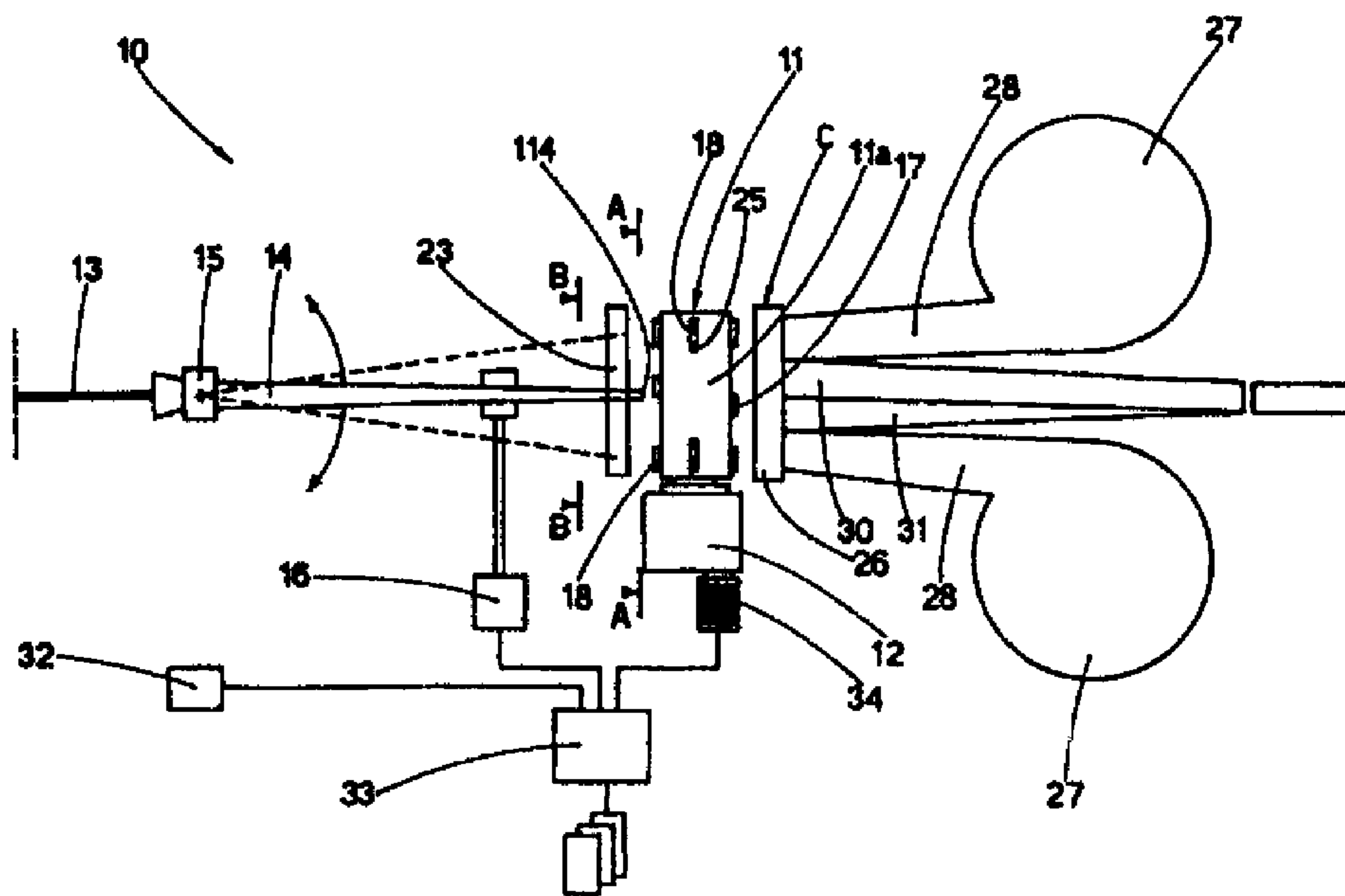




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(57) **Abrégé/Abstract:**

Method for shearing to size bars, the method using shears comprising a pair of counter-rotating drums (11), the shears comprising a single-channel switching device (14) suitable to cause the rolled stock (13) to transit in correspondence with a shearing zone (20) and a scrapping zone (21), there being included reception means (30, 31) for the bars sheared to size and reception means (28) for the scrapped ends, the blade-bearing drums (11) being maintained in continuous rotation for the whole duration of the shearing cycle, the rotation speed of the blade-bearing drums (11) being made proportionate, on each occasion, to the specific speed of feed of the rolled stock (13) and to the desired base measurement of the bars, the base measurement being a desired shearing length which is a sub-multiple of the length of each bar to be sheared to size, the speed of rotation of the drums (11) being angularly constant and calculated to achieve a finite number of passes of the shearing blades (17) for the specific speed of feed of the rolled stock (13) and for a plurality of specific lengths of the bar (13) which are multiples of the base measurement. Shears for shearing to size rolled bars suitable to achieve the method as described above.

