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(54) **DEVICE FOR HIGH SPEED DISCHARGE OF BARS AND SECTIONS ON COOLING BED IN HOT ROLLING MILL PLANTS**

VORRICHTUNG ZUM SCHNELLEN ABFÖRDERN VON STÄBEN UND PROFILEN AUF EIN KÜHLBETT IN WALZANLAGEN

DISPOSITIF PERMETTANT DE DECHARGER A VITESSE ELEVEE DES BARRES ET DES PROFILES SUR UN LIT DE REFROIDISSEMENT DANS DES INSTALLATIONS DE LAMINAGE A CHAUD

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**EP-A- 0 402 572**                      **EP-A- 0 419 447**  
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- **PATENT ABSTRACTS OF JAPAN vol. 097, no. 001, 31 January 1997 -& JP 08 224610 A (KOBELITEEL LTD), 3 September 1996,**

**EP 1 009 554 B1**

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**Description**Technical Field

**[0001]** This invention has for object a device for the high speed discharge of bars and sections on cooling bed in hot rolling mill plants.

Background Art

**[0002]** The speeds existing in the steel bars hot-rolling plants is of about 12 - 13 m/sec for systems with openable channel or with reciprocating movement and of about. 35 m/sec for rotating drum-channels.

**[0003]** Increasing this speed is difficult.

**[0004]** This invention is substantially intended for stock receiving and discharge devices with channels provided with openable means with reciprocating oscillating movement.

**[0005]** The main cause is in the stand-off forced by the receiving of the rolling bars downstream of the "flying shear", that cuts the continuous rolled section or bar stock, into pieces deviating it by sending a bar on one side and a bar on the other in a known stock receiving device that receives the bar by two parallel adjacent channels.

**[0006]** The channels are generally openable and closable and/or provided with other movement for discharging the bars received in turn on the underlying cooling bed.

**[0007]** This solution is preferably intended for the production of small sections, which is penalised by roller ways and cursors, respect to bigger sections due to said speed limit.

**[0008]** This and other pre-existing rolling mill plants have in any way some faults and by increasing the speed there is a risk of tangling and the straightness is endangered and distortions may occur.

- Patent Abstracts of Japan vol.097, no.001, 31 January 1997 - JP08224610A (KOBE SEEL LTD), 3 September 1996 and EP 0402572A (SIMAC SPA) 19 December 1990 disclose a device for discharging bars and sections on an underlying cooling bed with respective cooling toothed plate, in rolling mill plants, of the type that includes movable "U" shaped channels for receiving bars closable by covers, wherein a transfer means is provided, able to receive said the bars from said movable "U" shaped channels and translate and discharging them on said adjacent cooling toothed plate.

**[0009]** These faults are particularly serious and frequent, so downstream of the cooling bed (toothed plate), they must be picked up and straightened with consequent very high costs.

## Purpose of the present invention

**[0010]** Purpose of the present invention is of increasing the production speed of the small sections (shaped like angles "L", and T, U sections, square sections, hexagon sections, window sections, flat-shaped, and so on.) without however endangering their straightness, avoiding screwing not accepted by the market or by machines for the subsequent processing.

## Disclosure of the invention

**[0011]** This and other aims are reached as claimed by a device for receiving bars and sections and discharging them on a underlying cooling bed involving a toothed plate, in rolling mill plants, of the type which includes movable "U" shaped channels closable by covers, for the bars receiving, characterised in that it is structured by the following combined characteristics:

- beneath said device, there is a transfer able to receive said bars as a support and translate them, discharging them in an adjacent toothed plate for the cooling and further translation;
- the movability of said "U" shaped channels is such to allow them to lower under the support and translation plane of said transfer for laying said bars on the resting plane of said transfer.

**[0012]** In this way a reliable and simple device is realized that allows an higher speed and a better work performance without damaging the material or tangling it.

**[0013]** Advantageously the number of said channels is two, an internal one toward said toothed plate and an external one, and in which they lay coplanar, and the internal one extends downwards with an arm to act as a momentary stop of the advancement of the bars deposited upstream by said external channel in said transfer.

**[0014]** In this way the system operativeness is improved .

**[0015]** The method for operating is advantageously concretized as follows:

- making a first bar arrive in the external channel;
- making a second bar arrive in the internal channel;
- lowering the external channel beneath the translator advancing line in order to make said first bar advance;
- stopping said first bar with the presence of said internal channel through said translator;
- enclosing said external channel lifting it for receiving a third bar and lowering said internal channel to allow said second bar to be advanced by said translator before said first bar;
- stopping said internal channel in position to maintain said first bar stopped and allowing said second bar to move a tooth forward in said toothed plate;

- further lowering said internal channel to allow the advancement of said first bar toward said toothed plate.

