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54 Device to park the dummy bar downstream from the extraction and straightening group.

57 Device to park the dummy bar (11) that can be used in continuous casting machines with a casting line (17) having rollers (18) which stretches between the ingot mould (16) and the substantially horizontal outlet and comprises an extraction and straightening group (12) located at said outlet, said device including in combination:

- a swinging supporting structure (21) to park the dummy bar (11), said structure (21) being sustained revolvably at its upper side downstream from said extraction and straightening group (12) and being able to rotate between a raised position of rest and a lowered working position,
- oscillator means (24) which can carry out rotation of said supporting structure (21) between its position of rest and working position, and
- means (25) which can pull and clamp the dummy bar (11) on said supporting structure (21) and are anchored to the same said structure (21), whereby possible known means are also envisaged for controlling and coordinating the actuation of said oscillator means (24) and said means (25) which pull and clamp the dummy bar (11).

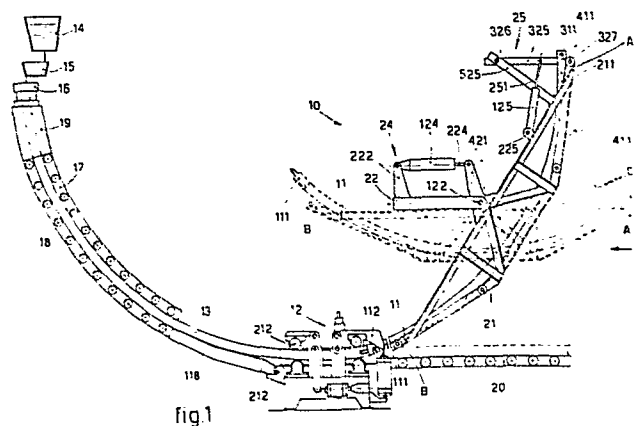


fig.1

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1. Description of the invention entitled:

"DEVICE TO PARK THE DUMMY BAR DOWNSTREAM FROM THE EXTRACTION
AND STRAIGHTENING GROUP"

in the name of DANIELI & C. OFFICINE MECCANICHE SpA.
5. at Buttrio

This invention concerns a parking device for the dummy
10. bar normally used to withdraw the continuous billet in conti-
nuous casting plants.

To be more exact, the invention concerns a structure
that swings between two positions, whereby the first position
is used to park the dummy bar during its phase of rest, where-
15. as the second position is employed to support and guide said
dummy bar during the phase of initial insertion thereof and
also during the phase of starting the continuous billet (here-
inafter called "billet").

In the art of continuous casting the molten metal is
20. conveyed in a wheeled ladle or by a crane to an ingot mould
having an open bottom and suitable shape and located above
the casting line.

Said ingot mould receives the molten metal from said
ladle through a pre-heated tundish and discharges said metal
25. downwards through its open bottom in a partly solidified con-

continuous flow of a pre-set section; said flow becomes gradually solidified on the casting line with the help of suitable cooling means located in the first part of said casting line.

It is necessary to close the open bottom of the ingot mould temporarily before beginning the casting so as to prevent a disorderly flow of the metal.

The open bottom of the ingot mould is closed by means of a dummy bar, which is inserted by a group of entraining rollers into the open bottom of the ingot mould, and any gap created between the dummy bar and the open bottom is sealed with suitable refractory material.

The first part of the metal poured into the ingot mould thus closed is left to solidify partially so as to become united to the head of the dummy bar.

Following on the filling of the ingot mould and the oscillation thereof to hinder the formation of a crust of metal on its inner walls, the entraining rollers are actuated and arrange to pull the dummy bar and withdraw the billet connected to the end of said bar.

The dummy bar is detached from the billet thereafter and is parked in a suitable position near the extraction group and discharge line, along which the cast metal goes on travelling for the rolling processes which follow thereafter.

Said dummy bar, now having a new head, is taken once again from its parking device at the beginning of the next casting and the foregoing procedure to start the billet is followed once more.