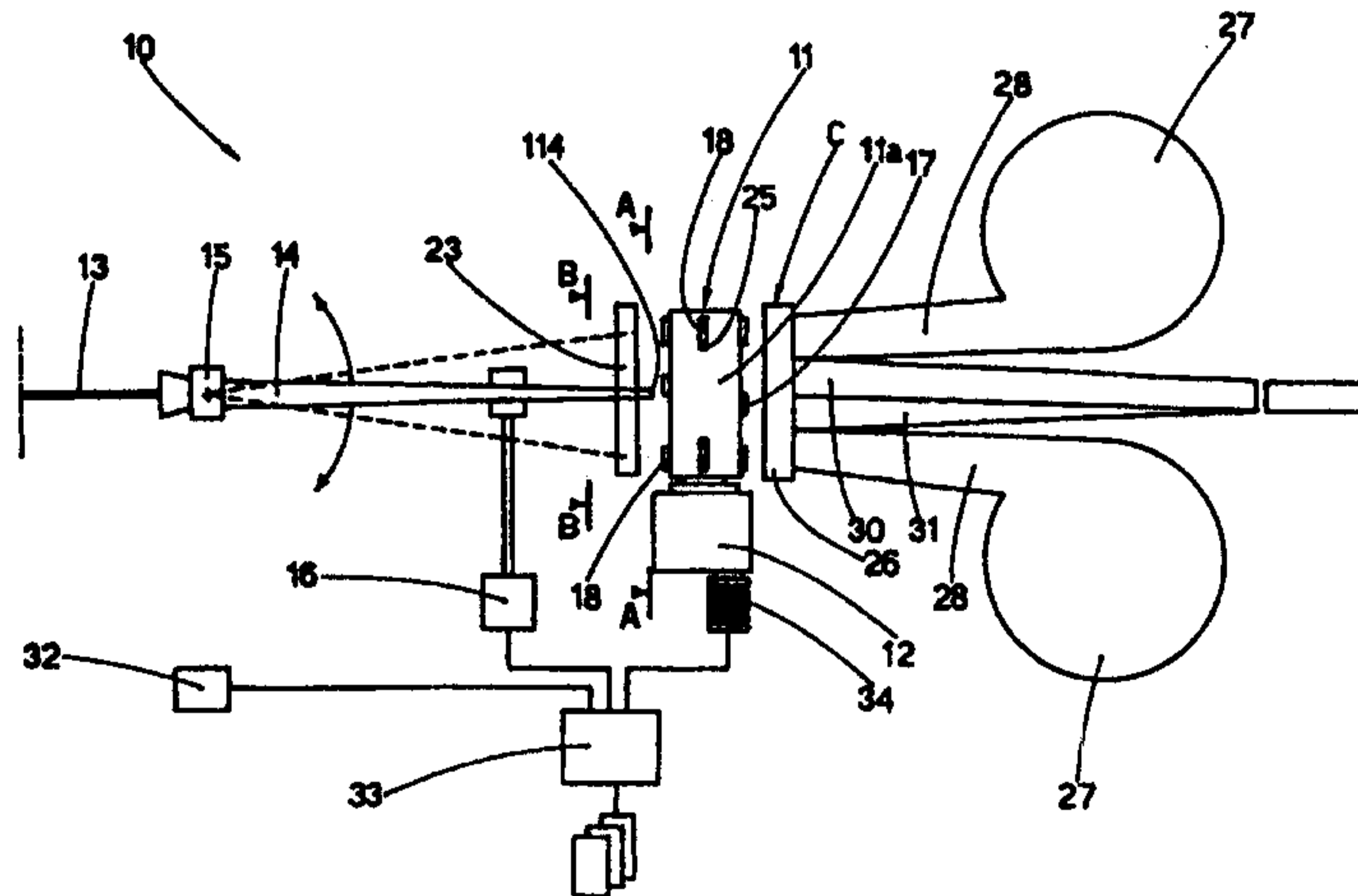
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(54) Title: METHOD FOR SHEARING TO SIZE ROLLED BARS AND RELATIVE SHEARS FOR SHEARING TO SIZE



(57) Abstract

Method for shearing to size bars, the method using shears comprising a pair of counter-rotating drums (11), the shears comprising a single-channel switching device (14) suitable to cause the rolled stock (13) to transit in correspondence with a shearing zone (20) and a scrapping zone (21), there being included reception means (30, 31) for the bars sheared to size and reception means (28) for the scrapped ends, the blade-bearing drums (11) being maintained in continuous rotation for the whole duration of the shearing cycle, the rotation speed of the blade-bearing drums (11) being made proportionate, on each occasion, to the specific speed of feed of the rolled stock (13) and to the desired base measurement of the bars, the base measurement being a desired shearing length which is a sub-multiple of the length of each bar to be sheared to size, the speed of rotation of the drums (11) being angularly constant and calculated to achieve a finite number of passes of the shearing blades (17) for the specific speed of feed of the rolled stock (13) and for a plurality of specific lengths of the bar (13) which are multiples of the base measurement. Shears for shearing to size rolled bars suitable to achieve the method as described above.

"METHOD FOR SHEARING TO SIZE ROLLED BARS AND RELATIVE SHEARS
FOR SHEARING TO SIZE"

* * * * *

FIELD OF APPLICATION

5 This invention concerns a method for shearing to size rolled bars and relative shears for shearing to size as set forth in the respective main claims.

The invention is applied in the field of steel production to shear to size rolled bars, round pieces or other sections
10 obtained in bars and emerging from the rolling train at a speed of 100 metres per second and more.

BACKGROUND OF THE INVENTION

In the state of the art there have been various proposals for flying shears used in the metallurgical field for
15 shearing to size bars emerging from the rolling train.

Before the continuous shearing to size step, these flying shears provide to eliminate the leading end of the rolled stock and, at the end of the continuous shearing to size
20 step, they provide to eliminate the trailing end of the rolled stock too, inasmuch as normally these two ends have unacceptable geometric deformations and/or include pollutant particles.

