

641762 CONVENTION

AUSTRALIA

Patents Act 1990

REQUEST FOR A STANDARD PATENT

I/We being the person(s) identified below as the Applicant, request the grant of a patent to the person identified below as the Nominated Person, for an invention described in the accompanying standard complete specification.

[70,71]Applicant and Nominated Person:

Norsk Hydro A.S
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[54]Invention Title:

MACHINE FOR REMOVING SLAG AND METAL REMINDERS FROM CRUCIBLES

[72]Names Of Actual Inventors:

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[31,33,32]

Details of basic application(s):-

902275

NORWAY

NO

23 May 1990

I am/We are not an opponent or eligible person described in section 33-36 of the Act

21 May 1991

PHILLIPS ORMONDE & FITZPATRICK
Attorneys for:
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By:

David B Fitzpatrick

Our ref : 216731

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AUSTRALIA

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NOTICE OF ENTITLEMENT


I, DAVID JOHN TADGELL

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being Patent Attorneys for NORSK HYDRO A.S. the applicant, state the following:

1. The nominated person (applicant) is entitled to the grant of a patent as assignee of the actual inventor(s).
2. The nominated person (applicant) is entitled to claim priority from the basic convention application as applicant of the said application.
3. The basic convention application was the first made in a Convention country in respect of the invention the subject of the application.

Dated: 21 May 1991


.....(Signature)
(DAVID JOHN TADGELL)

To: The Commissioner of Patents

PHILLIPS ORMONDE & FITZPATRICK
Our Ref: 216731

AUSTRALIA

Patent Act

641762

C O M P L E T E S P E C I F I C A T I O N

(ORIGINAL)

Class Int. Class

Application Number:

Lodged:

Complete Specification Lodged:

Accepted:

Published:

Priority:

Related Art:

Names(s) of Applicant(s):

NORSK HYDRO A.S.

Actual Inventor(s):

Leif Meisingseth, Jorn Bjarne Lilleby

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Complete Specification for the invention entitled:

MACHINE FOR REMOVING SLAG AND METAL REMINDERS FROM CRUCEABLES

The following statement is a full description of this invention, including the best method of performing it known to applicant(s):

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The present invention relates to a machine for removing slag and metal remainders from casting ladles or crucibles, including a frame on which is provided a carriage with a rotating cutter means being movable in an upwardly inclining direction, and one in connection with the frame provided means for tilting a crucible from a lower loading position to an upper working position where the axis of the crucible is coaxial with the axis of the rotating tool.

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10 Casting ladles or crucibles for metal melts will, after being used, have remainders of slag and metal left on their lining of refractory material. Such remainders have to be removed before the ladles can be used.

15 Formerly, the ladles were cleaned manually by chipping or by machining with simple air driven machines, but such work was hard, time consuming and damaging to the workers health. Besides the refractory linings of the ladles were often damaged, and the total costs with the manual cleaning were thus high.

20 Later on mechanical devices have been developed, but many of these have not been commercially exploited.

US patent Nos. 2.911.662 and 2.963.725, and NO patent No. 147.940 all show devices for cleaning casting ladles or



crucibles having a movable rotating cutter head. Crucibles to be cleaned are placed on a support having a direction of rotation which is opposite to the rotating cutter head, and the cutter head is provided in a position being eccentric to the axis of the rotation for the crucible. The object with such arrangement is to ensure that all metal and slag remainders are removed from the bottom of crucibles.

It is however a major disadvantage with the known devices that the tools are rapidly worn out. This in turn results in that the tools have to be exchanged after a short period of time, i.e. 15-20 cleaned crucible for each set of tools. Further, it is a disadvantage that the known devices are expensive, due to the fact that two different driving units are used, one for the cutter head and another for rotation of the crucible. Still further it is a disadvantage with the known devices that they have a construction height which is relatively high. Particularly this is the case with cleaning device according to NO patent No. 147.940 where the construction height is more than two stories high and where the room in which the device is to be placed have to be specially designed.

US patent No. 4.153.965 discloses a cleaning device similar to the ones described above, but which is provided with a "full profile" cutter head and where the crucible is held in a stationary position. With the term "full profile" is meant that the diameter of the cutter head corresponds to the inner diameter of the crucible. The cutter head is provided with three tools or shears being placed at a distance from one another along its periphery. In addition the cutter head is provided with a separate cutter unit which has for its object to clean the bottom completely. The separate cutter unit is eccentrically disposed relative to the cutter head axis and is driven via a planetary gear.

