP-A-1.110.642 and in
US-A-4.328.409.

30 However, the members that effect the shearing
operations and the distanced disposition of the
individual longitudinal bars very often have times and
operating frequencies that differ from those of the

- 2 -

automatic machine for which the longitudinal bars are intended.

This disadvantage entails, in a first step, keeping the automatic machine inactive at least for the time needed
5 to shear a sufficient number of bars and dispose them distanced, and, in a subsequent step, stopping the shearing members in order to allow the complete feed of the longitudinal bars to the automatic machine.

The alternate inactivity of the automatic machine and
10 the shearing members obviously entails a considerable reduction in productivity of the individual operating parts.

It is also known to provide accumulation devices, or stores, interposed between the shearing members and the
15 automatic machine, which normally provide one or more stores for the pre-sheared bars and a plurality of pick-up members, for example with a chain or screw, which pick up the pre-sheared bars from the store in an order constrained to their mechanical conformation, for example
20 according to the pitch of the chain or screw, in order to dispose them distanced on the feed plane of the machine.

However, known feed devices allow to actuate only a rigid pre-loading of the pre-sheared bars, that is, without being able to vary on each occasion their speed
25 and/or frequency of accumulation, and therefore, afterwards, of feed, in order to compensate for the possible differences in times and operating frequencies between the shearing members and the automatic machine, or the temporary lack of feed of the bars.

30 Moreover, known devices are conformed in a substantially specific manner according to the diameter of the bars fed, so that every time it is necessary to feed to the automatic machine a set of bars with

- 3 -

different diameters, burdensome steps are necessary in order to equip and prepare the device.

Purpose of the present invention is therefore to achieve an accumulation and feed device for metal bars that will allow to reduce to a minimum the waiting 5 downtimes and to feed the operating machine substantially without an interruption, irrespective of the differences in times and operating frequencies of the machine and the members that shear the bars, or the temporary 10 interruption of feed.

The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

15 SUMMARY OF THE INVENTION

The present invention is set forth and characterized in the main claim, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

20 In accordance with said purpose, an accumulation and feed device for metal bars according to the present invention is able to be associated with any automatic machine, for example of the type for making metal reinforcement meshes, and comprises at least pick-up 25 means suitable to extract one or more metal bars from a shearing assembly in which the metal bars are pre-sheared in length to a desired size.

According to one characteristic of the present invention, the device also comprises a translation 30 assembly provided with at least a rack disposed in an intermediate position between the shearing assembly and the automatic machine, and provided with a plurality of retaining elements kinematically independent of each

- 4 -

other and able to transfer on each occasion one or more metal bars from the shearing assembly to the automatic machine, in practice achieving an accumulation store of the dynamic type for the metal bars.

5 According to the present invention, the kinematic independence of the retaining elements of the rack allows to selectively vary, on each occasion and according to specific operating requirements, both the times and the frequency of displacement of the bars from the entrance
10 to the exit of the rack.

In fact, the retaining elements can move independently at different speeds and at different times so as to increase and/or reduce the speed of translation of the individual bars in the segment that goes from the
15 shearing assembly to the automatic machine, and can thus accumulation the bars so as to pre-form groups or sets formed by a desired number of said bars, according to the type of working to be done with the automatic machine, and hence to feed the latter substantially continuously.

20 In one form of embodiment, the translation assembly also comprises a transport plane disposed downstream of the rack and on which the metal bars exiting from the rack are disposed distanced, before they are definitively fed to the automatic machine.

25 According to a preferential form of embodiment, on the transport plane at least two independent series of positioning means are provided, which prepare the metal bars, distanced as desired, to be sent to the machine.

The presence of at least two series of positioning
30 means allows to prepare a first set of bars to be sent immediately to the machine and at least a second set of bars that will be prepared to be sent to the machine as soon as the first set of bars has been discharged.

- 5 -

In this way, it is possible to further free the times and operating frequencies of the automatic machine with respect to the times for picking up and preparing the bars.

5 Moreover, since the rack according to the invention is conformed to pre-form inside it desired sets of bars and to distribute them then on the transport plane on different positioning means, it is possible, although effecting a discontinuous removal of the bars from the
10 shearing assembly, to feed the bars substantially continuously to the machine.

 According to a preferential form of embodiment, the rack has a substantially vertical development and comprises a plurality of retaining shafts, disposed one
15 above the other, which are kinematically independent from each other and are substantially parallel to each other and disposed alternately off-set on two, substantially vertical parallel planes, so as to define two substantially vertical parallel rows. On every shaft a
20 plurality of supporting fins are provided, which depart radially from the shaft and define between them respective housing seatings for the metal bars. Advantageously, the seatings can accommodate bars substantially of any diameter.

25 This advantage allows to change the type of metal bars without needing to effect any specific equipping operation on the device.

 By inserting a first metal bar from above between the two rows of shafts, and parallel to them, the bar is
30 positioned in a relative housing seating of a first shaft, and thus rests on a respective supporting fin.

 By making the first shaft rotate by a determinate angle, the first bar is made to fall onto the supporting

- 6 -

fins of a second shaft below, and a new housing seating is presented, free to position a second bar on the fins of the first shaft. Then, by rotating the first and the second shaft in coordination, the first bar is made to
5 fall onto the fins of a third shaft and the second bar onto the fins of the second shaft, and so on until the fins of every shaft support a metal bar.