Also, in the state of the art, the first or last bar is sheared to segments in order to obtain samples for testing
25 and inspection.

Among those shears which are known to the state of the art, flying shears using counter-rotating blades mounted on blade-bearing drums have proved to be the most suitable also for shearing bars travelling at high speed.

30 These shears comprise at least a counter-opposed pair of counter-rotating drums, each of which has an equal number of blades, at an equal angular distance from each other, mounted on its circumference.

CONFIRMATION COPY

An example of this type of flying shears is set forth in EP-A-0618033.

Upstream and downstream of the blade-bearing drums there are switching devices suitable to convey the rolled bar lengthwise; the switching devices can be displaced normally on a horizontal plane in order to make the rolled stock itself pass between the counter-rotating blades at the moment of shearing.

The speed at which the switching devices are laterally displaced is correlated to the circumferential position and the speed at which the drums rotate, in such a way that the instant at which the bar transits between the blades coincides with a desired shearing position of the blades themselves.

At present, in so-called start-stop shears, the drums are taken from a stationary position to the working peripheral speed several seconds before shearing and, after shearing is completed, they are stopped.

This subjects the motor means of the drums to high stresses, with acceleration and deceleration ramps with a slope proportional to the time in which they have to reach working speed.

The working speed, advantageously, is equal to the rolling speed so as to prevent the bar in transit being drawn or jamming.

The motor means are therefore subject to extremely variable and discontinuous dynamics, which considerably increases their absorption and therefore the overall consumption of the shears.

Moreover, the motor means must necessarily have very high power, in order to reach the high working speeds required as quickly as possible.

Moreover, shears known to the state of the art do not

- 3 -

allow to make accurate cuts in terms of length of the rolled bar inasmuch as, since the blade-bearing drums are taken to the desired speed some seconds before shearing takes place, it is difficult to relate the speed of rotation of the drums and
5 the position of their blades to the speed of the rolled bar.

Businessmen working in this field complain about this problem especially for very high rolling speeds, for example of around 100 metres per second and more.

In fact, it is often the case that at the moment the
10 rolled stock is sheared to size, or when a desired length of the rolled bar has passed after the leading end has been sheared, the blades are no longer in the correct shearing position; this leads to shearing errors, even of several metres, especially at high speeds.

15 Moreover, shears as are known to the state of the art have a problem of the correct positioning, discharge, scrapping and recovery of the sheared-off end segments.

DE-A-4119843 describes a shears for cropping the leading and trailing end of a rolled product, comprising a pair of
20 counter-opposed blade-bearing heads, each of which has pairs of cooperating blades defining at least three adjacent shearing planes.

The shears also comprises a switching device which can traverse on a horizontal plane, the function of which is to
25 take the rolled stock which is to be sheared into cooperation with the shearing planes defined by the blades.

Between two adjacent shearing planes there is a space without blades, which defines substantially the space through which the usable part of the bar passes.

30 In the case of a simple cropping of the leading and trailing ends, the switching device makes a single-direction movement between the various shearing planes, at a speed———

correlated to the width of the blade-less space between the blade-bearing heads.

In the case of shearing to size, the switching device moves alternately between the various shearing planes where
5 the blades are, at a speed correlated to the length of the segment to be sheared to size.

FR-A-1.430.009 also refers to a shears for rolled products comprising blade-bearing drums rotating continuously at a uniform angular speed and cooperating with a device to feed
10 the rolled stock synchronised with the speed of rotation of the drums, so that the rolled stock passes between the blades at a precise shearing moment.

The solutions proposed by these documents are not satisfactory because the speed of rotation of the blade-
15 bearing drums is correlated only to the speed of feed of the rolled stock, but not to the length of the segments to be sheared, and therefore for every shearing to size operation it is necessary to re-phase the synchronisms to define the correct shearing moment.

20 Moreover, the solutions known in the state of the art do not take into account the fact that, in correspondence with the shearing of the trailing end, the last segment of the rolled stock to be sheared to size is often not of a size which is compatible with the requirements of production, and
25 therefore has to be discarded, causing a great loss of material.

The present Applicant has designed and embodied this invention to overcome the shortcomings of shears known to the state of the art, to reduce energy consumption and
30 stress on the motors, to improve the accuracy of the shearing operation and to obtain further advantages as will be shown hereinafter.

SUMMARY OF THE INVENTION

This invention is set forth and characterised in the respective main claims, while the dependent claims describe other characteristics of the main embodiment.

The purpose of the invention is to provide a method for shearing to size rolled bars at a speed of 100 metres per second and more, and also the relative flying shears to shear to size which will achieve this method, the method and the shears making it possible to reduce energy consumption, to reduce the amount of material discarded and to have extremely accurate shearing operations.

The invention also proposes to simplify the shears for shearing at speed, to use a smaller amount of equipment for shearing to size and for scrapping, to simplify the governing, control and command programming, to help the rolled stock to position itself in the desired discharge channel, to reduce deformation of the hot rolled stock which is to be sheared inasmuch as the diameter of the blade-bearing drum can be reduced and therefore the unsupported section of the rolled stock is reduced, and to obtain further advantages as will become clear in the following description.

The method according to the invention provides to maintain the blade-bearing drums in continuous rotation during the cycle wherein the bars are sheared from the rolled stock arriving from the rolling mill.

This makes it possible to reduce stresses on the motor means of the blade-bearing drums, and therefore to reduce the power installed, the wear on the mechanical organs and the start-stop drive mechanisms; it is likewise possible to reduce the possibility of break-downs and malfunctions, and to obtain an extremely high precision in shearing the desired length of bar.