It is a major disadvantage with this known device that it is complicated and mechanically weak in relation to the great



strain it is exposed to in connection with the cleaning operation, and this may well be one of the reasons why it is not commercially exploited. There is further another disadvantage with the device according to US patent No. 5 4.153.965 and that is the construction height which is high due to the steep inclination angle for the rotating cutter means.

It is an object of the present invention to provide an improved machine for cleaning crucibles .

According to the invention there is provided a machine for removing slag and metal remainders from crucibles or casting ladles, including a frame wherein is disposed a carriage being movable in an upwardly inclining direction on guides or rails, which carriage is provided with cutter means having a tool head, and holder means for a crucible which is tiltable from a first position where the crucible can be placed on the holder means to a second, operating position where the crucible is coaxial with the cutter means, wherein the cutter means is of the full profile type and is provided with a plurality of first tools which are spaced apart along the periphery of the tool head, and second tools which are spaced apart in the radial direction on the front part of the tool head, which second tools are arranged so that the bottom of the crucible becomes substantially completely cleaned, and that the tool head is provided with through-going holes in the axial direction.

In a preferred embodiment of the invention the plurality of second tools are arranged such that the wall as well as the bottom of the crucible becomes completely cleaned.

With the here defined invention having a plurality of first and second tools, an effective cleaning of the crucibles is achieved, and the load or strain on each of the tools are relatively low. This in turn reduces the wear of the tools. Thus, in connection with the testing



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of the machine it has been revealed that the lifetime of the tools is equivalent to the cleaning of 1000 crucibles or ladles. This implies that the maintenance costs are vastly reduced.

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The through-going openings in the cutter head are necessary for the slag and metal remainders being scraped off by the tools to be transported backwards and out of the crucible.

According to a preferred embodiment of the invention,

5 the cutter head may be provided with screw threads directly behind the tools whereby the slag and metal remainders are more effectively transported out of the crucible. Hereby the inclination angle for the cutter head may be reduced, and the construction height correspondingly lowered.

10 The invention will now be further described by way of example only and with reference to the drawings in which;

Fig. 1 shows a longitudinal view of the machine according to the invention,

15 Fig. 2 shows a front view of the cutter head for the machine in an enlarged scale,

Fig. 3 shows a tool for the cutter head shown in Fig. 2.

20 The machine according to the invention comprises as shown in Fig. 1 three main components, namely a frame 8, a carriage or a slide 5 with cutter means 19, and means 9 for holding and tilting crucibles or casting ladles.

25 The cutter means 19 is fixed to a shaft 2 which is provided on a carriage 5. The shaft is driven by a hydraulic motor 1. Further the carriage is slidably mounted on the frame 8 by means of solid wheel guides 6, 7 disposed on each side of the frame.

A ram 4 is provided to move the carriage in each direction. The cutter means 19 comprises a cutter head 20 and a conveying screw part 3, cfr. later section. The carriage with the cutter



means is arranged at an angle (is inclined) relative to the frame. This is done to more easily transport the slag and metal remainders out of the crucible during the cleaning operation.

5 With regard to the holder means 10 for the crucible 9, this is tiltably provided at the front end of the frame by means of a ram 14. The tiltable holder means 10 can be tilted from a loading/unloading position, where a crucible (dotted lines) can be placed on or taken off the holder means, to an operating
10 position (drawn lines) where the axis of the crucible is coaxial with the axis of the cutter head. The crucible is firmly held in its operating position by means of locking pins 12.

In conjunction with the holder means 10 is provided a support
15 for a mould 11. In situations where warm crucibles are cleaned, the mould can be moved under the crucible shown in Fig. 1 such that any remaining melted metal in the crucible may be discharged into the mould before the cleaning operation is started. Under the mould is provided a container
20 13 for collecting slag and metal reminders being scraped out of the crucible.

Besides, above the cutter means is provided a suction cover 16 which is connected to an air suction pipe 17. The suction cover 16 can be moved sideways along rails 15 in connection with
25 maintenance of the cutter means. The space under the cover 16 may wholly or partly be built in to reduce or eliminate the escape of dust.