Advantageously, at the respective ends of each of the shafts independent stop assemblies are provided, for
10 example with a mechanical or fluid-dynamic brake, and independent rotation assemblies, so as to allow to coordinate the rotation of every individual shaft, and hence the fall of the bars from the fins of the shafts disposed relatively higher towards those of the shafts
15 relatively lower.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given
20 as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a schematic view of the lay-out of an automatic machine for making metal reinforcement meshes with which an accumulation and feed
25 device according to the present invention is associated;
- fig. 2 shows a lateral view of the accumulation and feed device in fig. 1;
- fig. 3 is a three-dimensional view of a first part of
30 the accumulation and feed device in fig. 1;
- fig. 4 is an enlarged view of a first face of the accumulation and feed device in fig. 1;
- fig. 5 is an enlarged view of a second face of the

- 7 -

accumulation and feed device in fig. 1;

- fig. 6 is a cross section from VI to VI of fig. 2;

- figs. 7, 8 and 9 are schematic views of some operating sequences of the accumulation and feed device in fig. 1.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

With reference to the attached drawings, an accumulation and feed device 10 according to the present invention is configured first to accumulate and then to feed a plurality of pre-sheared metal bars 11 to an automatic machine 13, only shown schematically in fig. 1, for example a machine to make metal reinforcement meshes 111 by means of welding bars 11, which in this case are longitudinal bars, to corresponding transverse bars 11a, or other analogous or comparable machine.

To be more exact, the accumulation and feed device 10 according to the invention is suitable to pick up the bars 11 directly from two shearing assemblies 15, able to shear the bars 11 to a pre-determined length, and to feed the sheared bars 11 to the automatic machine 13.

The device 10 comprises, from the top downwards (figs. 2 and 3), a pick-up member 16 disposed in cooperation with the shearing assemblies 15, and a translation assembly 40 which allows to transfer the sheared bars 11 from the shearing assemblies 15 to the automatic machine, at the same time achieving a dynamic accumulation and feed store.

In this case, the translation assembly 40 comprises a rack 12 having a substantially vertical development and inside which the pick-up member 16 deposits the bars 11 on each occasion exiting from the shearing assembly 15, and a supporting plane 17, substantially horizontal and provided with positioning means, in this case consisting

- 8 -

of two series of positioning chains 30, associated with a base 27.

The two shearing assemblies 15 are disposed above the pick-up member 16 of the rack 12, and are both of a substantially known type, and therefore will not be described in detail here.

The pick-up member 16 comprises a pair of pick-up chains 19, opposite and counter-rotating, which develop in a direction substantially transverse to the development of the bars 11.

Each pick-up chain 19 is disposed below a relative shearing assembly 15 and is provided with pick-up teeth 20 (figs. 4, 5 and 6), so as to take the bars 11 towards a central loading zone 14 of the rack 12, or towards respective lateral zones 18 to discard the bars 11.

Advantageously, the two shearing assemblies 15 alternately release the pre-sheared bars 11 onto the relative pick-up chains 19 so as to increase the frequency of feed of the rack 12 by the pick-up member 16.

In correspondence with the loading zone 14, on the length of the rack 12, there are a plurality of stabilizing supports 24 of the tilting type, which absorb possible vibrations and stresses of the bars 11 once they have been released by the pick-up member 16, and thus guarantee a correct positioning of the bars 11 in the subsequent operating steps.

The rack 12 in this case comprises a plurality of retaining shafts 21, mounted kinematically independent of each other.

To be more exact, the retaining shafts 21 are disposed substantially vertical and parallel with each other, and are positioned alternately off-set on two parallel

- 9 -

planes, so as to define two parallel and vertical rows of retaining shafts 21.

Each retaining shaft 21 comprises a plurality of star-shaped elements (fig. 6) disposed at pre-defined distances on its length, and each one having a plurality of supporting fins 23 which extend radially and define between them respective housing seatings 25. The supporting fins 23 and the housing seatings 25 have a size and conformation such as to allow to support and house at least a bar 11 substantially of any diameter whatsoever, for example comprised between about 4 mm and about 20 mm.

Each retaining shaft 21 also comprises at a first end (fig. 4) a relative stop flange 26 shaped according to the number of supporting fins 23 and housing seatings 25 of the star-shaped elements 22, and able to cooperate with a corresponding stop actuator 29, in this case of a pneumatic type, which is able to interfere transversely in a radial direction with the shaping of the stop flange 26, in order to normally prevent the rotation of the relative retaining shaft 21.

On the other end of each retaining shaft 21 (fig. 5) a relative rotation flange 36 is mounted, shaped in a substantially equivalent manner to the relative stop flange 26, but oriented angularly off-set by half a pitch with respect to the latter. Each rotation flange 36 cooperates with a relative rotation actuator 39, in this case pneumatic, moved vertically by a relative motor member 37, and able to interfere transversely both in a radial direction and also in a tangential direction, with the shaping of the rotation flange 36, in order to determine the rotation of the relative retaining shaft 21.

- 10 -

The rack 12 also comprises, below the retaining shafts 21, a plurality of translation screws 31, which are oriented transversely to the retaining shafts 21 and allow to translate the bars 11 released by the last retaining shaft 21 towards the supporting plane 17.

In this case, the supporting plane 17 comprises a bench 38 (figs. 1 and 2) on which the two series of positioning chains 30 are provided, in this case disposed substantially in pairs and oriented orthogonal to the development of the supporting plane 17, so as to form two sets of bars 11 positioned at the desired distance and substantially parallel to each other according to the design specifications of the metal mesh.

A plurality of relative blades 32, protruding from the supporting plane 17, are associated with the positioning chains 30 and determine the formation and movement of each set of bars 11 along the supporting plane 17.

Each series of positioning chains 30 is independently associated with respective toothed crowns, respectively driver 33 and driven 35, of a substantially known type and not described in detail here. Again in a substantially known manner, in order to coordinate the movement of the two series of positioning chains 30, each driver crown 33 is keyed to a relative drive shaft 34, in turn made to rotate by means of its own drive member.

The base 27 also supports, on the side of the automatic machine 13, a drawing assembly with rollers 28 which allows to send the made-up sets of bars 11 in sequence to the automatic machine 13, where they will be typically welded to the transverse bars 11a to form the desired metal reinforcement mesh 111.

The accumulation and feed device 10 as described heretofore functions as follows.

- 11 -

When it is necessary to feed to the automatic machine 13 a determinate number of bars 11 to form a metal mesh 111, the bars 11 are pre-sheared to size by the shearing assemblies 15 and loaded into the rack 12 by means of the pick-up chains 16, through the loading zone 14. The bars 11 thus fed are initially gripped by the stabilizing supports 24, after which the stabilizing supports 24 tilt to allow the bars 11 to fall between the two vertical rows of retaining shafts 21.