In order to obtain the desired length of the bar - which

varies from case to case - the invention provides to make the speed of rotation of the blade-bearing drums proportionate to the speed of feed of the rolled stock and to the length of the bar sheared.

5 It is therefore in the spirit of the invention to calculate, on each occasion, the correct speed of rotation of the blade-bearing drums according to the speed of feed of the specific rolled stock which is to be sheared and the base measurement constituting the bar, in such a manner as
10 to obtain, with a finite number of rotation passes of the blade-bearing drums, a plurality of consecutive cuts of the desired length.

'Base measurement' should be taken to mean the finished length which is then found as a multiple in all the sheared
15 bars, in any particular shearing cycle.

Thus, for a base measurement of, for example, six metres, the length of the sheared bars will be a multiple of this base measurement and the number of rotation passes of the blade-bearing drums for each length of bar will always be a
20 finite number.

Therefore, it is within the spirit of the invention that with each new rolled stock to be sheared, given the same base measurement, the speed of rotation of the blade-bearing drums is rephased in order to relate it correctly to the
25 real speed of feed of the rolled stock; in the same way a re-adjustment of the speed of rotation of the blade-bearing drums corresponds to a variation in the base measurement, given the same speed of advance of the rolled stock.

According to the invention, in order to shear the trailing
30 end, the remaining length of the bar to be sheared is measured with a remote sensor, we calculate how many base measurements are contained in the said remaining length and we proportion the length of the terminal segment of bar

which precedes the trailing end to the measurement of the remaining length, so as to have, in any case, bars sheared to size which are multiples of the base measurement.

In this way we prevent the formation, before the trailing
5 end, of segments which are too short or in any case have to be discarded because they cannot be used.

The invention provides a shears with two drums, facing each other and in continuous counter-rotation, equipped with specific blades for shearing to size and, at the two sides
10 of the blades for shearing to size, specific blades for scrapping the leading and trailing ends of the rolled stock.

In one embodiment of the invention, there are also specific blades employed for shearing the leading and trailing ends of the rolled stock.

15 Shearing the leading end and shearing the trailing end should be taken to mean the first and last usable cut of the good part of the rolled stock to be sheared to size.

According to a variant, the blades for shearing the leading and trailing ends are adjacent to the scrapping
20 blades.

According to another variant, the leading end and the trailing end are sheared by the same blades which shear to size.

According to a further variant, the specific blades for
25 shearing the leading and trailing end of the rolled stock are also used for shearing sample segments, in correspondence with the leading and/or trailing ends of the rolled stock, which are then used for testing and inspection.

30 According to the invention, the blades for shearing to size are misaligned with respect to the rolling axis; to be more exact, according to a variant, the blades for shearing to size, in pairs on the respective drums, are arranged

aligned with the corresponding blades of the other drum, respectively on one side and the other side of the rolling axis. According to a variant of the invention, the blades for shearing to size, and/or the blades for shearing the leading and trailing end, are conformed and geometrically arranged so as to direct the sheared end of the rolled stock upwards or downwards.

This makes it possible, for example, to direct correctly the bars sheared to size towards two or more discharge channels or similar, associated with the desired collection means.

According to the invention, at the sides of the blades for shearing to size, and separating them from the scrapping blades, there are two spaces without blades which serve for the rolled stock to pass through, both on the left and on the right of the blades for shearing to size during the step wherein the good segment of the rolled stock is passing through.

The rolled bar is taken by a single-channel switching device which can be traversed alternately from one bladeless space to the other so that at every passage in correspondence with the blades for shearing to size a bar of the desired length is obtained, which is in any case a multiple of the base measurement.

When the good segment of the rolled stock has been sheared to size, the remaining trailing end is taken by the single-channel switching device in correspondence with the scrapping shears.

According to a variant, the scrapping shears are also conformed and geometrically arranged so as to direct the segments which are to be scrapped upwards or downwards in order to convey them correctly towards discharge channels or similar associated with the desired collection means such

as, for example, cylindrical collection drums known as cyclones.

According to a variant, the blade-bearing drums include, at least in correspondence with the blades, a cam development, possibly with recesses or similar, which help to direct the sheared bars or the scrap segments correctly into the respective discharge channels.

According to another variant, upstream of the blade-bearing drums there is at least a tile with a conformation which helps to direct the rolled stock in the most suitable direction as required on each occasion by the shearing cycle.

It is within the spirit of the invention also to use two or more parallel shears in such a manner as to allow the simultaneous shearing of one or more rolled products arriving from the same multi-section rolling line, or even from two different rolling lines.

Thus it is possible to reduce costs and the overall bulk of the plants, as it is possible to use the same motor means for all the parallel shears.

According to a variant, at least some of the parallel shears can be excluded from the shearing line when not in use or for maintenance operations.