Known dummy bars are substantially of three kinds: rigid bow-shaped dummy bars, semi-rigid bow-shaped dummy bars consisting of a number of articulated segments and flexible chain-type dummy bars.

The known systems to park rigid dummy bars or semi-rigid dummy bars in segments require a fixed supporting struct-

ture which is shaped like a bow, lies on the vertical plane of the casting line, stretches upwards from the extraction group and ends at a point having a height not less than the height of the ingot mould.

5. Patents US 3,930,533 (Rokop), US 3,433,287 (Greenberger) and US 3,344,844 (Reinfeld and others), which describe systems for parking dummy bars of this type, reveal some problems relating to the bulky construction, heavy weight and unsatisfactory lay-out of said fixed bow-shaped structures.

10. Patent US 3,682,233 (Rokop and others) claims a system to park flexible dummy bars which consists of a substantially upright fixed structure with a horizontal tract, the structure being located above the extraction group and casting line, whereby a secondary entraining group is lodged in the horizontal tract so as to move the dummy bar within said bearing structure.

Notwithstanding the advantages offered by this system by way of a lesser bulk than in said known systems, yet this system still takes up a great deal of space and is only fit for flexible dummy bars.

Indeed, the structure proposed in this patent stretches vertically above the ingot mould and takes up much useful space both near the extraction group and near the upper part of the casting plant.

25. One problem common to the foregoing known parking systems lies in the fact that the new head of the dummy bar can be fitted only near the extraction group.

It is the purpose of our invention to embody a device to park dummy bars which swings between a raised position of rest and a lower working position and which is able to take up less space than known parking systems and to be lighter and cheaper to make.

One advantage lies in the fact that the invention enables

1. a new head to be fitted to the dummy bar in its raised position far from the extraction group during the phase of rest. .
This leads to a great saving of time and therefore to high .
output. .

5. Another advantage is the free space created near the extraction group and discharge line during casting; this space .
can be employed for other more useful purposes. .

Our invention is therefore embodied with a device to .
park dummy bars which can be used in continuous casting mach- .
10. ines with a casting line on rollers stretching between the in-
got mould and the substantially horizontal outlet and compris-
ing an extraction and straightening group located at said out-
let, said device being characterized by including in working .
combination: .

15. - a swinging supporting structure to park the dummy bar, where-
by said structure is revolvably supported in its upper part
downstream from said extraction group and can rotate between
a raised position of rest and a lowered working position, .
- oscillator means able to rotate said supporting structure .
20. between its position of rest and working position, and .
- means able to pull and clamp the dummy bar on said support-
ing structure, said means being anchored to said structure,
whereby means are also envisaged for controlling and coordin-
ating the actuation of said oscillator means and said means .
25. which pull and clamp the dummy bar, in relation to the overall
working of the casting machine. .

In a preferential embodiment of the invention said sup- .
porting structure consists of a cradle structure with a sub- .
stantially bow-shaped profile and with a U-shaped section, .
30. whereby said cradle structure comprises a tubular element .
through which the rotation shaft passes and which is solidly .
fixed to the upper part of the two vertical sides of said .
structure, and whereby the cradle structure includes one or .

1. more integral levers stretching outwards and radially in re-
lation to said tubular element and cooperating at their end
with said oscillator means anchored to the fixed structure
of the machine on which said cradle structure pivots, and
5. whereby said cradle structure in its turn bears means to pull
and clamp the dummy bar which are able to effect any displace-
ments of the dummy bar and the clamping thereof during the
phase of rest.

The pulling of the dummy bar along the casting line and
10. the loading thereof on the supporting cradle structure are
carried out advantageously by the group which extracts the
continuous billet.

We shall describe hereinafter a preferential embodiment
of our invention as a non-restrictive example and shall refer
15. to the attached tables, wherein:

Fig. I gives a side view of the continuous casting machine
with the cradle structure to park the dummy bar accor-
ding to the invention;

Fig. 2 gives a view in the direction of the arrow C of Fig. I
20. and shows only said cradle structure in its horizontal
position where said structure is shown in Fig. I with
lines of dashes in its position of rest;

Fig. 3 shows the tail of the dummy bar.

