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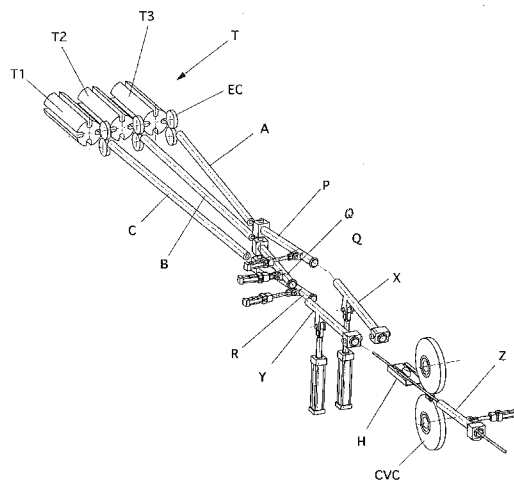
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(54) Title: SYSTEM FOR THE RECEIVING AND CONVEYING OF BARS FROM A ROLLING MILL TOWARDS A COLLECTION AND DISCHARGE DEVICE



(57) Abstract: System for the receiving and conveying of bars from a rolling mill towards a collection and discharge device, of the type in which is provided with: - bar deviation means on different paths associated to - at least one length cutting device of the advancing bar (CVC); - at least bar brake means (FC) associated to - at least one bar receiving and discharge group with at least two adjacent devices with channel/s of bar receiving and discharge (T1,T2), onto the underlying translation plate (PR), characterised in that: - said bar receiving and discharge group (T) includes at least three bar receiving and discharge devices (T1,T2,T3) adjacent and substantially parallel one to another; - said bar deviation means includes movable guiding devices to alternately direct, in a sequential way, the incoming bars in repetitive progression, onto the respective channel/s (en) of each of said bar receiving and discharge devices (T1,T2,T3), so that while the first (T1) completes and/or finishes the discharge of the bar, the last (T3) is in a position to receive a new bar and that/those intermediate (T2) is working in bar receiving.

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DESCRIPTION

**SYSTEM FOR THE RECEIVING AND CONVEYING OF BARS FROM A ROLLING MILL  
TOWARDS A COLLECTION AND DISCHARGE DEVICE**

Technical Field

- 5 This invention refers to a system for the sequential receiving and conveying of bars from a rolling mill towards a collection and discharge device, the characteristics of which conform to the pre-characterizing part of the main claim.

Definition

- 10 In this description, a bar is intended as any type of metal rolled-section, therefore also wire or rod or section.

Domain

The domain is substantially directed to hot rolling-mill plants for the production of metal bars.

Background Art

- 15 At present, it is known that for the production of bars by means of the hot rolling mill, after the rolling mill train, the cutting at speed of the continuous rolled-section into bars is provided, and their deviation substantially onto two associated parallel channels which operate in alternation, with respective tail brake/bar break (of known art), to brake the advancing bars and drop them onto an underlying cooling plane, where they are gradually transferred towards a packing line.

- 20 This solution therefore substantially provides two channels, so that, in alternate functioning, while one receives the bar, the other the discharges it and vice-versa.

Problems and disadvantages of the background art

- 25 Problems and disadvantages of the background art are identified substantially in the fact that in this way, a non-surmountable speed limit for the production of bars is reached, a limit which is imposed by the alternation of said two channels.

To solve this problem, solutions have been created with more pairs of channels, with the use of other deviators upstream, in such a way as to create more bar receiving, stopping and discharge lines, each line involving said couple of receiving devices with channels. Examples

of these solutions are found in IT1010454 in the name of Officine Meccaniche Danieli regarding a device for the conveying of bars from a rolling mill at very high speed, characterised in that it includes a four-way or more channel within which the bars cut to measure can arrive in a sequential way. This solution is complex and however requires the  
5 splitting of the rolling onto two paths each including a double channel (four in total), onto three paths each still containing a double channel (six in total), etc. The solution therefore becoming complex, but above all, cumbersome.

Solutions have also been proposed with means with two channel devices, in which each channel device includes more channels able to receive said bars in a sequential way. Such  
10 solution is described in the Italian patent application n.UD97A000007 of 21-1-1997 in the name of SIMAC S.p.A. and provides two drums, each drum equipped with two opposite pairs of channels.

An improved solution, in which the feeding with four channels towards two rotating drums is provided, each involving four channels with two opposite pairs, is described in the patent IT-A-  
15 1127813 in the name of SIMAC S.p.A.

All these solutions however, have a limit imposed by the pair of channel devices, which only have to double the pairs to increase speed, but therewith being obliged to bear greater encumbrances and complexity, with the additional disadvantage that also greater encumbrance poses insurmountable limits, obliging the doubling of the plant with consequent  
20 duplication of costs.

Furthermore, it is known that with two channel devices with bar receiving at a speed of 40m/sec, it is necessary to cut and receive bars of a length no less than 90-100m, for said imposed time limit allowed for the receiving, braking and discharge of each bar in a sequential way, on one and on the other. It is known that plants with very long bars must also have  
25 plants which are very bulky and long (therefore also the buildings which contain them) and therefore more expensive. If the bars are 100m, they oblige both the channel devices and the cooling plate to be of the same length, therefore greater encumbrance. Furthermore, it is known that the very long bar with a small diameter (e.g. 6-10mm) is treatable and workable

with difficulty, and can easily tangle.

#### Scope of the invention

The scope of the invention is that of solving the above-mentioned problems and disadvantages and furthermore, without more burdens and without reducing reliability and  
5 without a substantial increase in encumbrances:

- improving the functionality and efficiency;
- increasing the performance of the plant in order to allow to work at a higher speed without the need to duplicate the cooling plate line.

Another aim of the invention is that of being able to produce very short bars, as it is known  
10 that very short bars are not realizable with traditional devices with pairs of channels which receive the bars in alternation, precisely for the limits imposed by the respective sequential action of bar receiving, braking and discharge.