**[0016]** Advantageously said channels are offset in height and the internal one is at a higher level than the external one and in which the respective arms are of the oscillating type, hinged on the outside and such not to interfere one respect to the other in the respective movement.

**[0017]** This setting allows to further improve the operativeness. The operating method is advantageously concretized as follows:

- making a first bar arrive in the external channel;
- lowering the external channel beneath the translator advancing line so that said first bar advances up to said cooling plate, while at the same time said second bar arrives in the internal channel, which does not interfere with said advancement;
- enclosing said external channel lifting it for receiving a third bar and enclosing said internal channel in order to allow them to receive said fourth bar and free the way for the discharging of the third rod as in the previous phase.

#### Description of a preferred embodiment

**[0018]** These and other advantages will appear from the following description of two preferred embodiments, with the aid of the included drawings, whose details are not to be considered as limitative but only supplied as an example.

**[0019]** Figure 1 is a schematic front cross sectional view on the vertical-plane of a first solution of the device for the receiving and discharging of bars according to the present invention.

**[0020]** Figure 2 is a schematic view of the plant of Fig. 1 in the respective phases A),B),C),D)E), of its working.

**[0021]** Fig. 3 is a view of a alternative solution as regards the solution of Fig.1.

**[0022]** Fig.4 shows the phases of the solution of Fig.3.

**[0023]** As disclosed by the above shown figures: by (5) the device for receiving and discharging bars in its ensemble is indicated and by (6) the underlying cooling bed.

**[0024]** The underlying cooling bed (6) includes a transversal translator with endless chains or endless tape or rollers herein called endless transfer means (61), upstream of a known translating system with toothed plane called cooling plate or toothed plate (62) which notoriously works comb-like to move a bar from a seat (between two teeth) to the other.

**[0025]** The upper placed device for the bars receiving and discharging (5) includes two parallel and adjacent channels arranged on horizontal-plane above the underlying bed 6.

**[0026]** Each channel is made up of an upper part as

cap (51) and lower part as a real "U" shaped channel (52), the lower part (52) is movable to open and discharge the bar received on the underlying bed.

**[0027]** The bars are indicated by way of examples by 1,2,3,4 for locating them in logic succession of arrival, in order to understand the mechanism or receiving and discharging system.

**[0028]** As claimed, the invention therefore consists of two channels whose lower part, substantially "U" shaped (52), is vertically movable (or almost vertically).

**[0029]** These lower parts make up the true channels for alternatively receiving the bars cut to measure downstream of the rolling mill and downstream of a known flying shear not illustrated but of prior art, while the upper part (51) substantially, as said, acts as a cap.

**[0030]** On the channels entry two bar-brakers with rollers shaped according to the section shape are provided, not illustrated but of prior art known in this sector.

**[0031]** The two channels alternatively discharge the bars above the underlying transfer (61) that will carry it towards the plate (52), which will receive them by placing them one for each tooth (toothed seat).

**[0032]** The internal channel placed toward the plate must also retain the bar discharged from the external channel in order to space it from the bar 2, 3 and allow the plate (62) to rotate (advance in rotational movement) avoiding charging the bar 1 on the same tooth occupied by the bar 2.

**[0033]** For this reason the internal channel during its lowering will stop in intermediate position in order to remove the bar 2 and retain the bar 1.

**[0034]** By carrying out the lowering of the internal channel, the bar 1 is made free.

**[0035]** The lifting / lowering control of the two channels may be of different type (520):

- a) solution with longitudinal tie rod with pistons (reciprocating cylinders) or connecting rod-crank or levers with electric DC or AC motor not shown.
- B) 2 parallel shafts operated by pistons or gearmotors and electric motors;
- c) 2 shafts with engaged eccentric device;
- D) other.

**[0036]** The upper closure of the channels is supported by a longitudinal beam (50), fixed to ground by a series of columns.

**[0037]** As shown in Figures 2-3 the lower parts that make up the "U" shaped channels lift and lower up to being under the advancing line of the endless transfer means (61).

**[0038]** In this way, when they have been lowered beneath it, the bar is taken by the transfer (61) that translates it on the toothed plate (62), etc.

**[0039]** Figures 3 and 4 substantially show a variation in which the lower "U" shaped movable channels, are moved by oscillating arms (520).

**[0040]** This second solution better eases the laying on

the endless transfer means (61) giving the bars also an advancing component.

[0041] In the transferring phases of Fig. 2 it can be seen that:

A) indicates the arrival of the first bar 1 in the external channel;

B) indicates the arrival phase of the second bar 2 in the internal channel;

C) indicates that the bar 1 is discharged from the external channel and it is stopped by the external wall of the internal channel that acts as a stop in said position while the bar 2 of the internal channel has already been discharged and translated to the toothed plate (62).