In the figures the same parts or parts having the same
25. functions bear the same reference numbers.

In Figs. I and 2, the device I0 which parks the dummy bar
II is located downstream from and above the group I2 that ex-
tracts and straightens the true billet or continuous billet
I3 in a continuous casting machine consisting of a ladle I4,
30. tundish I5 and an ingot mould I6 having an open bottom and
positioned on the casting line I7 equipped with rollers I8
and with a curved guide II8, said line I7 having in its first
tract a cooling chamber I9, whereby there could be an oscil-

1. lating group which acts on said ingot mould I6.

Downstream from the group I2 extracting and straightening the billet is positioned the roller discharge table 20 on which the billet runs after the dummy bar has been detached with known unfastening means generically indicated with II2.

In the example shown said group that unfastens the dummy bar II is part of the extraction and straightening group I2 and acts so that the head of the dummy bar anchored to the actual billet I3, when unfastened, is separated from said dummy bar II, which goes without its head onto the parking device IO and lets the actual billet run along the roller discharge table 20 for the processing phases thereafter.

The parking device IO, shown in Figs. I and 2 and the purpose of our invention, consists of a swinging supporting structure 2I having a cradle-shaped structure I2I with a substantially bow-shaped bottom equipped with a plurality of idler rollers 22 and with two upright sides 22I connected together at their end with crosswise elements (not shown here), whereby a crosswise tubular element 32I is envisaged and is anchored at its ends to said upright sides 22I in their upper part. Thus the cradle structure I2I has a substantially U-shaped section.

Said tubular element 32I has at its ends two levers 42I which stretch out radially in relation to said tubular element 32I so as to form a fork together with said tubular element 32I.

Said levers 42I are preferably tilted in relation to the upper edge of said upright sides 22I.

The two sides 22I, tubular element 32I and two levers 42I form the unitary cradle structure I2I. Said cradle structure I2I is arranged revolvably on the bearing structure 22 of the machine at a point above the discharge line 20 and just downstream from the extraction and straightening group I2.

Said anchorage point consists of a pivot I22 on which the

1. tubular element 32I of the cradle I2I revolves. Figs. I and 2
show a preferential but not restrictive embodiment of the
oscillator means 24 which can actuate the rotation of the cra-
dle structure 2I between a horizontal raised position of rest
5. shown with lines of dashes and another sloped working position
in which the end B of the cradle structure lies in correspond-
ence with the outlet of the extraction and straightening group
I2.

In our example said oscillator means 24 consist of a hy-
10. draulic or pneumatic jack I24 anchored at one end to the bear-
ing structure of the machine 22 by a suitable support 222,
while the stem 224 of said jack I24 pivots at 322 on a cross-
wise shaft 425 solidly fixed at its ends to the free end of
each of said levers 42I, so that said stem 224 can actuate
15. the rotation of the cradle structure I2I around said pivot
I22.

According to the invention said cradle structure I2I also
comprises means 25 suitable for pulling and clamping the dum-
my bar II on said cradle structure I2I.

20. Said pulling and clamping means 25 only start working
when the dummy bar is out of the reach of the extraction and
straightening group I2, and serve to pull the dummy bar II
and hinder the return thereof, after its head has been detach-
ed, to said extraction and straightening group I2.

25. In our example said pulling and clamping means 25 com-
prise a jack I25 pivoting at one end at 225 on the cradle
structure I2I; said jack I25 cooperates with an arm 325 swing-
ing at 326 on a shaft 426 anchored at its ends to two supports
525 which are an integral part of the cradle structure I2I.

30. Said cooperation between the swinging arm 325 and jack
I25 takes place through the articulation of the stem 25I at
the point 252 located between the free end 327 of the arm 325
and the point of rotation 326 of said arm 325.