The cutter head 20 for the cutter means 19 is further shown in
30 Fig. 2 in a larger scale. It is provided with a plurality of tool holders 21 which are fixedly attached to grooves 22 in the cutter head by means of screws. To each tool holder 21 is releasably attached a tool or shear 24 by means of second screws 23.



In the example shown in Fig. 2 there is provided a plurality of first tools (totally 12) along the periphery of the cutter head and a plurality of second tools (totally 8) diametrically across the cutter head along lines a-a and b-b respectively.

5 The tools are so arranged and spaced apart from one another that the whole bottom of the crucible will be cleaned during the cleaning operation. Between the tools is provided through-going holes 25, whereby slag and metal remainders being scraped out from the crucible can be transported backwards through

10 the holes and out of the crucible. The screw part 3 of the cutter means (see Fig. 1) removes the remainders more effectively.

Fig. 3 shows an example of a specific tool design according to the invention. As will be apparent from the figure, the edges

15 on each side of the tool has a sinusoidal configuration. The object with such configuration is to reduce the strain on the tools under the cleaning operation. Besides, the special design makes it possible to turn the tools so that each side may be used. Hereby the lifetime of the tools may be prolonged

20 essentially.

The machine according to the invention functions as follows:

A crucible 9 is transported by means of a truck and is placed on the holder means 10. The holder means is thereafter tilted by means of a ram to its upper, operation position where the

25 axis of the crucible is in co-alignment with the axis of the cutter head. The crucible is warm as it just has been used, and any remaining melted metal is discharged to the mould 11 which has been moved to a position shown in Fig. 1. When there is no more melted metal in the crucible, the mould is moved

30 sideways, and locking pins 12 (two on each side) holds the crucible in a firm position.

The cutter means 19 can now be started by an operator. As it begins to rotate, the ram 4 simultaneously moves the carriage



with the cutter means towards the crucible. If the resistance or rather the forces acting on the cutter head exceed a predetermined level, the hydraulic pressure for the cutter head motor is reduced automatically towards zero, and the carriage
 5 with the cutter means is pulled back to its initial position. Hereby any breakage of the cutter means is avoided.

Normally, the cleaning operation will take 3-6 minutes, and the cutter means is returned to its initial position. Slag and metal remainders being scraped off the wall and bottom of the
 10 crucible are forced out through the holes 25 in the cutter head, via the screw part 3 and discharged into the container 13. After the cleaning operation has been terminated, the locking pins are released, and the holder means 10 is returned back to its initial position.

15 The cleaning operation is completely controlled by means of an electronic, logic control. Anyway, there is provided a platform 18 with a shield 26 for an operator who stops and starts the machine.

The machine according to the invention was initially designed to clean hot crucibles for aluminium metal. It has, however,
 20 been proved that the machine may also be used for removing slag and metal remainders from cold crucibles as well as other metals.



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A machine for removing slag and metal remainders
 from crucibles or casting ladles, including a frame
 5 wherein is disposed a carriage being movable in an
 upwardly inclining direction on guides or rails, which
 carriage is provided with cutter means having a tool head,
 and holder means for a crucible which is tiltable from a
 first position where the crucible can be placed on the
 10 holder means to a second, operating position where the
 crucible is coaxial with the cutter means, wherein the
 cutter means is of the full profile type and is provided
 with a plurality of first tools which are spaced apart
 along the periphery of the tool head, and second tools
 15 which are spaced apart in the radial direction on the
 front part of the tool head, which second tools are
 arranged so that the bottom of the crucible becomes
 substantially completely cleaned, and that the tool head
 is provided with through-going holes in the axial
 20 direction.

2. The machine according to claim 1, wherein the cutter
 means is provided with a screw formed part.

25 3. The machine according to any one of claims 1 to 2,
 wherein the second tools are disposed diametrically along
 lines (a-a and b-b) being in a right angle relative to one
 another.

30 4. The machine according to any one of claims 1 to 3,
 wherein the tools are flat and are provided with cutting
 edges having a sinusoidal configuration.

35 5. A machine for removing slag and metal remainder from
 crucibles or casting ladles substantially as herein
 described and illustrated.

DATED: 18 July 1993

NORSK HYDRO A.S.