D) indicates that only when the toothed plate 62 has carried out a transferring cycle in the following tooth of the bar 2, the internal channel will further lower to allow also to the bar 1 to advance and be discharged on the first seat of the toothed plate 62, while another rod 3 (Phase D) arrives in the external channel.

E) indicates that when the fourth bar 4 arrives on the internal channel, the external channel is lowered and the respective bar 3 advances until contacting the stop arm of the internal channel.

[0042] The cycle is repeated.

[0043] In the solution of Figs. 3, 4, it can be seen that the two channels are offset, that is they are placed at a different height and the internal one higher than the external one, the cycle instead is the following:

A) the bar 1 arrives in the external channel;

B) the external channel lowers and lays the bar 1 on the underlying transfer (61), that free to advance without obstacles is discharged directly in the toothed plate (62), while the second bar (2) arrives in the internal channel;

C) the internal channel opens and lays the bar 2 on the underlying endless transfer means (61) while the closed external channel receives the third bar (3);

D) the internal channel closes again and receives the fourth bar (4) while the external channel opens and lays the preceding bar (3) on said endless transfer means (61).

[0044] Of course as said the transferring device may be of any type, at the most also a tilted plane.

## Claims

1. Device for discharging bars and sections (5) on an underlying cooling bed (6) with respective cooling toothed plate (62), in rolling mill plants, of the type that includes movable "U" shaped channels (52) for

receiving bars (1,2,3,4 .....) closable by covers (51):

- wherein beneath said device (5), there is an intermediate transfer means (61) able to receive said bars (1,2,3,4, .....) from said movable "U" shaped channels (52) and translate them, and discharging them on said adjacent cooling toothed plate (6) to proceed with a further translation (62); **characterised in that**
- said beneath intermediate transfer means is an endless transfer means (61);
- the movability of said "U" shaped channels (52) is such to be able to lower under the support and translation plane of said endless transfer means (61) for laying said bars (1,2,3,4 .....) on the support plane of said transfer (61).

2. Device according to claim 1, **characterised in that** the number of said channels is two, an internal one (51-52) toward said toothed plate (62) and an external one (51-52), and in which they lay coplanar and the internal one protrudes downwards with an arm (520) to act as a stop of the momentary advancement of the bars placed upstream by said external channel in said transfer (61).

3. Device according to claim 1, **characterised in that** said channels are offset in height and the internal one is at a higher level than the external one and in which the respective arms are of the oscillating type, engaged on the outside and such not interfere one respect to the other in the respective movement.

4. Method for the transferring of bars in a cooling bed utilizing a channel device for receiving bars in longitudinal advancement and transferring them in said cooling bed, by a device and plant according to claims 1,2, **characterised in:**

- making a first bar (1) arrive in the external channel;
- making a second bar (2) arrive in the internal channel;
- lowering the external channel beneath the translator advancing line in order to make said first bar (1) advance;
- stopping said first bar (1) with the presence of said internal channel through said translator;
- enclosing said external channel lifting it for receiving a third bar (3) and lowering said internal channel to allow said second bar (2) to be advanced by said translator before said first bar (1);
- stopping said internal channel in position to maintain said first bar (1) stopped and allowing said second bar (2) to move of a tooth forward in said toothed plate;

- further lowering said internal channel to allow the advancement of said first bar (1) toward said toothed plate.

5. Method for the transferring of bars in a cooling bed utilizing a channel device for receiving bars in longitudinal advancement and transferring them in said cooling bed, by a device and plant according to claims 1,2, **characterised in:**

- making a first bar (1) arrive in the external channel;
- lowering the external channel beneath the translator advancing line in order to make said first bar (1) advance up to said cooling plate, while at the same time said second bar (2) arrives in the internal channel, which not interferes with said advancement;
- enclosing said external channel lifting it for receiving a third bar (3) and enclosing said internal channel to allow it to receive said fourth bar (4) and free the way for the discharge of the third bar (3) as in the previous phase.

#### Patentansprüche

1. Vorrichtung zum Abladen von Stäben und Profilen (5) auf einem darunterliegenden Kühlbett (6) mit gezähnter Kühlplatte (62), in Walzwerken, mit beweglichen "U"-förmigen Kanälen (52) zur Aufnahme von Stäben (1,2,3,4 .....), durch Abdeckungen (51) verschließbar:

- wobei unterhalb besagter Vorrichtung (5) ein Zwischentransfermittel (61) vorhanden ist, das besagte Stäbe (1,2,3,4, , ....) von den beweglichen "U"-förmigen Kanälen (52) aufnimmt und überführt und sie auf besagter angrenzenden gezähnten Kühlplatte (6) ablädt, worauf eine weitere Überführung (62) folgt; **gekennzeichnet dadurch, dass**
- besagtes unteres Zwischentransfermittel ein endloses Transfermittel (61) ist;
- besagte "U"-förmige Kanäle (52) sich unter die Stütze- und Überführungsebene von besagten endlosen Transfermitteln (61) absenken können, um besagte Stäbe (1,2,3,4 ..... ) auf der Auflageebene von besagtem Transfer (61) abzulegen.