1. The free end 327 of said arm 325 is a hook-wise end and .
can lodge itself in an upright notch 2II located lengthwise .
in the tail 4II of the dummy bar II and can cooperate with a .
pin 3II located crosswise within said notch 2II, as shown in .
5 Fig.3.

Said pulling means 25 are required to provide a thrust .
only in an upwards direction and are inactive when the dummy
bar has to be inserted in the extraction and straightening .
group, to which the dummy bar II descends, taking with it the
10 free end 327 of the swinging arm 325, from which it is automa-
tically detached when said arm 325 reaches the stop at the .
lower end of its run.

It is best for us to emphasise that the clamping action .
of the means 25 is only necessary when the cradle structure .
15 I2I is in its sloping position since in the position of rest .
the dummy bar stays still within said structure, where the .
fitting of its head III is prepared in a raised working sta- .
tion near which the end B of the cradle structure I2I halts..

When the dummy bar II is to be inserted during the ready-
20 ing of the machine at the beginning of casting, the cradle .
structure I2I, taking with it the dummy bar II complete with .
a removable head III, is driven by the oscillator means 24 so
as to take up its working position.

Said bar II stays attached to said cradle structure I2I .
25 owing to the clamping action of the means 25.

When the working position is reached, the jack I25 is .
disactivated and enables the arm 325 to revolve clockwise .
under the action of the weight of the dummy bar, which inserts
itself in the extraction and straightening group I2 and enters
30 upon its field of work.

The group I9 pulls the dummy bar II along the casting .
line I7 until its head III is inserted into the bottom of the
ingot mould I6.

1. When the first casting phase ends, the dummy bar II, of which the tail has stayed during said phase between the entraining rollers 2I2 of the extraction and straightening group I2, is withdrawn and thrust along the cradle-wise parking structure I2I, which is lying in its working position.

When the head III of the dummy bar reaches said extraction rollers 2I2, the pin 3II provided in the tail 4II of the dummy bar II lies near the bottom dead centre of the hook-like end 327 of the swinging arm 325, said end 327 being now in a raised and retracted position.

The jack I25 now starts working, rotates said arm 325 anti-clockwise and forces said arm to hook itself onto the pin 3II of the dummy bar II and to pull said dummy bar II upwards while its head III is still anchored to the billet I3.

15. When said head III reaches the means II2 that unfasten the head, the dummy bar II is freed in a known way and continues its path along the cradle structure I2I until the swinging arm 325 reaches its top dead centre, where said arm 325 is clamped by the jack I25 and at the same time hinders the return of the dummy bar II downwards.

The actual billet I3, instead, goes on moving along the roller discharge table 20.

The oscillator means 24 now start working and, by the actuation of the two-way jack I24, revolve the cradle structure I2I and therewith the dummy bar into the raised parking position or position of rest, where a new head III is fitted and made ready for the next casting.

We have described herein a preferential embodiment of the invention, but further variants are possible.

30. The shape and constructional features of the swinging cradle structure I2I can be varied, and other kinds of actuation means can be envisaged for performing the action of the oscillator means 24 and pulling and clamping means 25, said

other kinds of actuation means being able to cooperate with
flexible dummy bars of the types having articulated segments
or chains, the whole being possible for a person skilled in
this field without departing thereby from the scope of the in-
ventive idea of this invention.

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C L A I M S

1.

I. Device to park the dummy bar (II) that can be used in continuous casting machines with a casting line (I7) which employs rollers (I8), stretches between the ingot mould (I6) and the substantially horizontal outlet and comprises an extraction and straightening group (I2) located at said outlet, said device being characterized by including in combination and mutual cooperation and coordination:

10. - a swinging supporting structure (2I) for parking the dummy bar (II), said structure (2I) being revolvably sustained at its upper side downstream from said extraction and straightening group (I2) and being able to rotate between a raised position of rest and a lowered working position,
15. - oscillator means (24) which can carry out rotation of said supporting structure (2I) between its position of rest and working position, and
- means (25) which can pull and clamp the dummy bar (II) on said supporting structure (2I) and are anchored to the same
20. said structure (2I),
- whereby possible known means are also envisaged for controlling and coordinating the actuation of said oscillator means (24) and said means (25) which pull and clamp the dummy bar (II).