By PHILLIPS ORMONDE & FITZPATRICK

Patent Attorneys per:

David B Fitzpatrick



Abstracts

Machine for removing slag and metal reminders from cruceables or casting ladles, comprising a frame (8) whereon is disposed a carriage being movable in an upwardly inclining direction on guides or rails. The carriage is provided with cutter means (19) having a tool head (19). A holder means (10) for a cruceable is tiltable from a first position where the cruceable can be placed on the holder means to a second, operating position where the cruceable is coaxial with the cutter means.

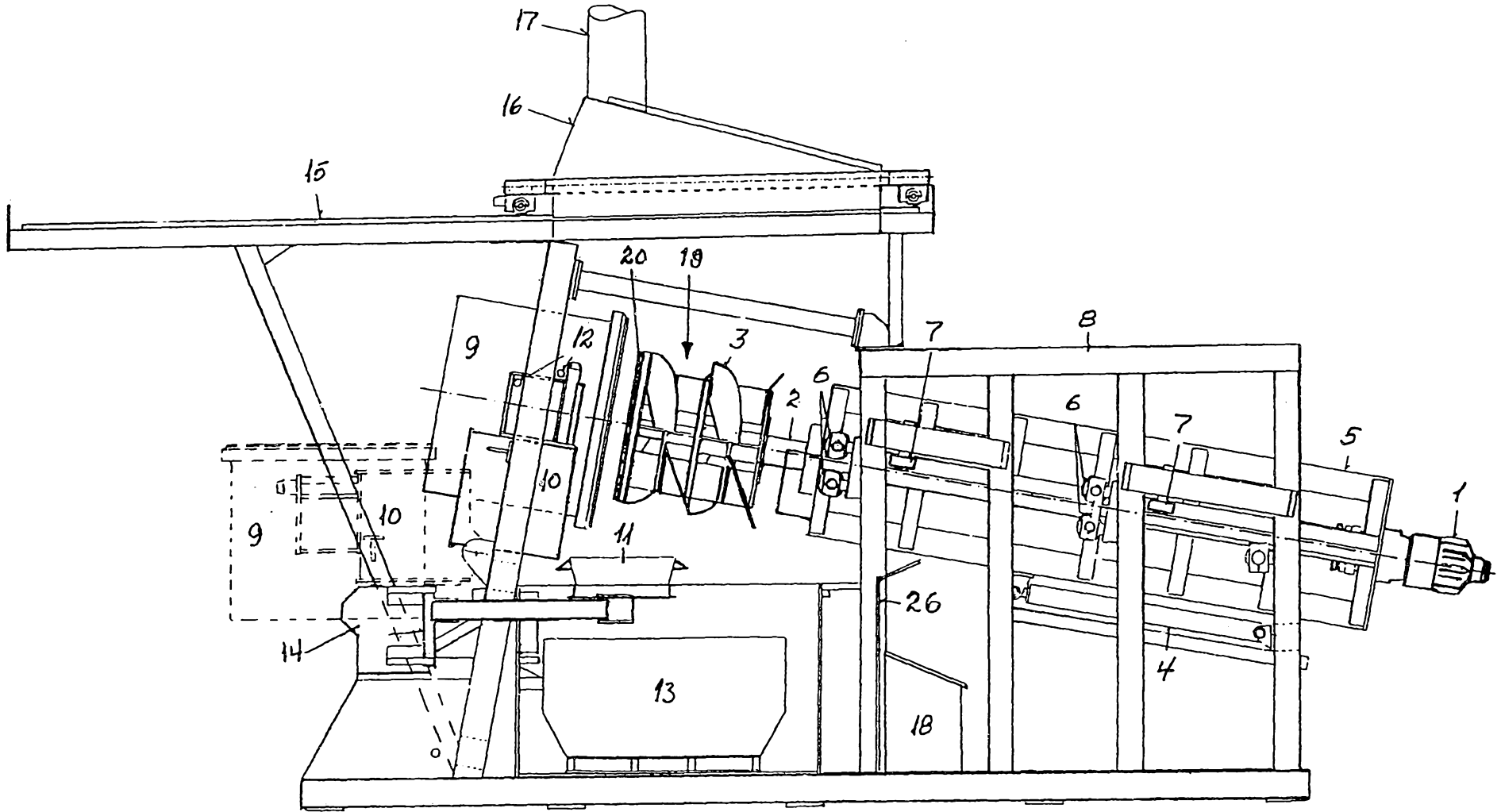
The cutter means is of the full profile type and is provided with a plurality of first tools (24a) which are spaced apart along the periphery of the tool head, and second tools (24b) which are spaced apart in the radial direction on the front part of the tool head. The second tools are arranged so that the bottom of the cruceable becomes completely cleaned. Further the tool head is provided with through-going holes (25) in the axial direction for the transportation of slag and metal reminders through such holes.