#### Solution of the problem and identification of the inventive characteristics

The problem is solved with the characteristics of the main claim.

15 The sub-claims represent advantageous preferred solutions which provide the best functionality.

#### Advantages

In this way there is the advantage of:

- improving the functionality and efficiency;
- 20 - increasing the performance.

In fact, with two bar receiving and discharge devices, the permissible speed of the advancing bar can reach 40m/sec., while with three adjacent devices, each of which receives and discharges one bar at a time, it is possible to reach a speed of 60m/sec. and above (70-80m/sec) due to greater simplification and greater time available for each device to receive,  
25 brake and discharge the respective bar onto the cooling plane and underlying transversal transfer.

With this solution, it is possible moreover to receive also very short bars, for example 50-60m, because there is greater receiving, braking and discharge time of each bar in a sequential

way. In this case, the receiving, braking and discharge device of the bar onto the cooling plate can be considerably shortened, reducing the encumbrance of the entire plant at equal production.

Moreover, it is known that the handling of shorter rods is simplified and the dangers of  
5 tangling are reduced.

Naturally with this solution it is also possible to receive, brake and discharge at high-speed two rolled wires/bars simultaneously (SPLIT rolling or by a two-wire rolling mill train as in IT-A-83489A/88) and discharge one bar at a time onto the plate using three drums with double channels (namely two opposite pairs for each drum) as in n.UD97A000007 in the name of  
10 SIMAC S.p.A.

Naturally with the implementation of three adjacent channel devices, nothing precludes the fact that only two of them may be used for advancing at slower speeds, as occurs for example with larger bars. In fact, it is known that with the same type of rolling-mill plant, the exit speed varies, increasing for increasingly smaller sections and reducing for increasingly bigger  
15 sections. In this way obviously, the plant will be much more versatile, faster and more compact.

#### Description of the preferred solution

For a better understanding, the invention is described in a preferred solution with the help of attached figures, wherein:

- 20 - Fig.1.- represents the front schematic view of the new bar receiving device with three adjacent devices (T1,T2,T3) with receiving channels (cn) for bar discharge onto the underlying cooling plate and transfer (PR) in which there are four channels (cn) arranged orthogonally on the rotating drum to alternately receive the respective bars, one bar at a time 1,2,3 (single file feeding).
- 25 - Fig.2.- represents a varied view with respect to the previous one, with the channels with opposite pairs to receive a double succession of bars 1-2, 3-4, 5-6, for each drum.
- Fig.3.- represents a variant in the method to the previous figure in which the bars received in each channel can be different 1B-1A, 2B-2A, 3B-3A.

- Fig.4.- represents a view illustrating the phases A),B),C),D),E) of receiving and discharge of the solution of Fig.1.

- Fig.5.- represents the plan-view of the section of the plant concerning the cutting of the bars into length and respective deviation onto the single channels (cn) of the three receiving, 5 braking and discharge devices (T1,T2,T3).

Figs.5A,5B,5C represent the corresponding sectional views of the plant of Fig.5.

Fig.6.- represents the perspective view of the solution of Fig.5.

Figs.7 and 8 provide alternative solutions with a non-rotating channel system.

#### Detailed description of the invention in relation to the figures

10 According to the figures, it is observed that the invention substantially includes a bar receiving and discharge group (T) made up of three bar receiving and discharge devices (T1,T2,T3).

Upstream of this, there are the respective sectioning and conveying apparatus, which essentially consist of:

i- an upstream horizontal deviator (Z) with two positions to deviate the bars alternatively to the 15 right and to the left of cutting blades of shears with continuously rotating blades of known art (CVC), obviously also being able to use shears of the start-stop type.

ii- a channel with two paths (H), placed downstream of the shears (CVC);

iii- a pair of vertical deviators (X, Y) each with vertical deviation movement in three positions;

iv- three horizontal deviators P,Q,R, placed one above the other, namely overlying, each with 20 horizontal movement in two positions, respectively right-left;

v- three fixed conveyors (A,B,C) which connect the exit of said three right-left deviators (P,Q,R), to the three channels of the device for bar receiving and discharge onto the cooling plate (T1,T2,T3) with the respective intermediation of a tail brake device (FC) of known art for each of them.

25 Naturally while in the figures from 1 to 6 the three receiving and discharge devices are of the type with three rotating drums, they could be also with openable shells, namely the rotating drums could be substituted by fixed openable channels, in this case three openable channels.

#### Functioning

I) the plant is provided with:

- upstream horizontal deviator (Z) on the right;
- right-hand vertical deviator (X) in the high position (upper);
- left-hand vertical deviator (Y) in the intermediate position (central);
- 5 - upper horizontal deviator (P) to the right
- intermediate horizontal deviator (Q) to the left;
- lower horizontal deviator (R) to the right,
- therefore the bar passes through the deviator (Z), the right channel of the double path (H), the vertical deviator (X) in the upper position, the upper horizontal deviator (P) to
- 10 the right, the third conveying (A) to the respective third receiving and discharge device (T3) by means of the bar-break (FC).