25. 2. Device as in Claim I, characterized by the fact that said swinging supporting structure (2I) consists of a cradle structure (I2I) which has a substantially bow-shaped profile and U-shaped section and pivots at its upper side on the fixed bearing structure (22) of the casting machine.

30. 3. Device as in Claim 2, characterized by the fact that said cradle structure (I2I) has two upright sides (22I) which are connected together in their upper part by a tubular element (32I) and at their lower end by a bottom consisting of

1. rollers (22).

4. Device as in Claim 3, characterized by the fact that said tubular element (32I) pivots on a pin (122) sustained crosswise by the bearing structure (22) of the machine.

5. Device as in Claim I or in Claim 2 or 3, characterized by the fact that said cradle structure (12I) has one or more actuation levers (42I) stretching away from the axis of rotation of said structure (12I) and anchored at one end to the outer surface of said tubular element (32I).

6. Device as in Claim I or in one or another of the Claims thereafter up to Claim 5 inclusive, characterized by the fact that said actuation levers (42I) are tilted in relation to the upper edges of said upright sides (22I) of said cradle structure (12I).

7. Device as in Claim I and in one or another of the Claims thereafter, characterized by the fact that said oscillator means (24) consist of a jack (124) pivoted at one end on the bearing structure (22) of the machine and having the free end of its stem (224) pivoting at (322) on a crosswise shaft (425) anchored at its ends to the free ends of said actuation levers (42I).

8. Device as in Claim I and in one or another of the Claims thereafter, characterized by the fact that said pulling and clamping means (25) comprise a jack (125) pivoted at one end at (225) on the cradle structure (12I), whereby the stem (25I) of said jack (125) is pivoted at an intermediate point on a swinging arm (325) pivoted at one end (326) on a crosswise shaft (426) anchored at its ends to two upright supports (525) solidly fixed to said cradle structure (12I), and whereby the free end (327) of said swinging arm (325) follows an arc tangential to the lengthwise axis of said cradle structure (12I).

9. Device as in the Claims hereinbefore, characterized

by the fact that said free end (327) of the swinging arm (325) comprises, in its edge opposite the outer end (A) of the cradle structure (12I), a hook-like profile which can cooperate with a pin (3II) positioned crosswise within a lengthwise groove (2II) machined in the tail (4II) of the dummy bar (II).