2. Vorrichtung nach Anspruch 1, **gekennzeichnet dadurch, dass** die Anzahl der besagten Kanäle zwei ist, ein innerer (51-52) zu besagter gezähnter Platte (62) hin und ein äußerer (51-52), und wobei sie koplanar liegen und der innere mit einem Arm (520) nach unten ragt, um als Stopper für das momentane Vorrücken der Stäbe zu wirken, die vorher von be-

sagtem äußeren Kanal in besagten Transfer (61) gelegt werden.

3. Vorrichtung nach Anspruch 1, **gekennzeichnet dadurch, dass** besagte Kanäle in der Höhe versetzt sind und der innere höher liegt als der äußere, und wobei die betreffende Arme schwingen, in Eingriff auf der Außenseite, so dass sie einander nicht bei ihrer Bewegung stören.

4. Methode zur Überführung von Stäben auf ein Kühlbett unter Benutzung einer Kanalvorrichtung zur Aufnahme von Stäben unter Vorrücken in Längsrichtung und zu ihrer Überführung auf besagtes Kühlbett durch eine Vorrichtung und Anlage nach Anspruch 1,2, **gekennzeichnet dadurch, dass:**

- ein erster Stab (1) in dem äußeren Kanal ankommt;
- ein zweiter Stab (2) im inneren Kanal ankommt;
- der äußere Kanal unter die Überführungs-Vorrücklinie abgesenkt wird, damit besagter erster Stab (1) vorrückt;
- der erste Stab (1) unter Vorhandensein von besagtem inneren Kanal durch besagte Überführung angehalten wird;
- besagter äußerer Kanal durch Anheben eingeschlossen wird, zur Aufnahme eines dritten Stabs (3), und besagter innerer Kanal abgesenkt wird, damit besagter zweiter Stab (2) von besagter Überführung vor besagtem ersten Stab (1) fortbewegt wird;
- besagter innerer Kanal in einer Position angehalten wird, so dass besagter erster Stab angehalten (1) wird und besagter zweiter Stab (2) sich in besagter gezähnter Platte um einen Zahn vorwärtsbewegt;
- besagter innerer Kanal weiter abgesenkt wird, um das Vorrücken von besagtem ersten Stab (1) zu besagter gezähnter Platte hin zu gestatten.

5. Methode zur Überführung von Stäben auf ein Kühlbett unter Benutzung einer Kanalvorrichtung zur Aufnahme von Stäben unter Vorrücken in Längsrichtung und zu ihrer Überführung auf besagtes Kühlbett durch eine Vorrichtung und Anlage nach Anspruch 1,2, **gekennzeichnet dadurch, dass:**

- ein erster Stab (1) in dem äußeren Kanal ankommt;
- der äußere Kanal unter die Überführungs-Vorrücklinie abgesenkt wird, damit besagter erster Stab (1) bis zu besagter Kühlplatte vorrückt, während gleichzeitig besagter zweiter Stab (2) im inneren Kanal ankommt, der besagtes Vorrücken nicht stört;
- besagter äußerer Kanal durch Anheben einge-

schlossen wird, zur Aufnahme eines dritten Stabs (3), und besagter innerer Kanal eingeschlossen wird, zur Aufnahme des besagten vierten Stabs (4) und zum Freimachen des Wegs für die Abladung des dritten Stabs (3) wie in der vorherigen Phase.

## Revendications

1. Dispositif pour décharger des barres et des sections (5) sur un poste de refroidissement sous-jacent (6) avec une plaque de refroidissement dentée respective (62), dans des installations de laminage, du type qui inclut des canaux amovibles en forme de "U" (52) pour la réception de barres (1,2,3,4 ..... ) qu'on peut fermer par des couvercles (51):

- dans lequel au-dessous dudit dispositif (5), il existe des moyens de transfert intermédiaires (61) capables de recevoir ladite barre (1,2,3,4, ..... ) à partir desdits canaux orientables en forme de "U" (52) et de les déplacer, et de les décharger sur ladite plaque de refroidissement dentée adjacente (6) pour continuer avec un déplacement ultérieur (62); **caractérisé en ce que**
- ledit moyen de transfert intermédiaire inférieur est un moyen de transfert illimité (61);
- la mobilité desdits canaux en forme de "U" (52) est capable de diminuer sous le support et le plan de déplacement dudit moyen de transfert continu (61) pour la pose desdites barres (1,2,3,4 ..... ) sur le plan de support dudit transfert (61).