10 In this way, by inserting a first bar 11 between the two rows of shafts 21 and parallel thereto, the bar 11 is positioned in the housing seatings 25 of the star-shaped elements 22 of a first shaft 21, thus resting on the respective supporting fins 23.

15 After this positioning, and at pre-determined sequential times, the respective stop actuator 29 is de-constrained from the relative stop flange 26, and the corresponding rotation actuator 39 is driven, actuating a guided rotation of the first retaining shaft 21 for a determinate angle.

20 The longitudinal bar 11 is thus positioned on the supporting fins 23 of a second shaft 21, under the first and positioned on the adjacent row.

25 As a consequence of the guided rotation of the first retaining shaft 21 for a determinate angle, when the first bar 11 is resting on the supporting fins 23 of the second shaft 21, the first shaft 21 presents a new, free housing seating 25 to the loading zone 14, so as to position a second bar 11 on its supporting fin 23.

30 With the same sequence as that previously described, the stop actuators 29 of the first two retaining shafts 21 are de-constrained, and the relative rotation actuators 39 are coordinately driven, to allow the guided

- 12 -

rotation of both the first and also the second shaft 21, thus causing the first bar 11 to fall onto the supporting fins 23 of a third shaft 21, and the second bar 11 to fall onto the supporting fins of the second shaft 21.

5 These rotation and stop operations are selectively repeated on each occasion and independently for each specific retaining shaft 21, until the supporting fins 23 of each shaft 21 support a relative bar 11.

For example, as shown schematically in sequence in
10 figs. 7, 8 and 9, when it is necessary to feed to the automatic machine 13 a set consisting of six bars 11, and when there are initially present only two bars 11 on the last two shafts 21, the latter are kept angularly stationary, while the other shafts 21 of the rack 12 are
15 individually and selectively activated until the complete disposition is reached of the six bars 11 on the last six shafts 21 of the rack 12.

With the present invention it is therefore possible to selectively rotate only the retaining shafts 21 which are
20 actually necessary, so as to recoup possible deficiencies or equalize different operating times between the various mechanical members, until the rack 12 is filled as desired.

Once the desired filling of the rack 12 has been
25 achieved, a dynamic accumulation and feed store is defined, which allows to feed the supporting plane 17 substantially continuously and consequently the automatic machine 13 substantially without any break in continuity, irrespective of the speed of the pick-up member 16 and
30 the shearing frequency of the shearing members 15.

As soon as the last retaining shaft 21 releases the relative bar 11, the screw 31 transports said bar 11 onto a first blade 32 of a first positioning chain 30.

- 13 -

Advantageously, the screw 31 also heads the bars 11, in a substantially known manner.

The first chain 30 is then made to advance by one step, corresponding to the distance that has to exist between the bars 11, and the last retaining shaft 21 releases a
5 second bar 11, and so on until a set is formed, consisting of a desired number, in this case six, of bars 11.

The first chain 30 translates the set formed
10 orthogonally to the axis of the bars 11 towards the drawing assembly with rollers 28, and then, from here, to the automatic machine 13.

At the same time, the last retaining shaft 21 releases other bars 11 onto the second chain 30 so as to
15 constitute a second set, and hence define another dynamic store to feed the automatic machine 13.

This solution allows a greater independence between the movement of the pick-up member 16 and the movement of feed of the bars 11 to the machine 13.

20 It is clear however that modifications and/or additions of parts may be made to the accumulation and feed device 10 as described heretofore, without departing from the scope of the present invention.

For example, it comes within the scope of the present
25 invention to provide that instead of the two series of positioning chains 30 two or more series can be provided of any other known transport mechanism, such as for example a step-wise motion mechanism, with actuators, vibratory, cascade, or others, suitable to guarantee the
30 formation of different sets of bars 11.

In other equivalent solutions, instead of the pick-up chains 19, the pick-up member 16 may provide magnetic loaders, or grippers, a mechanical arm, rollers, or other

- 14 -

known type and suitable for the purpose.

It also comes within the scope of the present invention to provide that between the shearing assemblies 15 and the pick-up member 16 at least a store can be provided
5 for the pre-sheared bars 11.

According to another variant even more than two shearing assemblies 15 can be provided.

According to another variant, the translation assembly 40 can provide two or more racks 12 disposed on the same
10 side, or on opposite sides, with respect to the supporting plane 17.

It is also clear that, although the present invention has been described with reference to specific examples, a person of skill in the art shall certainly be able to
15 achieve many other equivalent forms of accumulation and feed device for metal bars, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

- 15 -

CLAIMS

1. Accumulation and feed device for metal bars (11) able to be associated with an automatic machine (13) for working said metal bars (11), said device comprising at least pick-up means (16) suitable to extract one or more metal bars (11) at a time from a shearing assembly (15) in which said metal bars (11) are pre-sheared to a desired size, characterized in that it also comprises a translation assembly (40) comprising in turn at least a rack (12) disposed in an intermediate position between said shearing assembly (15) and said automatic machine (13), and provided with a plurality of retaining elements (21, 22) kinematically independent from each other and able to transfer on each occasion one or more of said metal bars (11) from said shearing assembly (15) towards said automatic machine (13), achieving a dynamic store for the accumulation of said metal bars (11).

2. Device as in claim 1, characterized in that said translation assembly (40) also comprises a supporting plane (17) disposed downstream of said rack (12) and on which said metal bars (11) exiting from said rack (12) are disposed, before they are fed definitively to said automatic machine (13).

3. Device as in claim 1 or 2, characterized in that said retaining elements comprise a plurality of retaining shafts (21) kinematically independent of each other, disposed substantially parallel to each other and alternately off-set on two substantially vertical parallel planes, so as to define two distinct parallel rows, on each of said retaining shafts (21) a plurality of supporting fins (23) being provided, extending radially and defining between them respective housing seatings (25) for said metal bars (11).