II) the functioning occurs according to the following phases:

- a)- at the beginning of the rolled-section head advancement as above, when it has reached the cutting length, the bar is cut from the continuous rolled-section deviating the same under
- 15 the rotating blades of the flying shears (CVC), activating the control of the upstream horizontal deviator (Z), which passes from one position to another;
- b) when cutting has occurred, the head of the second bar follows, without interfering with the first bar tail already in the other channel, passing along the following, already provided, path:
  - the left-hand channel of the double path (H);
  - 20 - the vertical deviator (Y) in an intermediate position;
  - the intermediate horizontal deviator (Q) in the left position;
  - the central/intermediate conveying (B) to the second receiving channel device (T2) found in an intermediate position, through the respective bar break (FC);
- c)- meanwhile the first bar is braked by the bar break device (FC) placed at the entry of the
- 25 respective channel of the third receiving device (T3) and therefore discharged;
- d)- as soon as the tail of the first bar has passed the start of conveying (A), the right vertical (X) and upper horizontal (P) deviators, move in order to be able to receive the third bar, respectively the right-hand vertical deviator (X) from the upper position to the lower position

and the upper horizontal deviator (P) from right to left;

e)- meanwhile the second bar has reached the cutting length, therefore it is cut (CVC), moving the upstream horizontal deviator (Z) from the left position to the right position;

f)- when cutting has occurred, the head of the third bar follows without interfering with the tail of the second bar in the path described in point d) in the first conveyor (C) and in the respective channel of the first bar receiving device (T1);

g)- consequently, the second bar is braked by the respective bar break (FC) placed at the entry of the channel of the second central bar receiving device (T2) and therefore discharged onto the plate;

h)- as soon as the tail of the second bar has passed the start of the central conveying (B), the left-hand vertical (Y) and intermediate horizontal (Q) deviators move respectively:

- the first (Y), from the intermediate position to the upper position and

- the second (Q), from left to right;

to receive the fourth bar and convey its head into the third conveying (A) and therefore into the respective third device with receiving channels (T3);

i)- meanwhile, when the third bar has reached the cutting length, the horizontal upstream deviator (Z) moves from the right position to the left position;

l)- when cutting has occurred, the head of the fourth bar, follows without interfering with the tail of the third bar, in the path as provided in point h), in the third conveying (A), and therefore into the third device with receiving channels (T3);

m)- simultaneously the third bar is braked by the bar break (FC) placed at the entry of the first bar receiving and discharge device (T1) and therefore discharged onto the plate (PR).

In the above phases, the cycle for the cutting and discharge onto the plate of the first three bars has been described, it is continued in such a way until all the bars that are obtained from a billet have been produced.

After having discharged the last bar onto the plate, all the deviators (Z,X,Y,P,Q,R) are arranged in the plant to repeat the cycle.

Naturally this is one of the possible solutions starting from the approach sub (l), but it is

evident that the initial setting could be different (e.g. contrary, or starting from the centre, or from any position, etc).

### Claims

- 1.- System for the receiving and conveying of bars from a rolling mill towards a collection and discharge device, of the type in which is provided with:
- bar deviation means on different paths associated to
  - 5 - at least one length cutting device of the advancing bar (CVC);
  - at least bar brake means (FC) associated to
  - at least one bar receiving and discharge group with at least two adjacent devices with channel/s of bar receiving and discharge (T1,T2), onto the underlying translation plate (PR), characterised in that:
  - 10 - said bar receiving and discharge group (T) includes at least three bar receiving and discharge devices (T1,T2,T3) adjacent and substantially parallel one to another;
  - said bar deviation means includes movable guiding devices to alternately direct, in a sequential way, the incoming bars in repetitive progression, onto the respective channel/s (cn) of each of said bar receiving and discharge devices (T1,T2,T3), so that while the first (T1)
  - 15 completes and/or finishes the discharge of the bar, the last (T3) is in a position to receive a new bar and that/those intermediate (T2) is working in bar receiving.
- 2.- System according to claim 1, characterised in that said bar receiving and discharge devices (T1,T2,T3) are rotating drums with a plurality of longitudinal peripheral channels (cn).
- 20
- 3.- System according to claim 1, characterised in that said bar receiving and discharge devices (T1,T2,T3) include at least one longitudinal static channel with an openable door.
- 4.- System according to claim 2, characterised in that there are four said channels (cn)
- 25 arranged orthogonally for each device (T1,T2,T3).
- 5.- System according to claim 2, characterised in that there are four said channels (cn) arranged in opposite pairs for each device (T1,T2,T3).

6.- System according to any of the previous claims, characterised in that it includes upstream of said bar receiving and discharge group (T) and bar break (FC) the following devices:

- 5 i- upstream horizontal deviator (Z) with two positions to deviate the bars alternatively to the right and to the left of cutting blades of shears with continuously rotating blades of known art (CVC), it also being possible to use shears of the start-stop type.
- ii- channel with two paths (H) placed downstream of the shears (CVC);
- iii- a couple of vertical deviators (X,Y) each with vertical deviating movement in three positions;
- 10 iv- three horizontal deviators P,Q,R, arranged one above the other, namely overlying, each with a horizontal movement in two positions respectively right-left;
- v- three fixed conveyors (A,B,C) which connect the exit of said three right-left deviators (P,Q,R), to the three channels of the bar receiving and discharge device onto the cooling plate (T1,T2,T3) with the respective intermediation of a tail brake/bar break (FC) device of known art for each of them.
- 15

7.- Method of bar receiving and discharge onto the cooling plate using the system according to the previous claim, characterised in that:

l) the plant is provided with:

- 20 - upstream horizontal deviator (Z) on the right;
- right vertical deviator (X) in a high position (upper);
- left vertical deviator (Y) in an intermediate position (central);
- upper horizontal deviator (P) in the right position;
- intermediate horizontal deviator (Q) in the left position;
- 25 - lower horizontal deviator (R) in the right position;
- the bar passing through the deviator (Z), the right channel of the double path (H), the vertical deviator (X) in the upper position, the upper horizontal deviator (P) in the right position, the third conveying (A) to the respective third receiving and discharge device

(T3) by means of the bar break (FC);

II) the following phases being:

a)- when it has reached the cutting length, the bar is cut from the continuous rolled-section deviating the same under the rotating blades of the flying shears (CVC), activating the control  
5 of the upstream horizontal deviator (Z) which passes from one position to the other;

b)- when cutting has occurred, the head of the second bar follows, without interfering with the tail of the first bar already in the other channel, passing through the path, already arranged as follows:

- the left channel of the double path (H);

10 - the vertical deviator (Y) in an intermediate position;

- the intermediate horizontal deviator (Q) in the left position;