1:52

FIG. 1

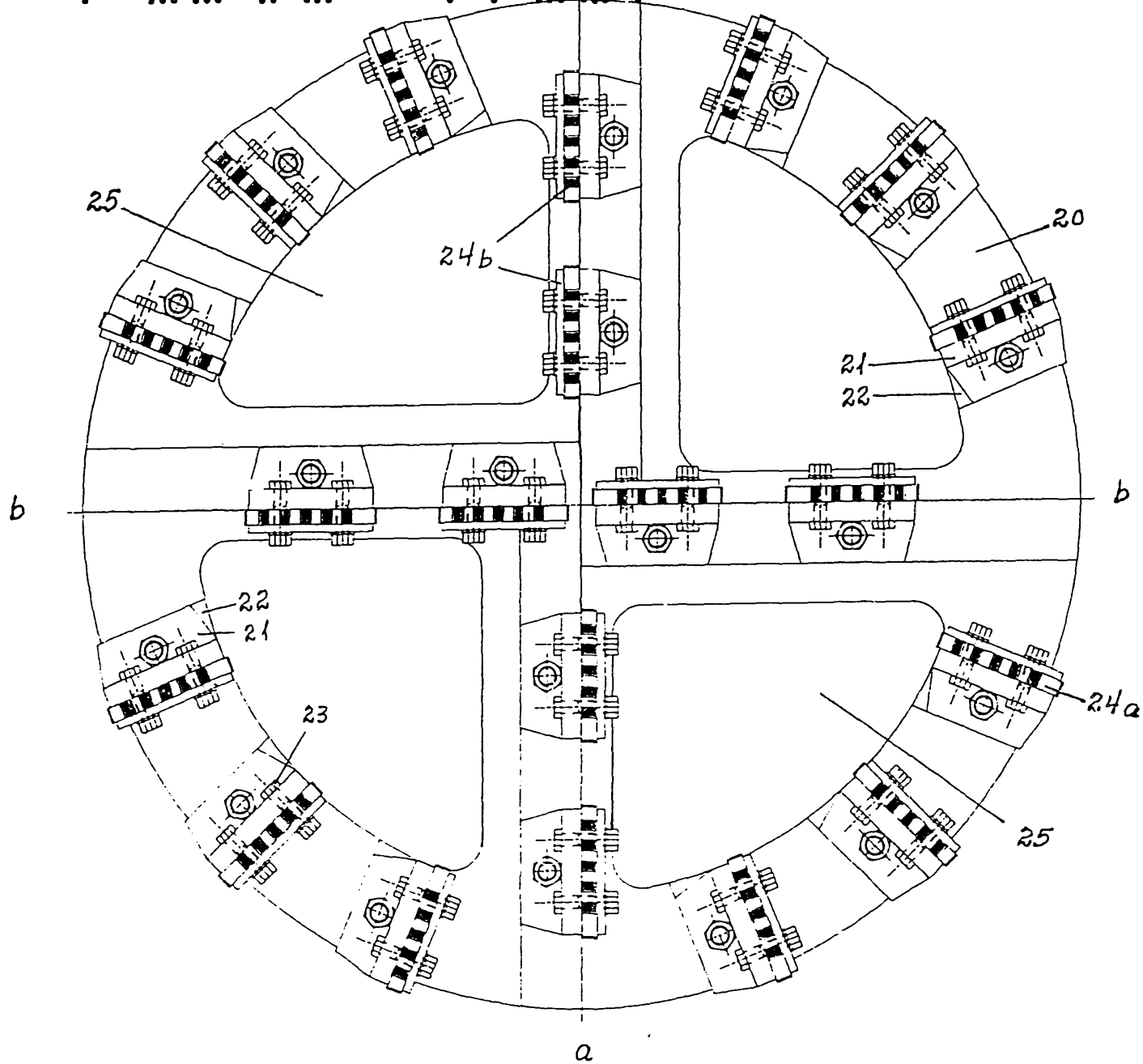
7 11 91 7205



1 1225/11

7 1 1 0 1 7 2 a

FIG. 2



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7 11 91 7725

FIG. 3