- 16 -

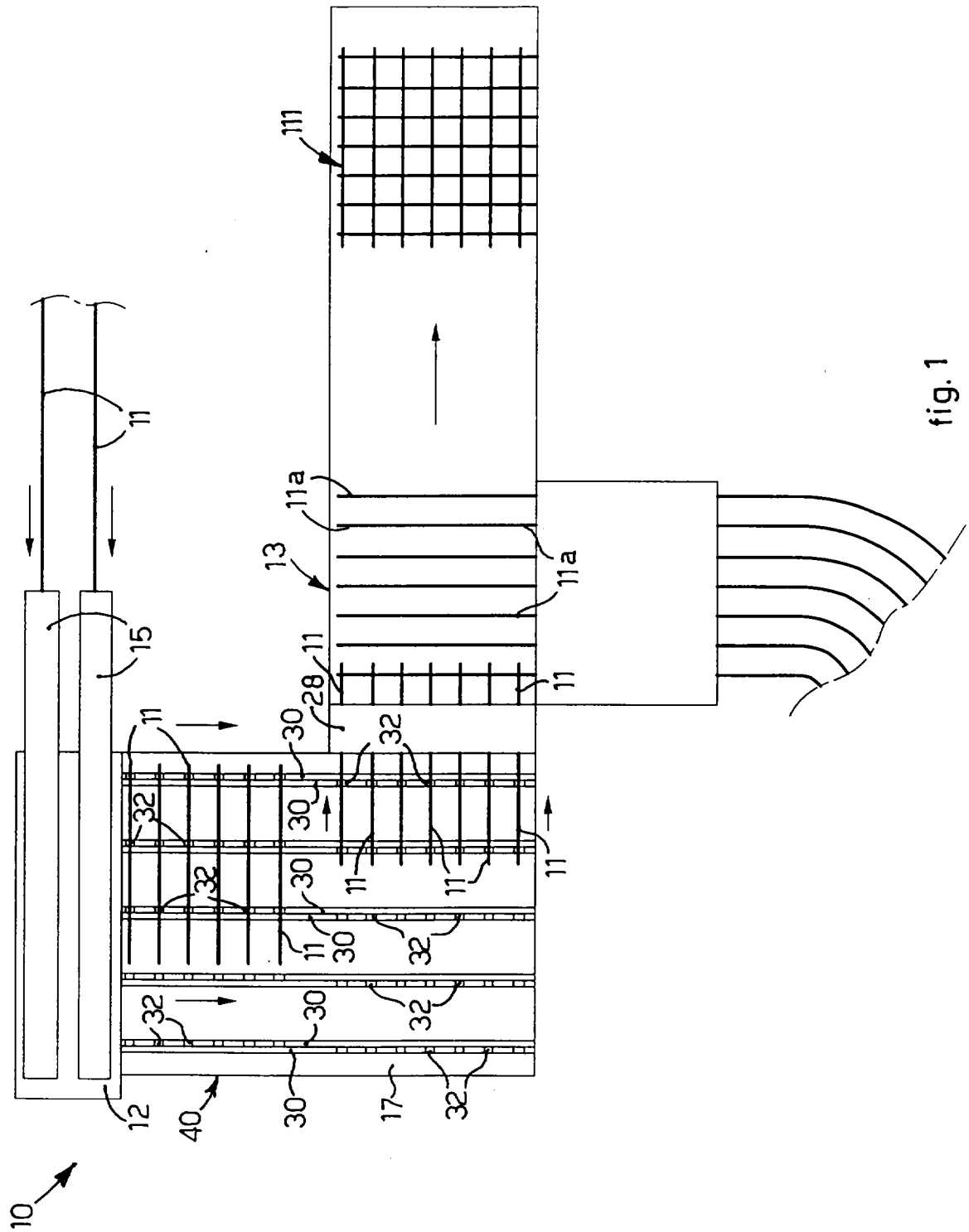
4. Device as in claim 3, characterized in that each of said retaining shafts (21) is associated at a first end with a stop assembly (26, 29) and at a second end with a rotation assembly (36, 39), able to cooperate
5 coordinately in order to condition the rotation of the relative retaining shaft (21) to a determinate frequency and for a determinate angle.
5. Device as in claim 4, characterized in that said stop assembly comprises at least a stop actuator (29) mounted
10 on said rack (12) and able to selectively interfere with a mating stop flange (26) mounted on the end of the relative retaining shaft (21).
6. Device as in claim 4, characterized in that said rotation assembly comprises at least a rotation actuator
15 (29) mounted on said rack (12) and able to selectively rotate a mating rotation flange (26) mounted on the end of the relative retaining shaft (21).
7. Device as in any claim from 2 to 6, characterized in that said supporting plane (17) comprises a base (27)
20 with which at least two independent series of positioning means (30) are associated, disposed in a direction substantially orthogonal to the development of said metal bars (11), and able to define relative sets of said metal bars (11) substantially parallel and distanced from each
25 other.
8. Device as in claim 7, characterized in that each of said series of positioning means comprises a plurality of chains (30).
9. Device as in any claim hereinbefore, characterized in
30 that said translation assembly (40) also comprises a plurality of stabilizing means (24) disposed immediately upstream of said retaining elements (21, 22) and able to absorb the possible vibrations and stresses of said metal

- 17 -

bars (11).

10. Device as in any claim from 2 to 9, characterized in that said translation assembly (40) also comprises screw means (31) oriented transversely to said metal bars (11) and able to head and to translate said metal bars (11) released by said retaining elements (21, 22) towards said supporting plane (17).