- the central/intermediate conveying (B) to the second receiving channel device (T2) found in an intermediate position, through the respective bar break (FC);

c)- meanwhile, the first bar is braked by the bar break device (FC), placed at the entry of the  
15 respective channel of the third receiving device (T3) and therefore discharged onto the plate (PR);

d)- as soon as the end of the first bar has passed the start of conveying (A), the deviators: right-hand vertical (X) and upper horizontal (P), move in order to be able to receive the third bar, respectively the right vertical deviator (X) from the upper position to the lower position  
20 and the upper horizontal deviator (P) from right to left;

e)- meanwhile the second bar has reached the cutting length, therefore it is cut (CVC) moving the upstream horizontal deviator (Z) from one position to the other;

f)- when cutting has occurred, the head of the third bar follows without interfering with the tail of the second bar in the path described in point d) in the first conveyor (C) and in the  
25 respective channel of the first bar receiving device (T1);

g)- consequently, the second bar is braked by the respective bar break (FC) placed at the entry of the channel of the second central bar receiving device (T2) and therefore discharged onto the plate (PR);

h)- as soon as the tail of the second bar has passed the start of the central conveying (B), the left vertical (Y) and intermediate horizontal (Q) deviators, move respectively:

- the first (Y), from the intermediate position to the upper position and
- the second (Q), into another position;

5 to receive the fourth bar and convey its head into the third conveying (A) and therefore into the respective third channel receiving device (T3);

i)- meanwhile, when the third bar has reached the cutting length, the horizontal upstream deviator (Z) moves from one position to the other;

l)- when cutting has occurred, the head of the fourth bar, follows without interfering with the  
10 tail of the third bar, in the path as provided in point h), into the third conveying (A) and therefore into the third channel receiving device (T3);

m)- simultaneously, the third bar is braked by the bar break (FC) placed at the entry of the first bar receiving and discharge device (T1) and therefore discharged onto the plate (PR);

- the cycle is repeated until the end and being intending for right and left or vice-versa.

15

8. System according to any of the previous claims, characterised in that said bar receiving and discharge channel devices are of the type with channels obtained on a rotating drum, for the receiving with the channel covered and subsequent bar drop with the channel uncovered.

20 9. System according to any of the previous claims, characterised in that said channel devices for bar receiving and discharge are of the type with fixed channels with a closable door for bar receiving and openable door for bar dropping.