BRIEF DESCRIPTION OF THE DRAWINGS

The attached Figures are given as a non-restrictive example, and show some preferential embodiments of the invention as follows:

Fig. 1 shows a diagram with a view from above of a shears according to the invention;

Fig. 2 shows a part and enlarged view from "A" to "A" of Fig. 1;

Fig. 3a shows a part and enlarged view from "B" to "B" of Fig. 1;

- Fig. 3b shows a diagram of a shearing cycle of the shears in Fig. 1;
- Fig. 4 shows a three-dimensional view of the enlarged detail "C" of Fig. 1;
- 5 Figs. 5a-5f show transverse cross sections of the blade-bearing drums of Fig. 2 in four different operating situations;
- Fig. 6 shows a variant of Fig. 5a;
- Fig. 7 shows a variant of Fig. 3b;
- 10 Figs. 8a-8b show a part view, seen from above, of the shears as shown in the embodiment in Figs. 6 and 7 in two different operating steps;
- Fig. 9a shows a variant of Fig. 2;
- Fig. 9b shows a view from above of a variant of Fig. 9a;
- 15 Fig. 10a shows a variant of Fig. 9b;
- Fig. 10b shows a variant of Fig. 10a.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

According to the invention, the shears 10 as shown in Figs. 1 and 2 includes two blade-bearing drums 11, respectively the upper drum 11a and the lower drum 11b, 20 super-imposed and made to counter-rotate by a transmission unit 12 associated with a motor 34; the blade-bearing drums 11 are in continuous rotation at a substantially constant angular velocity.

25 The shears 10 serves to shear to size a rolled product emerging from a hot rolling mill (not shown here), the rolled product consisting of a bar, wirerod or similar.

According to the invention, at least first blades 17 for shearing to size are mounted centrally on the blade-bearing 30 drum 11, and at the sides second blades 18 for scrapping.

The blades 17 and 18 are arranged at an equal distance on the circumference of the respective blade-bearing drum 11 and, in this case, there are two blades 17 for shearing to

size, arranged at 180° with respect to each other, and four scrapping blades 18, arranged at 90° with respect to each other, for each of the two drums 11.

Moreover, in the embodiment shown in Figs. 1 and 2, adjacent to the scrapping blades 18, there are third blades 25, in this case two for each drum 11, used to shear the leading and trailing end of the rolled stock.

Moreover, as will be described in more detail hereinafter, the third blades 25 are used to shear segments for sampling used for tests and inspections.

According to the invention, the sample segments are longer than the scrap pieces.

This makes it possible to identify the sample segments easily, even if, as happens in the preferential embodiment described here, they are conveyed to the same collection means used for the segments to be scrapped.

The blades for shearing to size 17 are divided into shearing blades 17a and shearing blades 17b, these blades 17a and 17b being arranged in a mating position on the respective drums 11 and having a different conformation studied to direct respectively upwards and downwards the leading end of the bar to be sheared to size.

The shearing blades 17a define a shearing axis 20a while the shearing blades 17b define a shearing axis 20b, the axes 20a and 20b being arranged symmetrically on one side and the other of the central rolling axis 120 (Figs. 2, 3a-3b).

Between the cylindrical ring which defines the ends of the blades 17 and the cylindrical rings which define the ends of the blades 18 and 25 arranged at the two sides, there is a space 19 without blades where the rolled stock 13 passes through without coming into contact with the blades 17, 18 and 25 for the whole good section of the rolled stock which is to be sheared to size.

To be more exact, as shown in Figs. 2 and 3b, the blades are arranged on the drums 11a and 11b to define a central zone 20 for shearing to size, astride the rolling axis 120, two lateral zones 22 through which the rolled stock 13 passes, and two zones 21 for shearing the leading and trailing ends and for shearing for scrap.

The median axes 22a of the two lateral transit zones 22 substantially indicate the nominal position of the rolled stock 13 during the passage of the good part of the bar, the axes 20a, 20b substantially indicate the positions for shearing to size, the axes 21b substantially indicate the positions for shearing the leading and trailing ends and for shearing for samples, and the axes 21a indicate the median axes of the zones for scrapping the leading and trailing ends.

The rolled stock 13 arrives at rolling speed from the last stand of the rolling train on an axis 120 and is guided inside a single-channel switching device 14 located upstream of the blade-bearing drums 11.

The single-channel switching device 14 traverses laterally around an articulated joint 15 in a movement which is imparted by drive means 16.

The traversing movement, according to the steps of the shearing cycle, takes the end 114 of the single-channel switching device 14, and therefore the rolled stock 13, in correspondence with one of the afore-said zones 20, 21 or 22, and precisely around the respective axis 20a, 20b, 21a, 21b and 22a.

The shearing cycle, shown schematically in Fig. 3b, provides that the rolled stock 13 as it emerges from the rolling line is first of all taken by the single-channel switching device 14 in correspondence with one of the two zones 21, for example, the one on the left, between the

scrapping blades 18 (Figs. 5e, 5f) to scrap a certain length of the leading end, then in correspondence with the sampling blades 25 to shear a sample segment of the leading end (Fig. 5d) and then in correspondence with the adjacent transit zone 22.

When the rolled stock 13 has travelled the desired length, it is taken in correspondence with the central zone 20 for the first shearing to size (Fig. 5a) and then to the opposite transit zone 22.

The rolled stock 13 is then taken alternately from one transit zone 22 to the other so that at every passage through the central zone 20 (Figs. 5a and 5b) it is sheared into bars 113 of the required length.

According to the invention, the rolled stock 13 moves from one zone to the other in a continuous movement.

Before the rolled stock 13 reaches the shears 10, control and monitoring means 32 located upstream and/or associated with the last rolling stand communicate to the control and command unit 33 the speed of feed of the rolled stock 13.

The control and command unit 33 determines the speed of rotation of the drums 11 according to the base length which is then found as a multiple in the bars 113 which have been sheared to size, and according to the circumferential distance of the shearing blades 17.

This means that when the rolled stock 13 reaches the shears 10 the speed of rotation of the drums 11 is coherent with the speed of feed of the rolled stock 13 according to the base length which will constitute, as a multiple, the length of the bars 113.