1/7



2/7

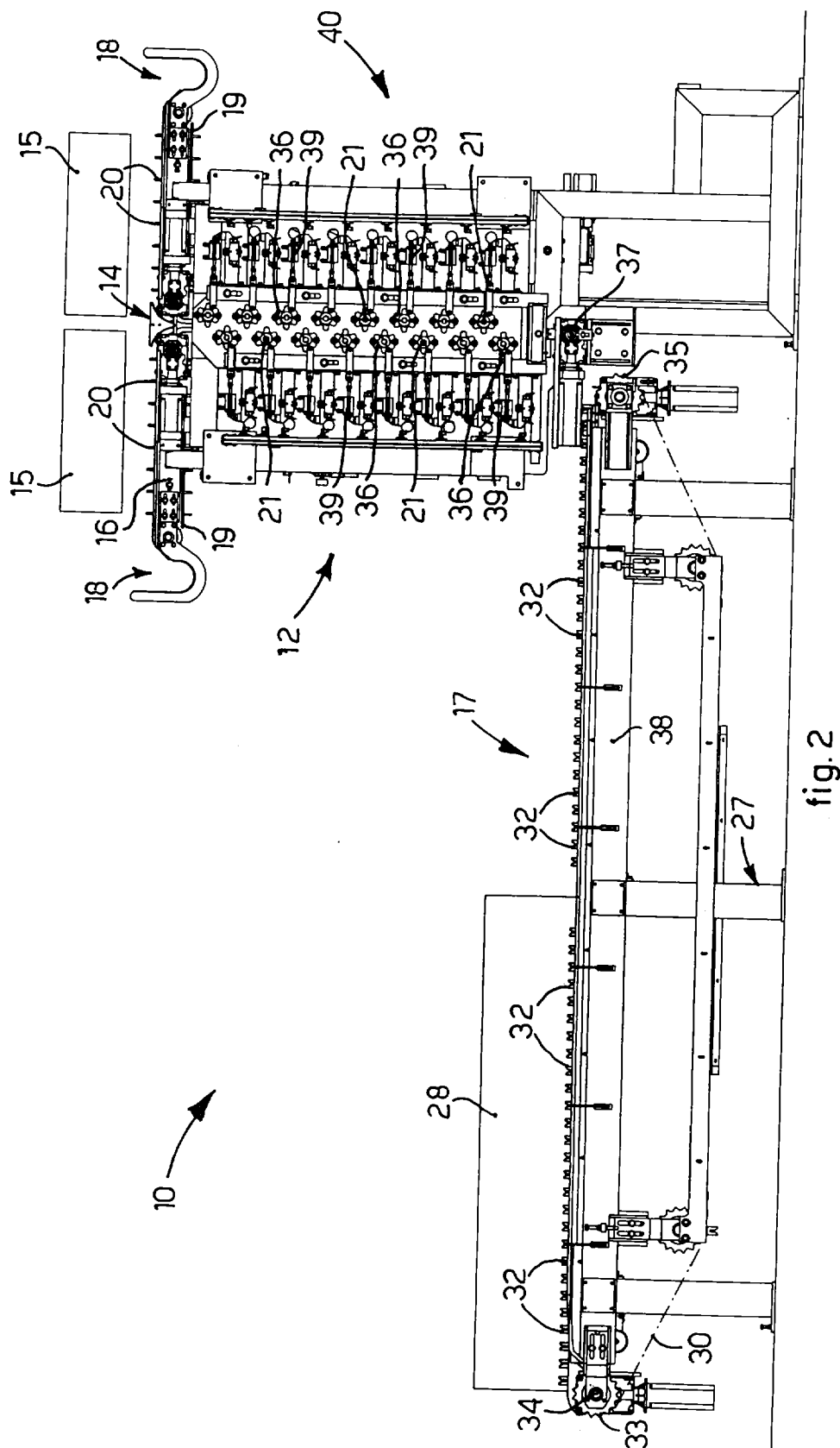


fig.2

3/7

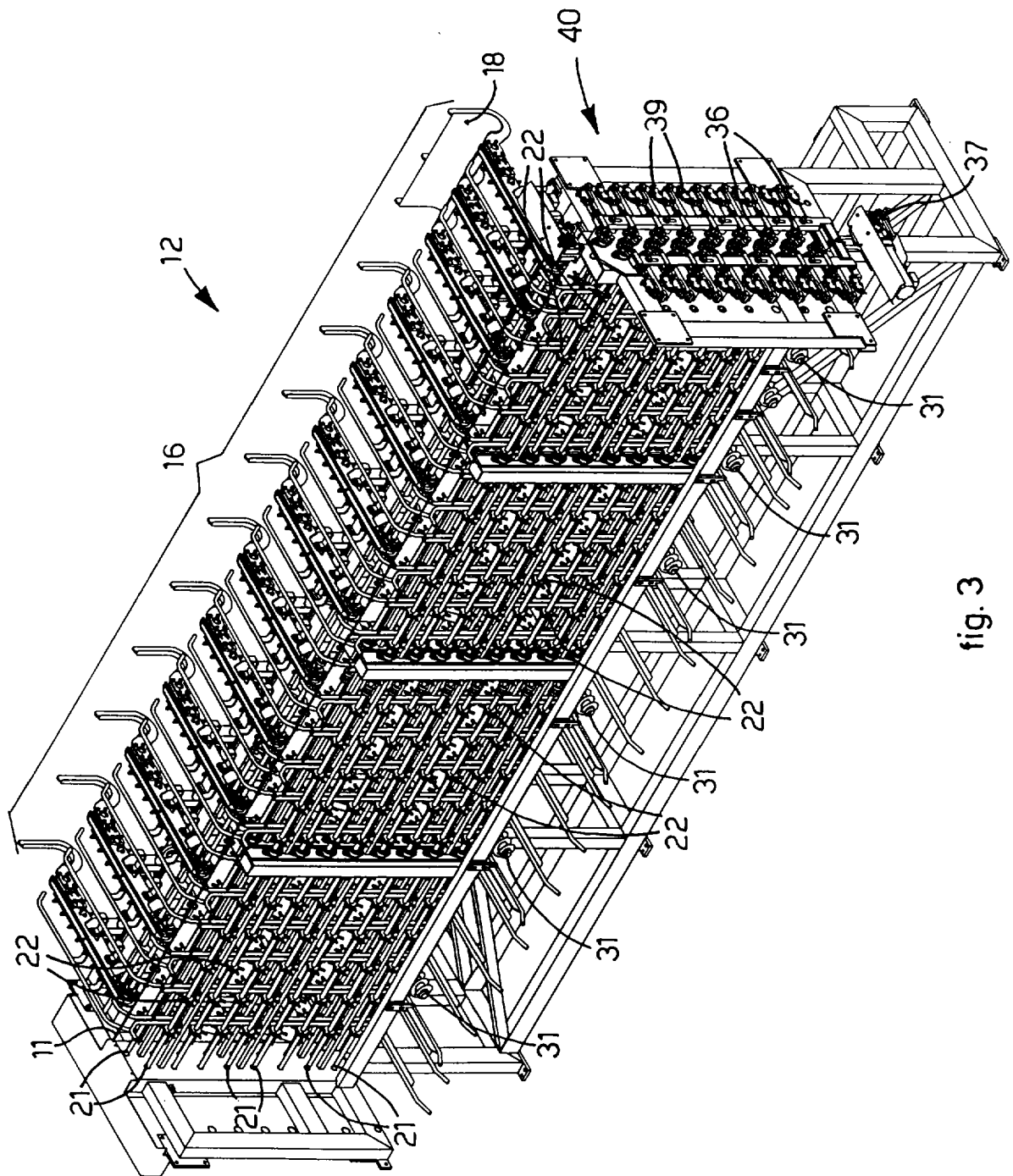