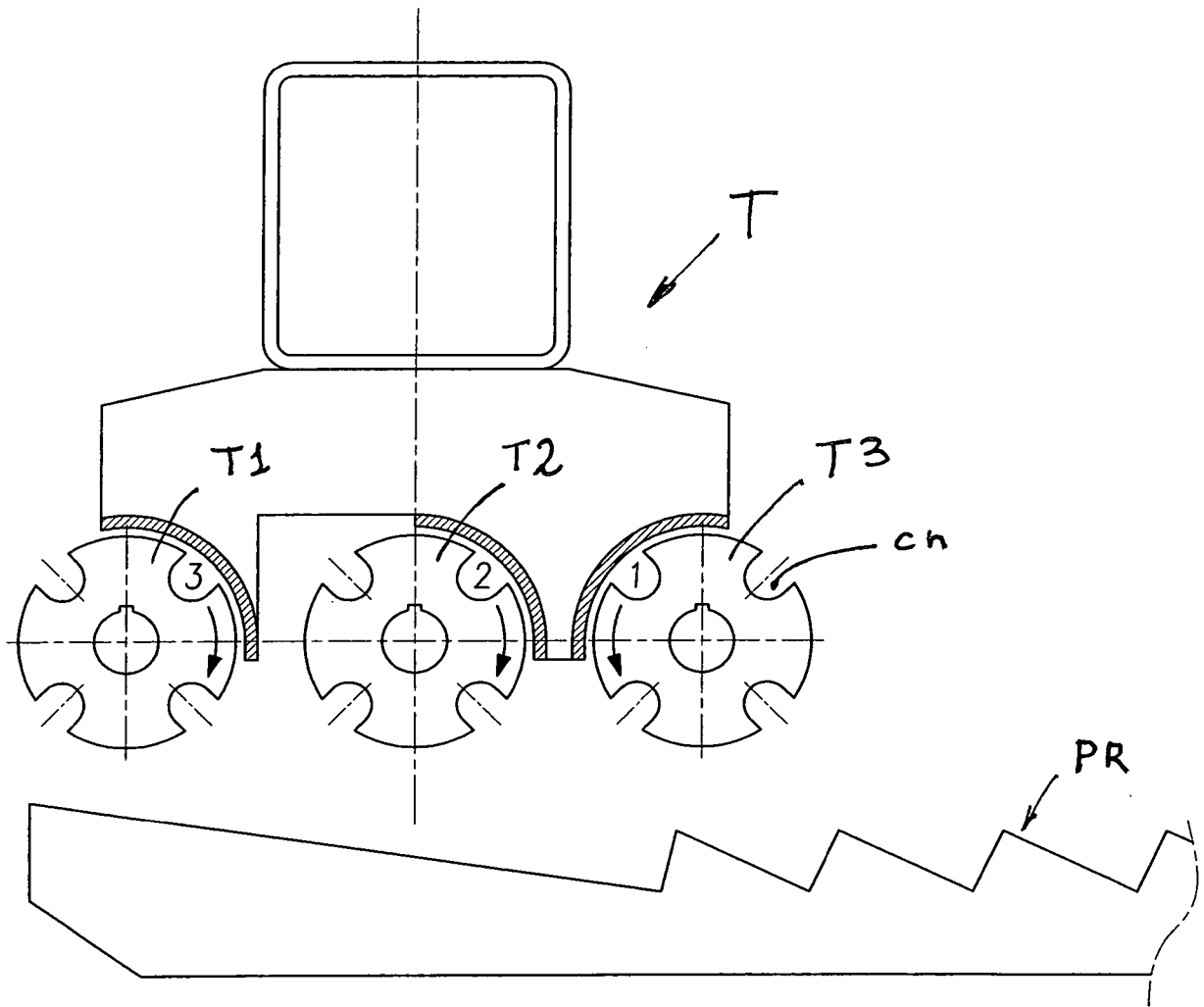


FIG.1

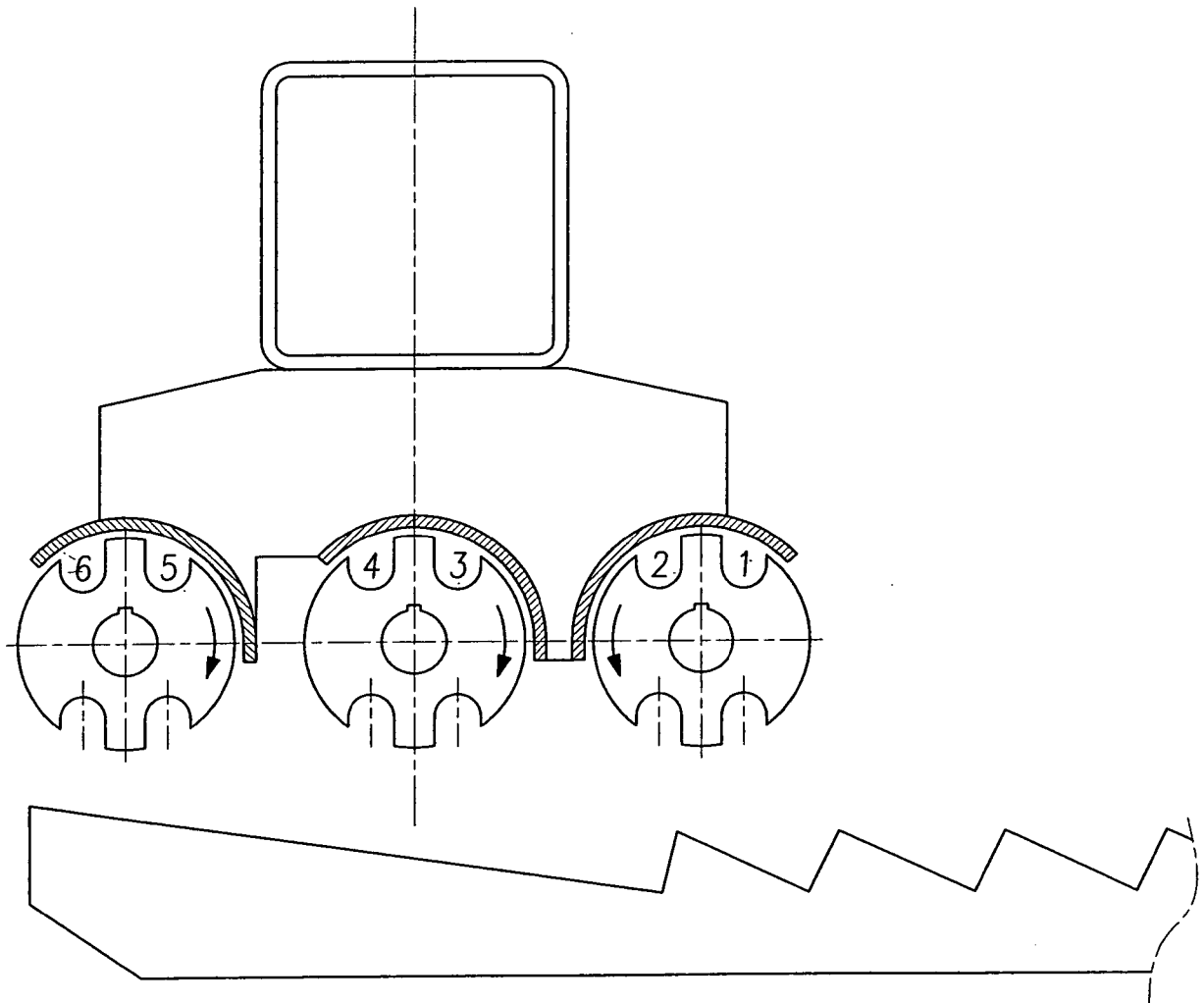


FIG.2

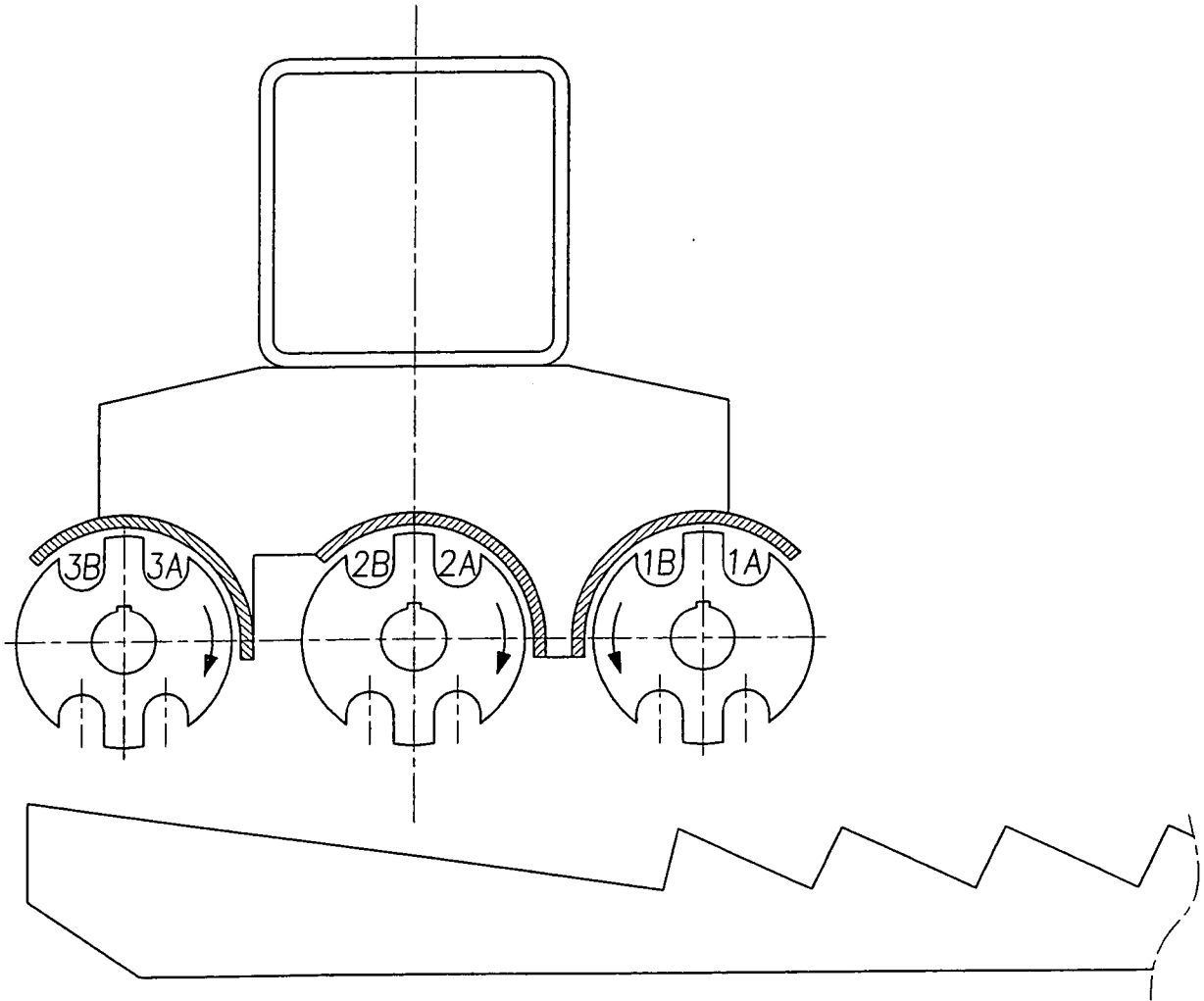
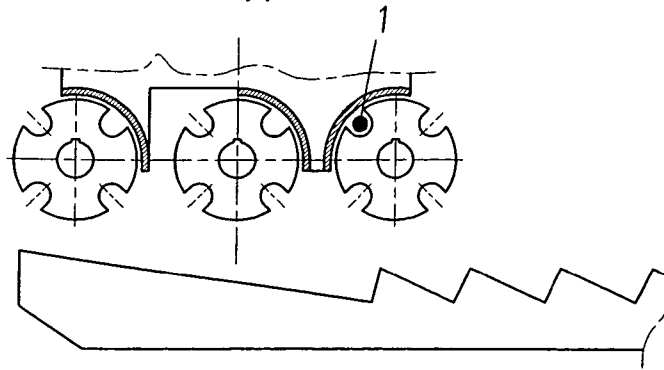