Due to this determination of the speed of rotation of the drums 11, and according to the speed of feed of the rolled stock 13 and the length of the bar to be sheared, the number of passes of the blades 17 for each shearing cycle is always

a finite number.

Subsequently, the remaining part, that is to say, the trailing end, of the rolled stock 13 is taken into correspondence with the zone 21 coherent with the specific
5 direction of lateral displacement of the rolled stock 13 so that the blades 25 can shear a segment of the trailing end for sampling (Fig. 5c) and the scrapping blades 18 can scrap the remaining part.

In other words, the zone 21 for scrapping the trailing end
10 of the rolled stock 13 is a function of the position assumed by the single-channel switching device 14, right or left of the shearing blades 17, after the last shearing to size.

The inclusion of two zones 21 prevents return movements and inversions of direction and therefore unnecessary passes
15 of the rolled stock 13 through the central zone 20 in order to scrap the trailing ends.

In the embodiment shown here, the end 114 of the single-channel switching device 14, during the traversing moment, travels inside a linear guide 23, shown in detail in Fig.
20 3a, defining a horizontal shearing plane 24.

According to a variant, used with blades having different heights or particular conformations, the guide 23 is shaped so as to define a shearing plane with a desired development, for example, a zigzag development, which will make it
25 possible to place the rolled stock 13 in the most suitable vertical position for the intervention of the blades 17, 18 or 25, and to correctly direct the sheared bars 113, the sample segments and the scrap segments 213.

With the help of Figs. 5a-5f, we shall now see how the
30 specific conformation of the blades 17, 18 and 25 makes it possible to convey correctly the sheared to size bars 113, the scrap segments 213 and the sample segments towards the respective reception channels 30, 31 and 28 associated with

the desired collection means.

To be more exact, the sheared to size bars 113 are sent through the reception channels 30 and 31 towards a loop-forming head, a winding device, or other collection devices, and the sample segments and scrap segments 213 are sent through reception channels 28 to collection cyclones 27.

According to the invention, by using two or more reception channels for the sheared to size bars 113 it is possible to facilitate and accelerate the collection operations, but without the latter affecting the rolling speed.

As shown in Fig. 5a, the blades 17a are conformed in such a manner that, after shearing has been carried out, the point of the rolled stock 13 is lifted and directed naturally upwards inside the reception channel 30.

On the contrary, the blades 17b, as shown in Fig. 5b, are conformed in such a way that, after shearing has been carried out, the point of the rolled stock 13 is lowered and directed naturally downwards inside the reception channel 31.

In this way, the sheared to size bars 113 are alternately conveyed into the reception channel 30 or the reception channel 31 according to whether the single-channel switching device 14 arrives in the central zone 20 from the left or from the right.

The scrapping blades 18 are arranged on the blade-bearing drums 11 in such a manner as to direct downwards (Fig. 5e) or upwards (Fig. 5f) the sheared end of the scrap segments 213.

To be more exact, in correspondence with the right zone 21, the scrapping blades 18 are conformed as shown in Fig. 5f inasmuch as the reception channel 28 develops substantially above the shearing plane 24 and therefore it is necessary to direct the scrap segment 213 upwards; in

correspondence with the left zone 21, the scrapping blades 18 are conformed as shown in Fig. 5e inasmuch as the reception channel 28 develops substantially below the shearing plane 24 and therefore it is necessary to direct
5 the scrap segment 213 downwards.

The blades for shearing the leading and trailing ends and for sampling 25 are divided into blades 25a for shearing the trailing ends (Fig. 5c) conformed to direct the sheared end of the rolled stock 13 downwards, and blades 25b for
10 shearing the leading ends (Fig. 5d) conformed to direct the sheared end of the rolled stock 13 upwards.

It is thus possible to direct correctly the rolled stock 13 upwards after the leading end has been sheared so as to allow the subsequent shearing to size of bars 113, or
15 downwards after the trailing end has been sheared so as to allow the subsequent shearing of scrap segments 213.

The correct directioning of the sheared to size bars 113 and the segments 213 is facilitated, not only by the particular reciprocal arrangement of the blades 17a, 17b,
20 18, 25a and 25b on the upper 11a and lower 11b blade-bearing drums, but also by the particular conformation of the blade-bearing drums 11 and the stationary tile 26 located downstream of the drums 11.

The tile 26, as can be seen in Figs. 3b and 4, is suitably
25 shaped so as to guide the sheared end upwards or downwards according to whether the shearing operation is performed by the blades 17a, 17b, 25a, 25b or 18.

To be more exact, as shown in Fig. 4, the tile 26 defines four substantially U-shaped transit seatings, respectively
30 the first 26a, the second 26b, the third 26c and the fourth 26d, the second 26b and the fourth 26d being faced downwards.

The first 26a and the fourth 26d transit seatings are substantially aligned with the respective reception channels

28, and the second 26b and the third 26c transit seatings are substantially aligned respectively with the reception channels 31 and 30.

To be more exact, the central sides 126 of the U-shapes defined by the second 26b and the third 26c transit seatings of the tile 26 are included respectively above and below the shearing plane 24.

In this case, moreover, the side in common 226 of the U-shapes defined by the second 26b and the third 26c transit seatings is inclined and its center falls substantially in correspondence with the rolling axis 120.

The blade-bearing drums 11a and 11b, in correspondence with the shearing blades 17, have cam conformations which are substantially mating with each other; they allow the sheared end to lift (Fig. 5a) or descend (Fig. 5b).