fig. 3

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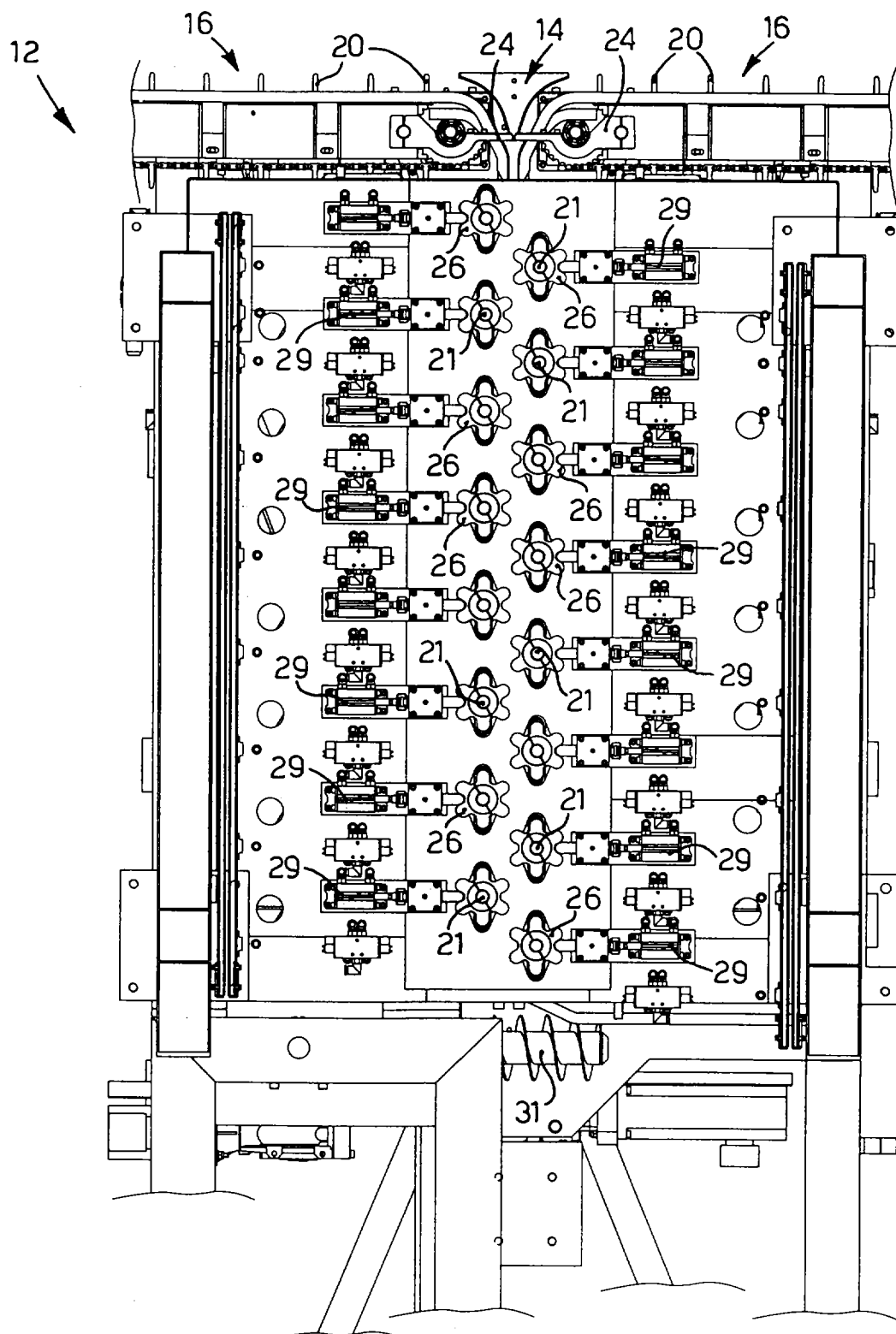