2. Dispositif selon la revendication 1, **caractérisé en ce que** le nombre desdits canaux est de deux, un canal interne (51-52) au niveau de ladite plaque dentée (62) et un canal externe (51-52) et où des coplanaires sont placés et le canal interne dépasse vers le bas avec un bras (520) utilisé pour arrêter l'avancement momentané des barres placées en amont par ledit canal externe dans ledit transfert (61).

3. Dispositif selon la revendication 1, **caractérisé en ce que** lesdits canaux sont réglés en hauteur et le canal interne est disposé à un niveau supérieur par rapport au canal externe et où les bras respectifs sont de type oscillant, engagés sur l'extérieur et de cette façon, ne se touchent pas l'un et l'autre lors du mouvement respectif.

4. Méthode pour le transfert de barres jusqu'à un poste de refroidissement en utilisant un dispositif de canal pour la réception de barres dans l'avancement

longitudinal et en les transférant dans ledit poste de refroidissement, par un dispositif et des installations selon les revendications 1,2, **caractérisé en ce que:**

- faisant arriver une première barre (1) dans le canal externe;
- faisant arriver une barre seconde (2) dans le canal interne;
- rabaissant le canal externe au-dessous de la ligne d'avancement du transformateur afin de faire avancer ladite première barre (1);
- arrêtant ladite première barre (1) avec la présence dudit canal interne à travers ledit transformateur;
- incluant ledit soulèvement du canal externe pour la réception d'une troisième barre (3) et rabaissant ledit canal interne pour permettre que ladite seconde barre (2) puisse être avancée par ledit transformateur avant ladite première barre (1);
- arrêtant ledit canal interne dans une position pour maintenir ladite première barre (1) arrêtée et pour permettre que ladite barre seconde (2) se déplace d'une dent avant dans ladite plaque dentée;
- rabaissant de plus ledit du canal interne pour permettre l'avancement de ladite première barre (1) vers ladite plaque dentée.

5. Méthode pour le transfert de barres dans un poste de refroidissement utilisant un dispositif de canal pour la réception de barres dans l'avancement longitudinal et pour le transfert de celles-ci dans ledit poste de refroidissement, par un dispositif et une installation selon les revendications 1,2, **caractérisé en ce que:**

- faisant arriver une première barre (1) dans le canal externe;
- rabaissant le canal externe au-dessous de la ligne d'avancement d u transformateur afin de faire avancer ladite première barre (1) jusqu'à ladite plaque de refroidissement, tandis qu'en même temps ladite seconde barre (2) arrive dans le canal interne, laquelle ne touche pas ledit avancement;
- incluant ledit soulèvement du canal externe pour la réception d'une troisième barre (3) et incluant ledit canal interne pour lui permettre de recevoir ladite quatrième barre (4) et libérer la voie pour la décharge de la troisième barre (3) comme dans la phase antérieure.