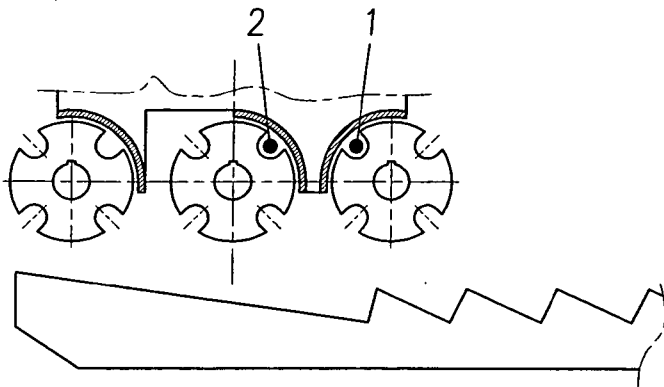


FIG. 3

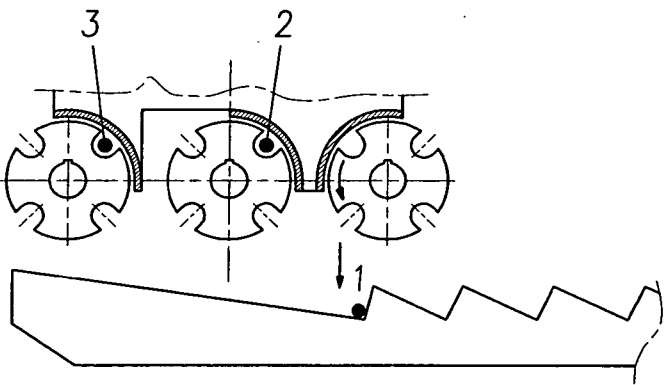
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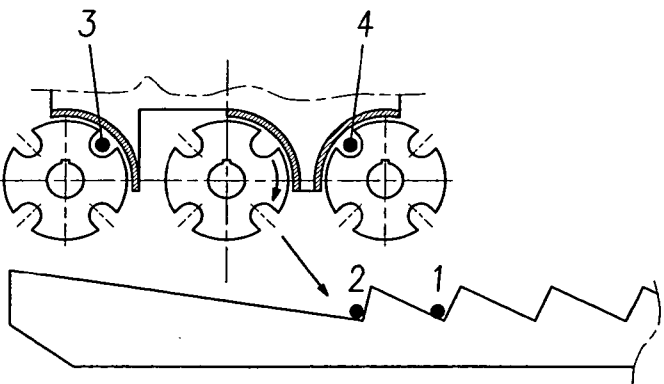
B)



C)



D)



E)