fig. 4

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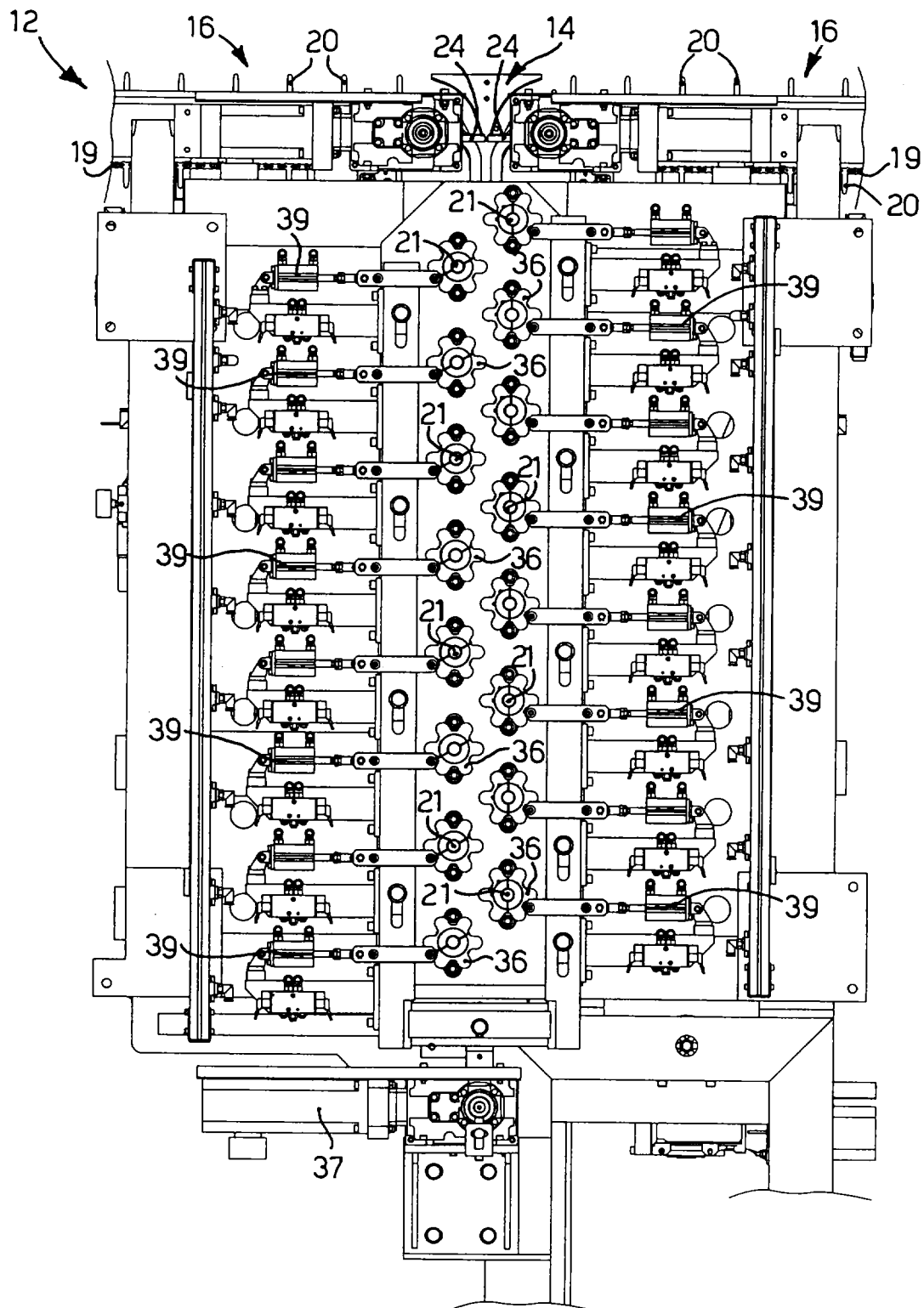


fig. 5

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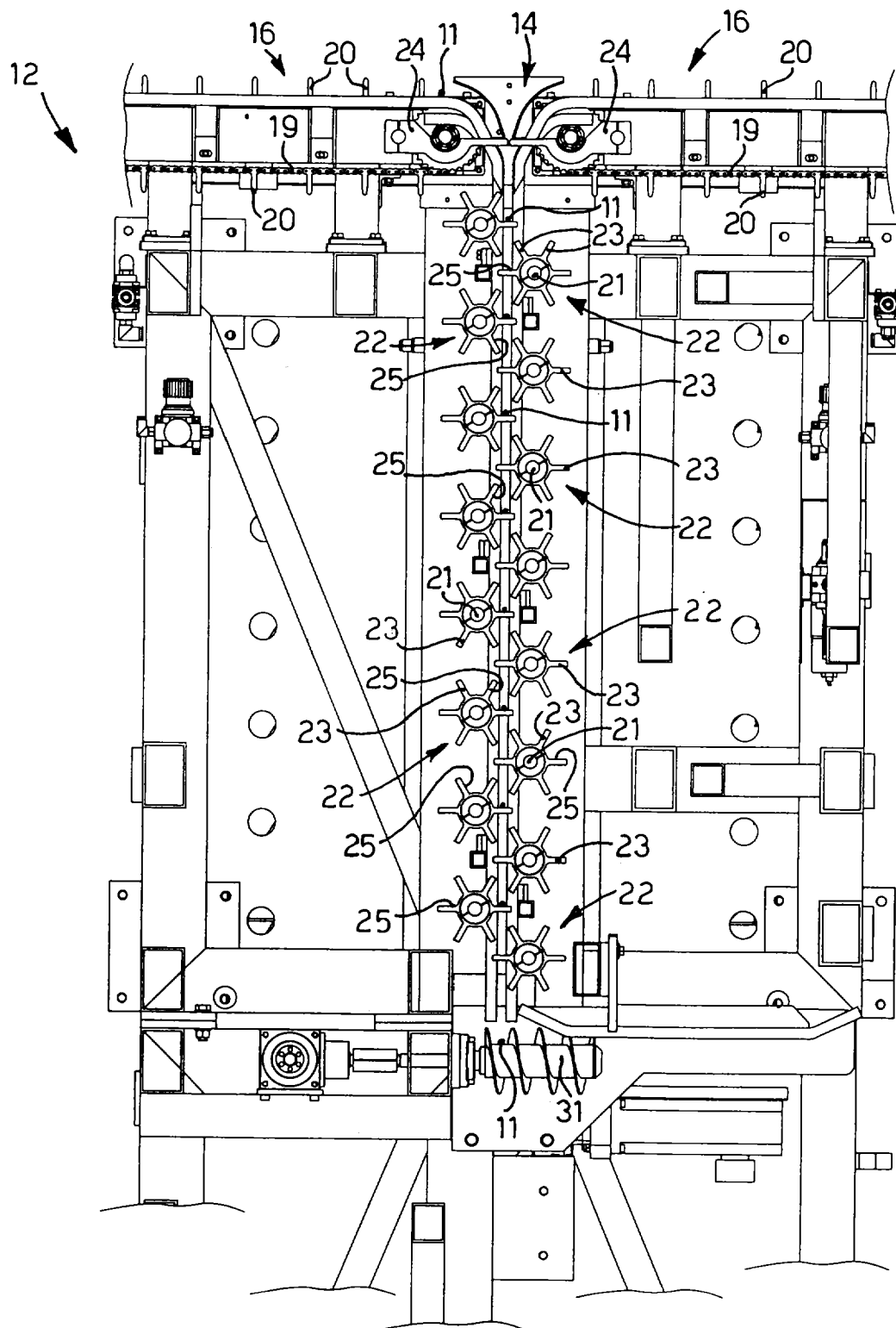