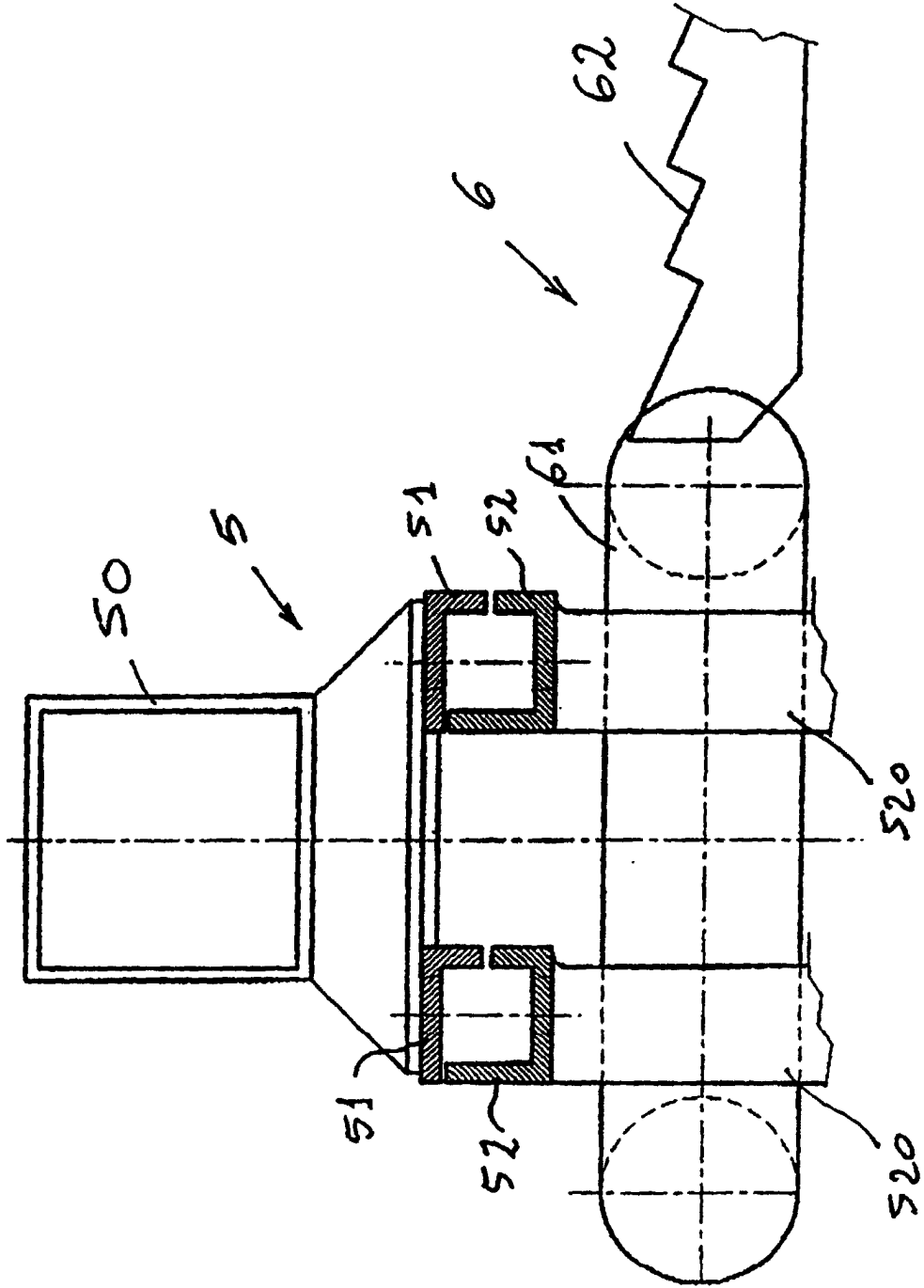
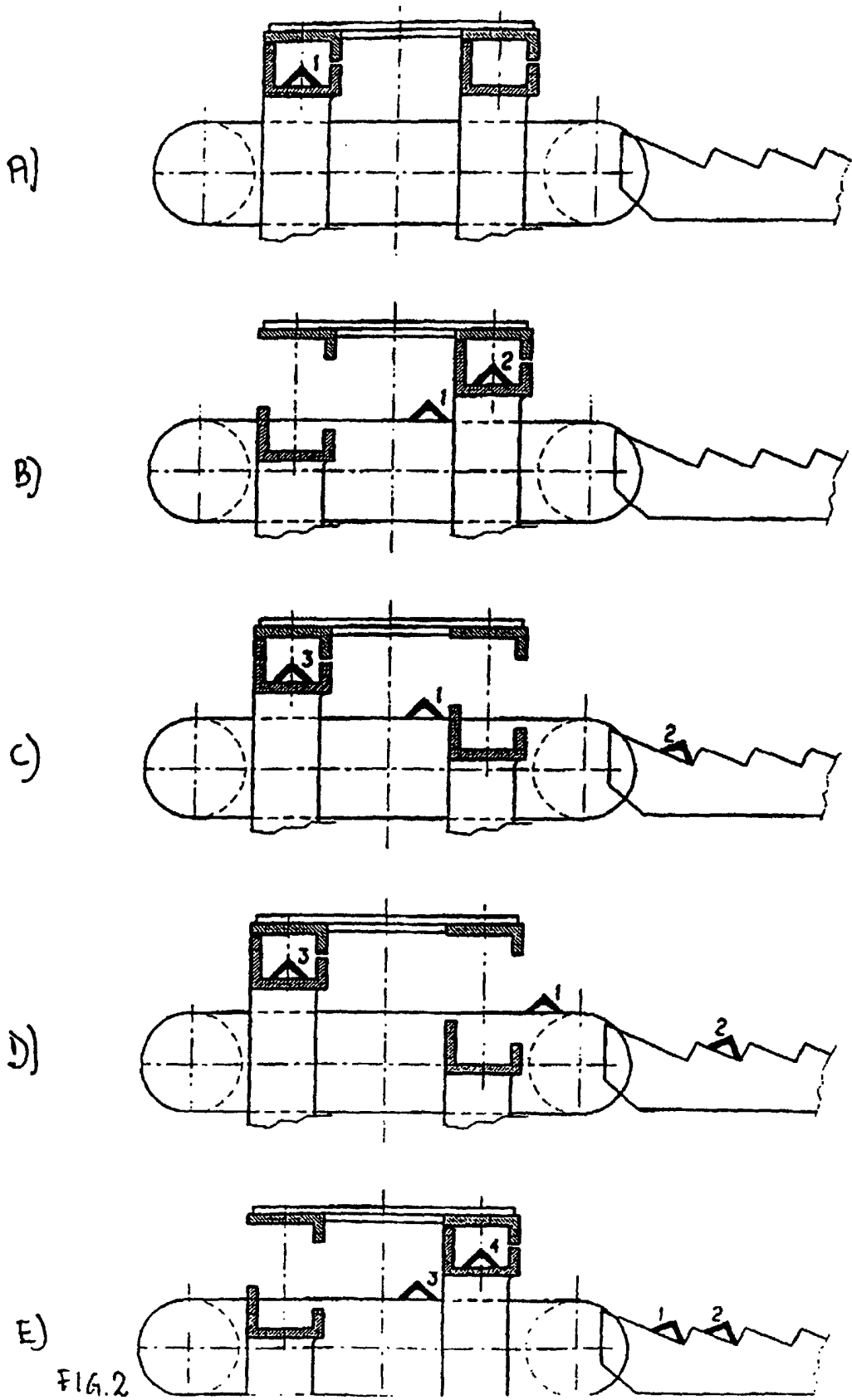