In correspondence with the blades for shearing the leading end 25b and the trailing end 25a, the cam conformation is similar to the one in correspondence with the blades for shearing to size 17a and 17b, except that, in this case, it is adapted to the need to direct correctly the sample segments into the reception channels 28.

In fact, as shown in Fig. 5c, on the upper drum 11a, in correspondence with the blades 25, there is a semi-circumference which, after the blades 25a have performed their shearing operation, makes it possible to direct downwards the rolled stock 13 until the blades 25b intervene.

The section of rolled stock included between the shearing operation carried out by the blades 25a and the blades 25b corresponds to a sample segment which is longer than the scrap segments 213 and can therefore be easily identified.

In this way, the sample segment thus sheared passes under the central side 126 of the third transit seating 26c and is

then conveyed into the reception channel 28 instead of into the reception channel 30.

When the afore-said semi-circumference is finished, the rolled stock 13 is taken above the central side of the U-shape defined by the third transit seating 26c of the tile 26 so that the sheared to size bars 113 are conveyed alternately into the reception channels 30 and 31.

The same considerations apply for Fig. 5d, except that, in this case, the semi-circumference in correspondence with the blades 25 is made on the lower drum 11b inasmuch as the sample segment must pass above the central side 126 of the second transit seating 26b so as to be conveyed into the reception channel 28 rather than the reception channel 31.

In correspondence with the scrapping blades 18, on the contrary, the upper blade-bearing drum 11a has recesses 29 for each blade 18, which, as can be seen in Figs. 5d and 5f, facilitate the discharge downwards or upwards of the scrap segments 213 and their correct positioning in the reception channels 28.

It lies within the spirit of the invention to include blade-bearing drums 11 with any number of blades 17, 18 and 25 and in any geometrical arrangement whatsoever.

In the variant shown in Fig. 6, used particularly if not exclusively for shearing rolled stock at high temperature and/or subjected to heat treatment, there are three blades 117 for shearing to size arranged at 120° from each other on the circumference of the respective blade-bearing drum 11.

As shown in Fig. 7, the center line of the blades 117 is substantially aligned with the rolling axis 120; the shearing to size of the rolled stock 13 into bars 113 takes place, just as in the embodiments explained above, in correspondence with the central zone 20 with every passage of the rolled stock 13 from one transit zone 22 to the other

due to the effect of the traversing movements of the single-channel switching device 14 (Figs. 8a-8b).

In this case too there are two reception channels 28 to convey the scrap segments 213 or the sample segments to the collection cyclones 27 and two reception channels, respectively 30 and 31, to convey the sheared to size bars 113 to the desired collection devices.

In this embodiment, upstream of the blade-bearing drums 11, there is a stationary tile 26 with a conformation studied to adapt to the channels 28, 30 and 31 which are arranged differently from the previous embodiments.

To be more exact, the tile 26 has a vertical baffle 326 at the center, aligned with the rolling axis 120, to separate the reception channels 30 and 31.

For the same reason, the scrapping blades 18 and the blades 25 for shearing the leading and trailing end and for shearing samples are also conformed to adapt to the arrangement of the reception channels 28, 30 and 31.

To be more exact, the scrapping blades 18, both on the left and on the right, are conformed as shown in Fig. 5e, inasmuch as both the reception channels 28 have a section which substantially develops below the shearing plane 24 and therefore it is necessary to direct the scrap segments 213 downwards.

In the variant shown in Figs. 6 and 7, there may be two or more shearing blades 117 which are mounted at an equal distance on the same shearing axis, which increases the accuracy of the shearing.

In the variant shown in Fig. 9a there is a shearing line consisting of two parallel shears 10, respectively 10a and 10b.

With this embodiment it is possible to simultaneously shear two rolled products 13 arriving from the same multi-

section rolling line or from two separate rolling lines.

In this case the shears 10a and 10b are driven by a single motor 34 associated at outlet with a speed reducer 35; motion is transmitted from the speed reducer 35 to the transmission units 12 of the two shears 10 by means of shafts 36.

The transmission shaft 36 of the shears 10b has a disengageable joint 37 which allows the shears 10b, equipped for this purpose with moving means 38, to be excluded from the shearing line when it is not being used or for maintenance purposes.

In the variant shown in Fig. 9b, the two shears 10a and 10b are driven by respective motors 34a and 34b; in this embodiment too the transmission shaft 36 of the shears 10b has a disengageable joint 37 which allows the shears 10b to be excluded from the shearing line.

In the variant shown in Fig. 10a, there are three shears 10, respectively 10a, 10b, and 10c, which allow to shear simultaneously three rolled products 13 arriving from the same multi-section rolling line or from three different rolling lines.

Each shears 10a, 10b, 10c is driven by a respective transmission unit 12 which, just as in the embodiments shown in Figs. 9a-9b, can be associated with its own motor or with a motor common to all three shears 10a-10c.

The variant shown in Fig. 10a can be used in the event that the three rolling lines, whose axes are shown respectively by 120a, 120b and 120c, have a large interaxis "i".

The variant shown in Fig. 10b can be used when the three rolling lines, whose axes are shown respectively by 120a, 120b and 120c, have a small interaxis "i", as in the case, for example, of multi-section rolling lines.

In this embodiment, the shears 10 has two super-imposed drums 111, greater in length and equipped with three groups of blades, each of which cooperates with a respective rolling axis 120a, 120b and 120c.