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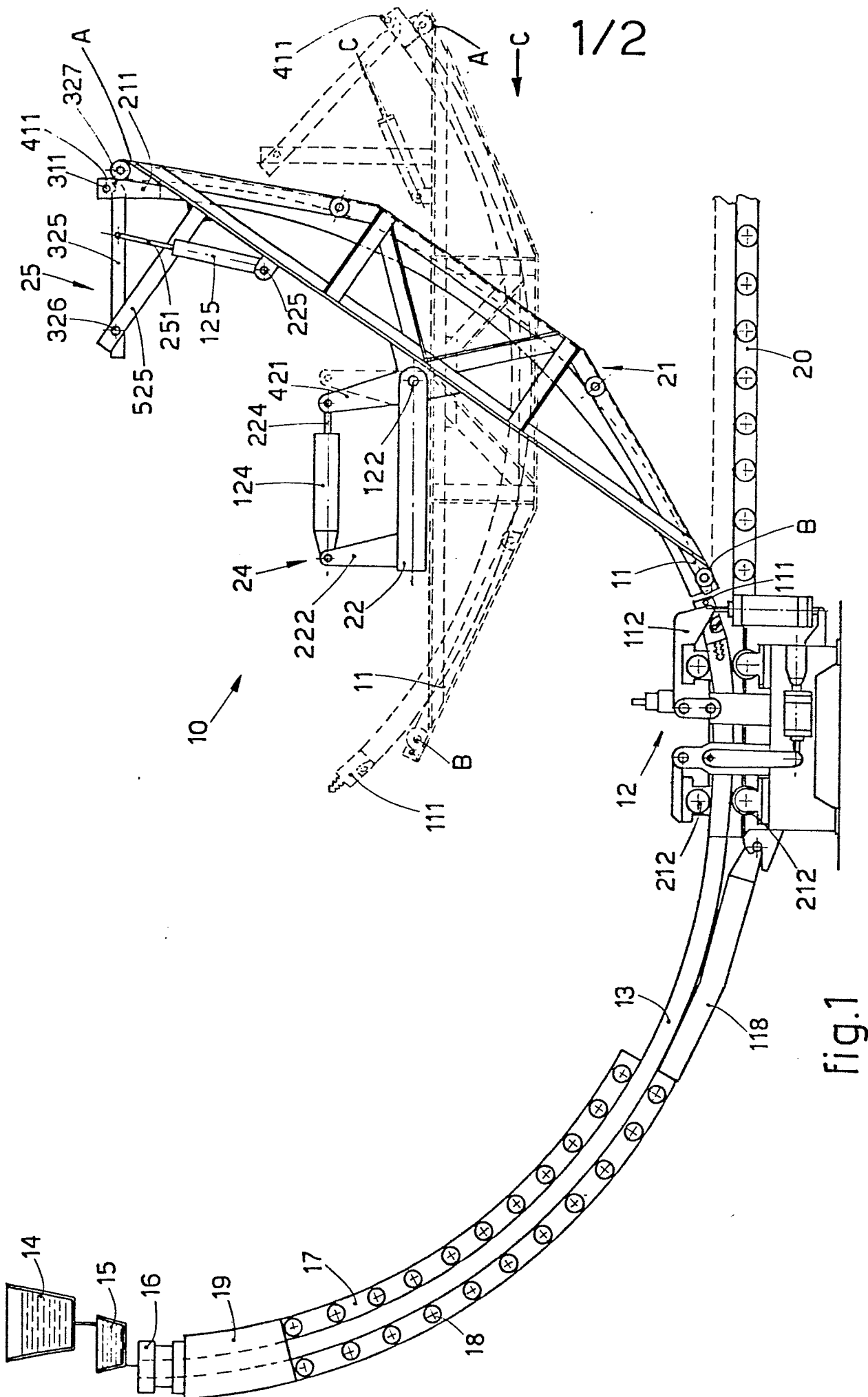