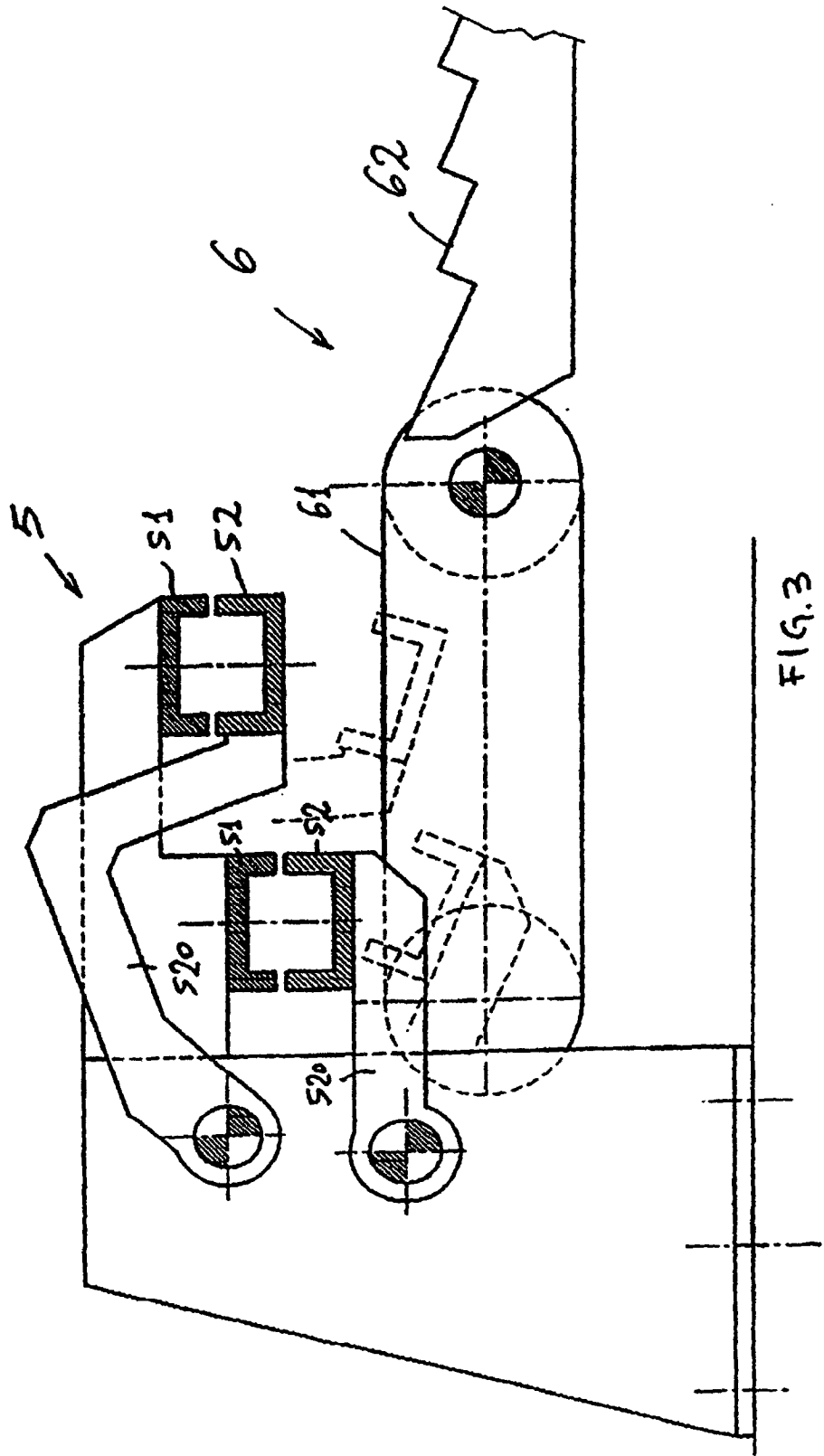