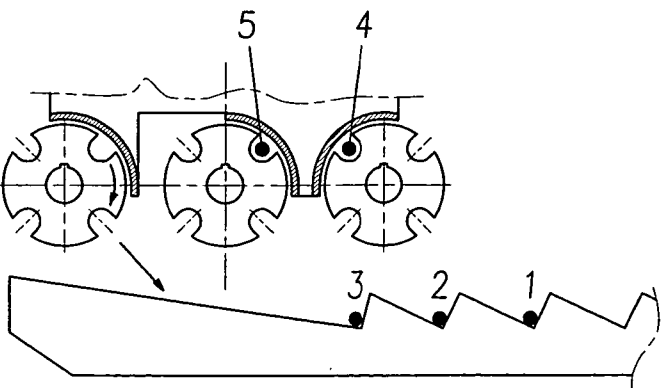


FIG. 4

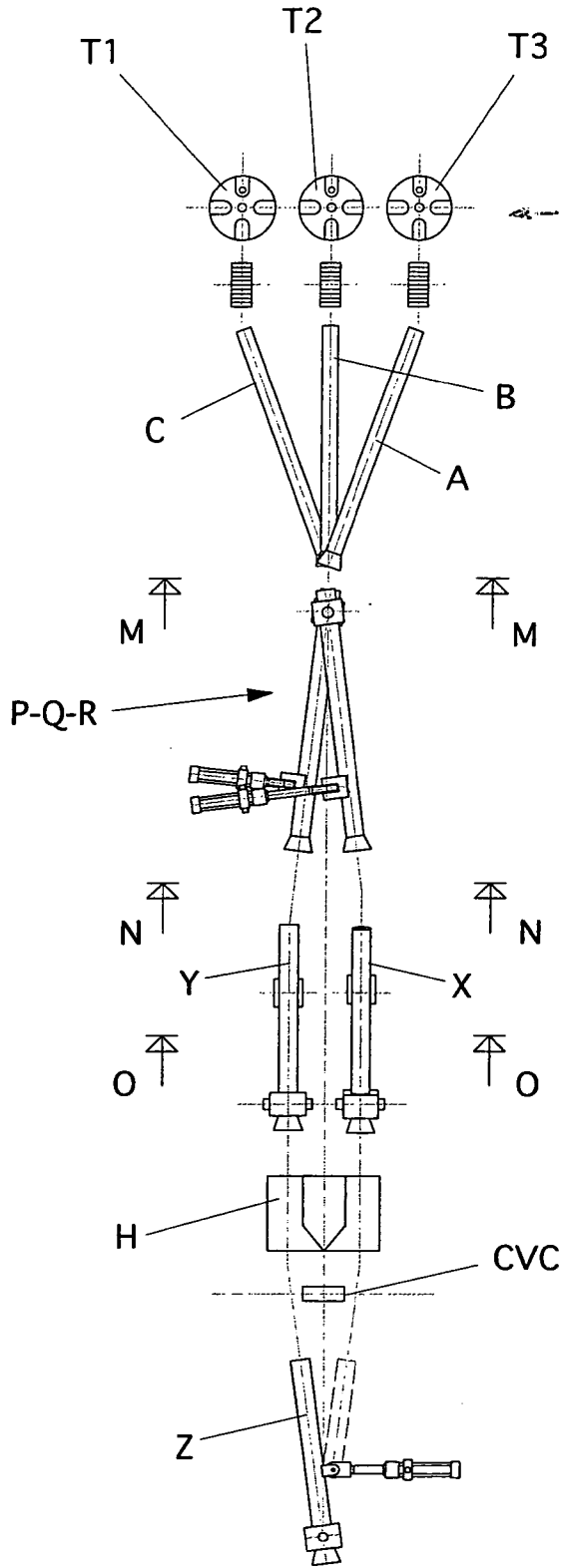


Fig. 5

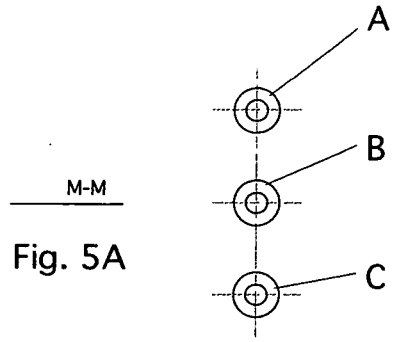


Fig. 5A

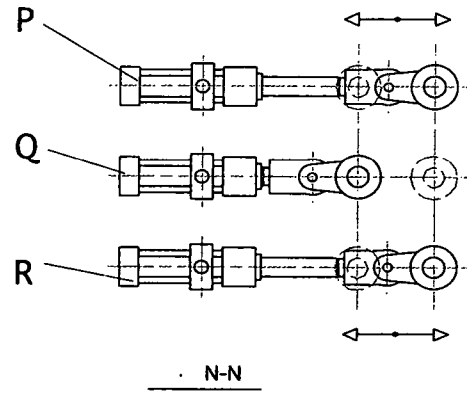


Fig. 5B

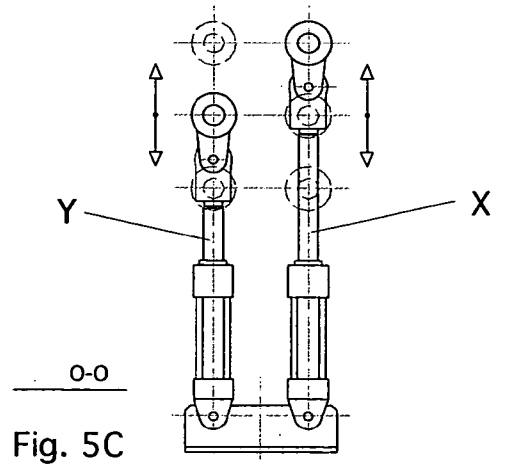


Fig. 5C

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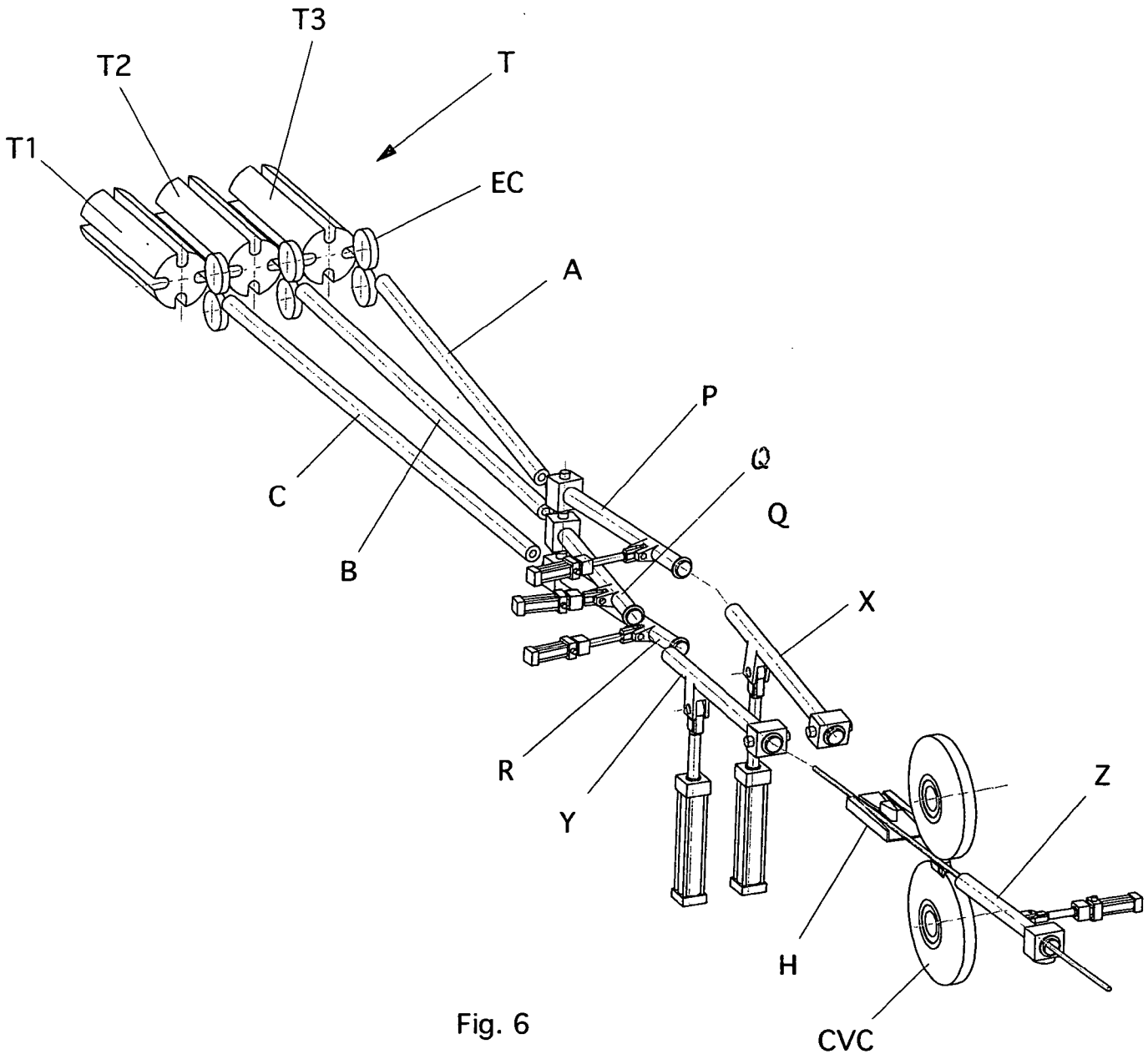


Fig. 6

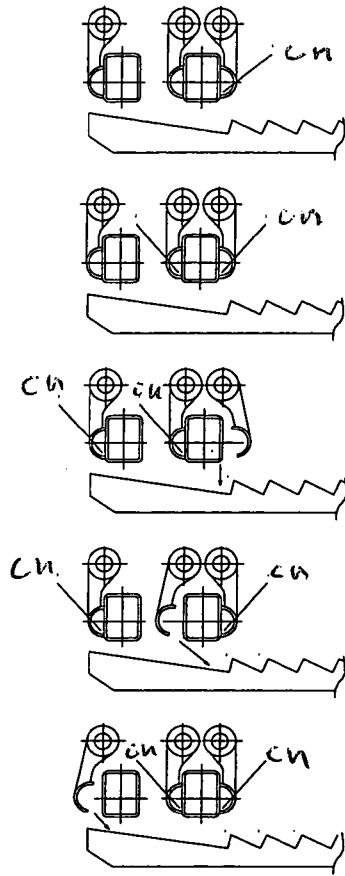


Fig. 7

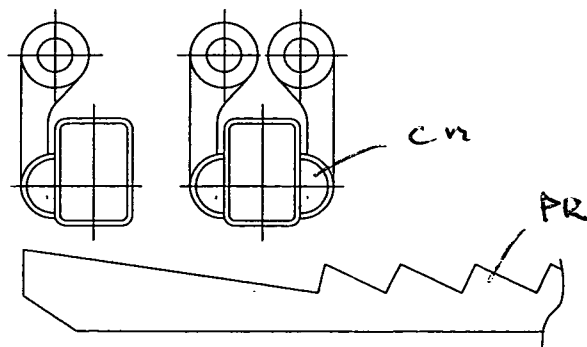


Fig. 8

## INTERNATIONAL SEARCH REPORT

International application No

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## A. CLASSIFICATION OF SUBJECT MATTER

INV. B21D43/00 B21B39/18 B21B43/00 B21C47/34

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)

B21D B21B B21C

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.
Y	IT 1 127 813 B (SIMAC SPA [IT]) 28 May 1986 (1986-05-28) cited in the application	1-5, 8, 9
A	claim 1; figures 1, 2 -----	6, 7
Y	US 3 258 951 A (KINNICUTT JR ROGER ET AL) 5 July 1966 (1966-07-05)	1-5, 8, 9
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 Further documents are listed in the continuation of Box C. See patent family annex.

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

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