fig. 6

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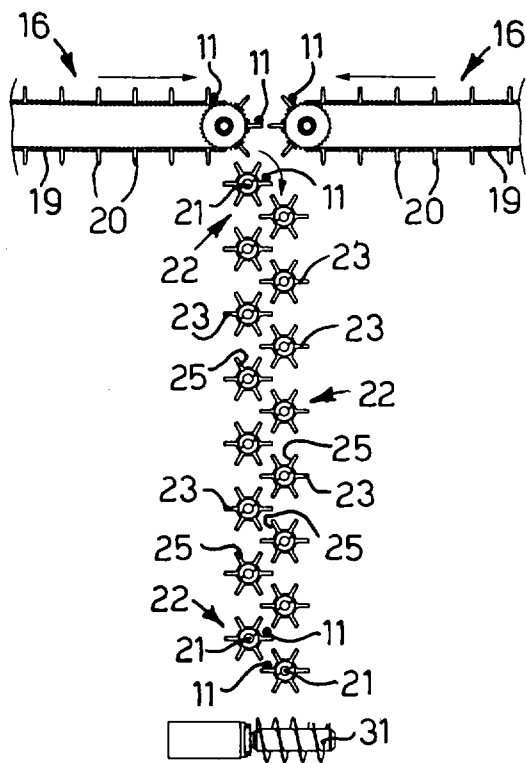


fig. 7

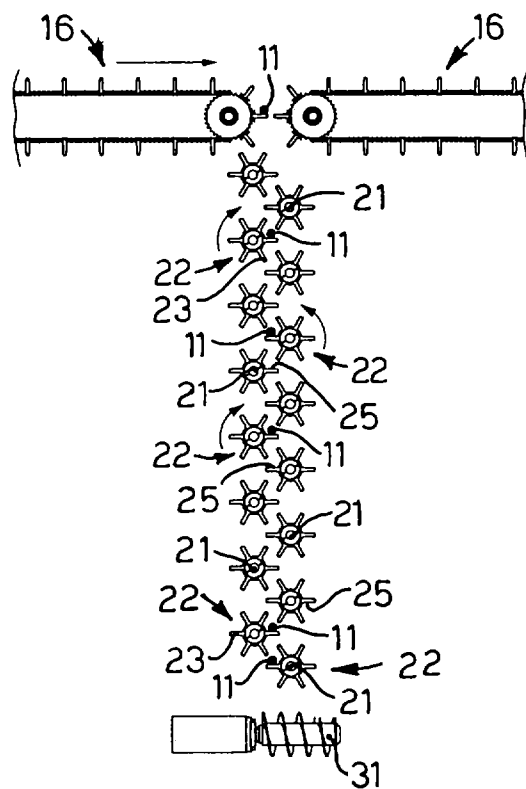


fig. 8

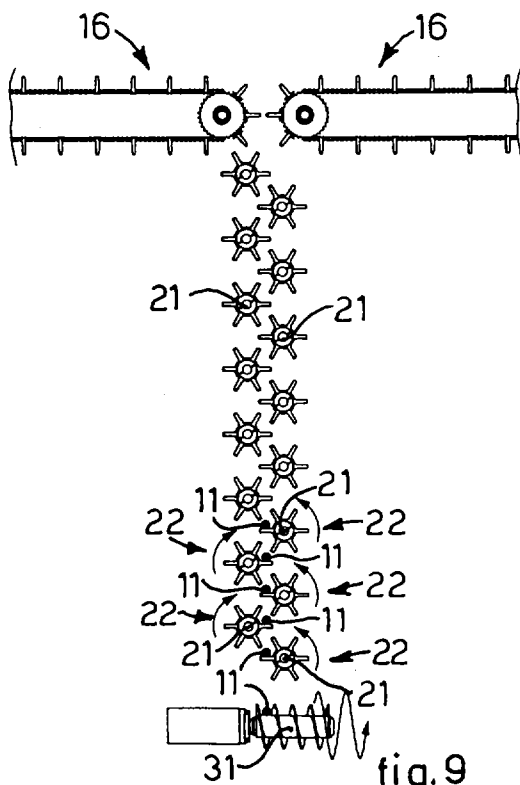


fig. 9

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2007/052841

A. CLASSIFICATION OF SUBJECT MATTER
INV. B21F23/00 B21F27/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B21F B21D B21B B23K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 122 883 A (MRK MARKETING MANAGEMENT TECH) 24 October 1984 (1984-10-24) page 5, line 30 - page 6, line 20 page 16, line 17 - page 17, line 8; figures 1a,6	1,2
A	EP 1 110 642 A (BETA SYSTEMS S.R.L.) 27 June 2001 (2001-06-27) paragraph [0013] - paragraph [0014]; figures	1-3,7,8
A	US 3 945 409 A (SCHERR ET AL) 23 March 1976 (1976-03-23) column 3, line 19 - line 36 column 5, line 34 - line 68; figures	1,2,10
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☒ See patent family annex.

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Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Barrow, Jeffrey

INTERNATIONAL SEARCH REPORT

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