FIG. 1





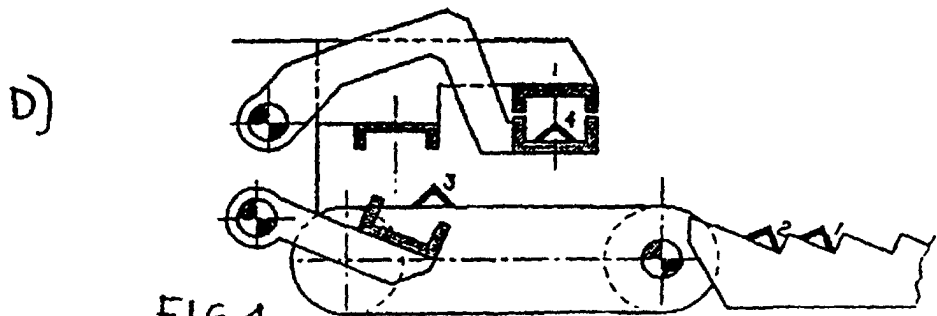
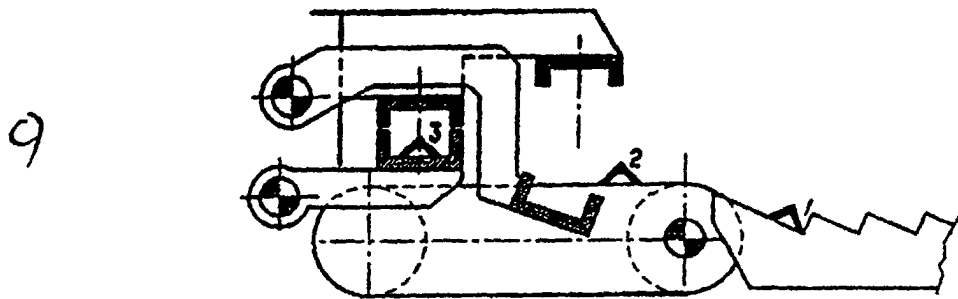
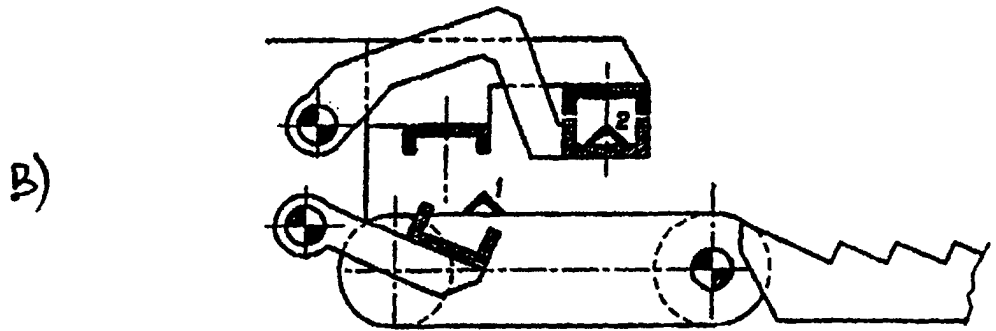
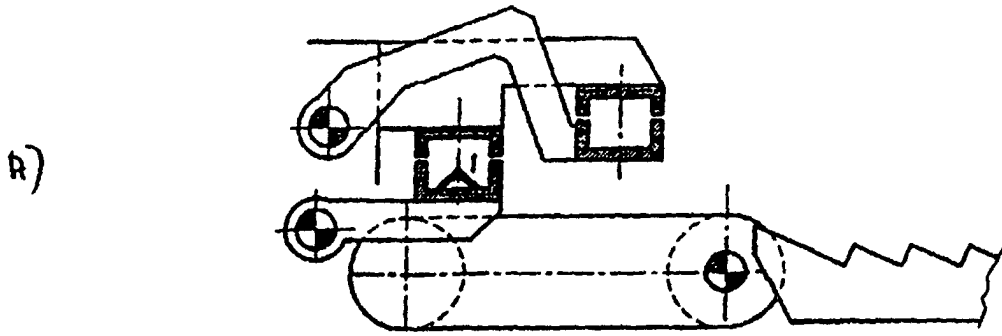


FIG. 4