fig.1

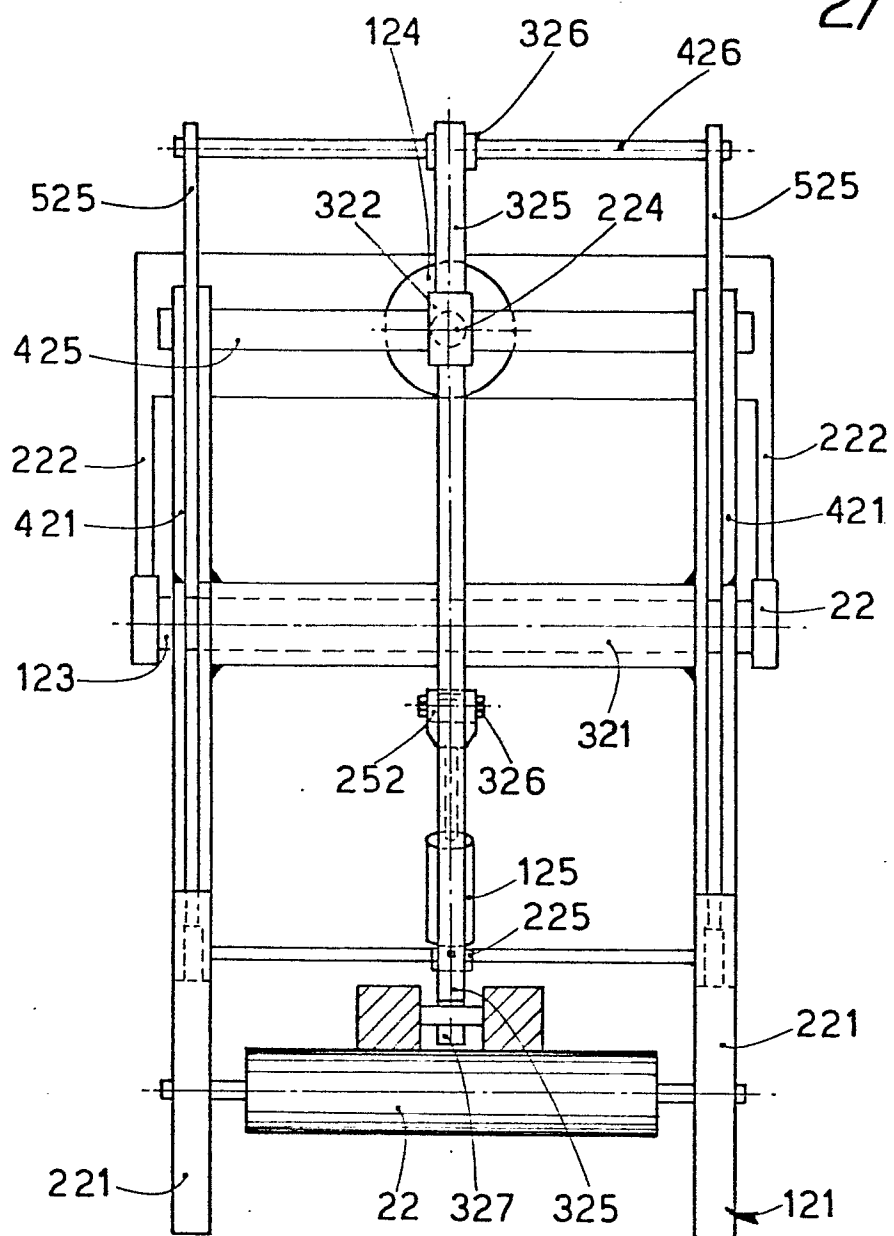


fig. 2

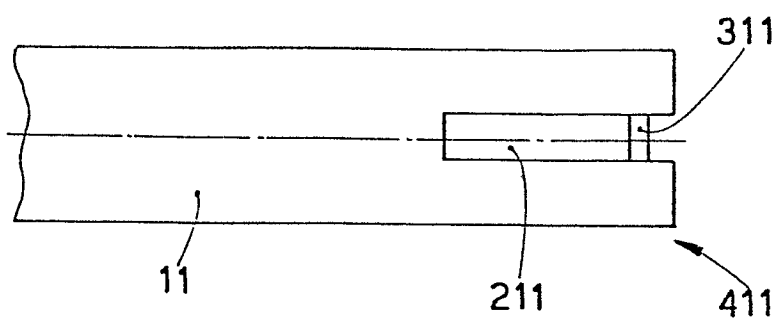


fig. 3



European Patent
Office

EUROPEAN SEARCH REPORT

0066550

Application number

EP 82 83 0110.1

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	<u>DE - B2 - 2 847 142</u> (CONCAST INC.) * claim 1 * & <u>US - A - 4 150 710</u> ---	1	B 22 D 11/08 B 22 D 11/14
A	<u>US - A - 3 426 835</u> (MICHELSON) * claim 1 * ---	1	TECHNICAL FIELDS SEARCHED (Int.Cl. ³)
D,A	<u>US - A - 3 344 844</u> (REINFELD et al.) * fig. 1 * ---	1	
D,A	<u>US - A - 3 433 287</u> (GREENBERGER) * claim 1 * ----	1	
			B 22 D 11/00
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons
Y The present search report has been drawn up for all claims			&: member of the same patent family, corresponding document
Place of search		Date of completion of the search	Examiner
Berlin		06-08-1982	GOLDSCHMIDT