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CLAIMS

1. Method for shearing to size rolled bars, the method using a shears comprising a pair of counter-opposed and counter-rotating drums with blades arranged on their circumference in a mating position, the shears comprising at least a switching device located upstream of the drums and suitable to traverse on a substantially horizontal plane to convey lengthwise a rolled stock emerging from a rolling train, the switching device being suitable to cause the rolled stock to transit at least in correspondence with a shearing zone and at least a scrapping zone located at the side of the shearing zone, there being included downstream from the drums first means to receive the bars sheared to size and second means to receive the scrapped leading and trailing ends, the first means cooperating downstream with means to collect the product and the second means cooperating downstream with braking means to brake the scrap segments, the blade-bearing drums being maintained in continuous rotation for the whole duration of the shearing cycle, the method being characterised in that, for each shearing cycle, the speed of rotation of the blade-bearing drums is calculated in order to be related to a specific speed of feed of the rolled stock, to a distance of the blades along the circumference of the drums and to a desired base measurement of the bars, the base measurement being a length which is a sub-multiple of a desired length of each bar which is to be sheared to size from the rolled stock, a speed of rotation of the drums being maintained angularly constant and being such as to achieve a plurality of lengths of bar, which are multiples of the base measurement, in a finite number of rotation basses of the shearing blades for the specific speed of feed of the rolled stock.

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2. The method as in claim 1, characterised in that, in order to shear the trailing end of the rolled stock, a remaining length of the rolled stock is measured, at a certain point upstream of the shears, and the number of base
5 measurements contained in the remaining length is calculated, the length at least of one end section of the sheared to size bar being determined by the actual length contained in the final segment without the trailing end.

10 3. The method as in claim 1, characterised in that the switching device is made to cooperate sequentially with a zone for scrapping the leading end, with a first transit zone, with a zone for shearing to size, with a second transit zone
15 opposite the first transit zone and with a zone for scrapping the trailing end, the transit into the shearing to size zone being repeated for the number of sized bars to be obtained from the rolled stock.

20 4. The method as in claim 3, characterised in that the trailing end is scrapped in the same zone where the leading end is scrapped.

25 5. The method as in claim 3, characterised in that the trailing end is scrapped in a specific zone for scrapping the trailing end situated on the opposite side, with respect to the zone for shearing to size, of the zone for scrapping the leading end.

30 6. The method as in any one of claims 4 and 5, characterised in that the position for scrapping the trailing end is a function of the specific transit zone, either left or

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right of the zone for shearing to size, of the last bar sheared from the rolled stock.

7. The method as in any one of claims 1 to 6, characterised in that between the shearing of the leading and/or the trailing end and the beginning of the shearing to size step there is a procedure to obtain a sample.

8. The method as in any one of claims 1 to 7, which uses at least two parallel shears serving the same or several rolling lines.

9. The method as in claim 8, characterised in that the shears are driven by a single motor means.

10. The method as in claim 8, characterised in that each shears is driven by respective motor means.

11. The method as in any one of claims 1 to 7, which uses drums equipped with at least two groups of identical blades, each group of blades serving a respective rolling line.

12. Shears for shearing to size rolled bars with blades arranged on a circumference of counter-opposed and counter-rotating drums, said shears comprising at least a switching device located upstream of said drums, movable sideways on a plane of feed of a rolled stock and conveying lengthwise the rolled stock emerging from a rolling train, said switching device being able to be displaced at least in correspondence with a shearing axis, there being included downstream from said drums first means to receive bars sheared to size and

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second means to receive scrapped leading and trailing ends, said first means cooperating downstream with means to collect a product and said second means cooperating downstream with braking means to brake scrap segments, said drums, rotating
5 continuously, including shearing blades at a center to shear to size the bars and laterally, on both sides, blades to shear the leading and trailing ends and to shear samples, and scrapping blades, there being included between the shearing blades and the scrapping blades respective spaces without
10 blades through which a good part of the rolled stock passes, the shears being characterised in that, for each shearing cycle, said drums are able to be rotated at an angularly constant speed, and means are provided to calculate a value of a rotation speed of said drums in such a way that it is
15 related to a speed of feed of the rolled stock, to a distance of said shearing blades along the circumference of said drums and to a desired base measurement of shearing of said bars to be obtained from said rolled stock, so as to achieve a plurality of lengths of bar, which are multiples of said base
20 measurement, in a finite number of rotation passes of the shearing blades for said specific speed of feed of said rolled stock.

13. The shears as in claim 12, characterised in that
25 said shearing blades are conformed to direct the bar sheared to size towards said respective first reception means and said shearing blades are conformed to direct the scrap segments towards said respective second reception means.

30 14. The shears as in claim 12, characterised in that said blades are conformed to direct the sheared end upwards or

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downwards according to whether the leading or trailing end has been sheared.

15. The shears as in claim 12, characterised in that
5 said blades are conformed to direct the sample segments towards the respective second reception means.

16. The shears as in any one of claims 12 and 13,
characterised in that said drums, at least in correspondence
10 with said shearing blades, have an outer cam conformation to guide the sheared to size bars towards said respective first reception means.

17. The shears as in any one of claims 12 to 16,
15 characterised in that said drums, on the outer periphery at least in correspondence with said scrapping blades, have recesses to guide the scrap segments towards said respective second reception means.

20 18. The shears as in any one of claims 12 and 13, characterised in that said drums, at least in correspondence with said blades for shearing the leading and trailing ends and for shearing samples, have an outer cam conformation to guide the sample segments towards said respective second
25 reception means.

19. The shears as in any one of claims 12 to 18,
characterised in that downstream of said blade-bearing drums there is a stationary tile defining at least transit seatings
30 to guide and convey the sheared to size bars towards said respective reception means and at least transit seatings to

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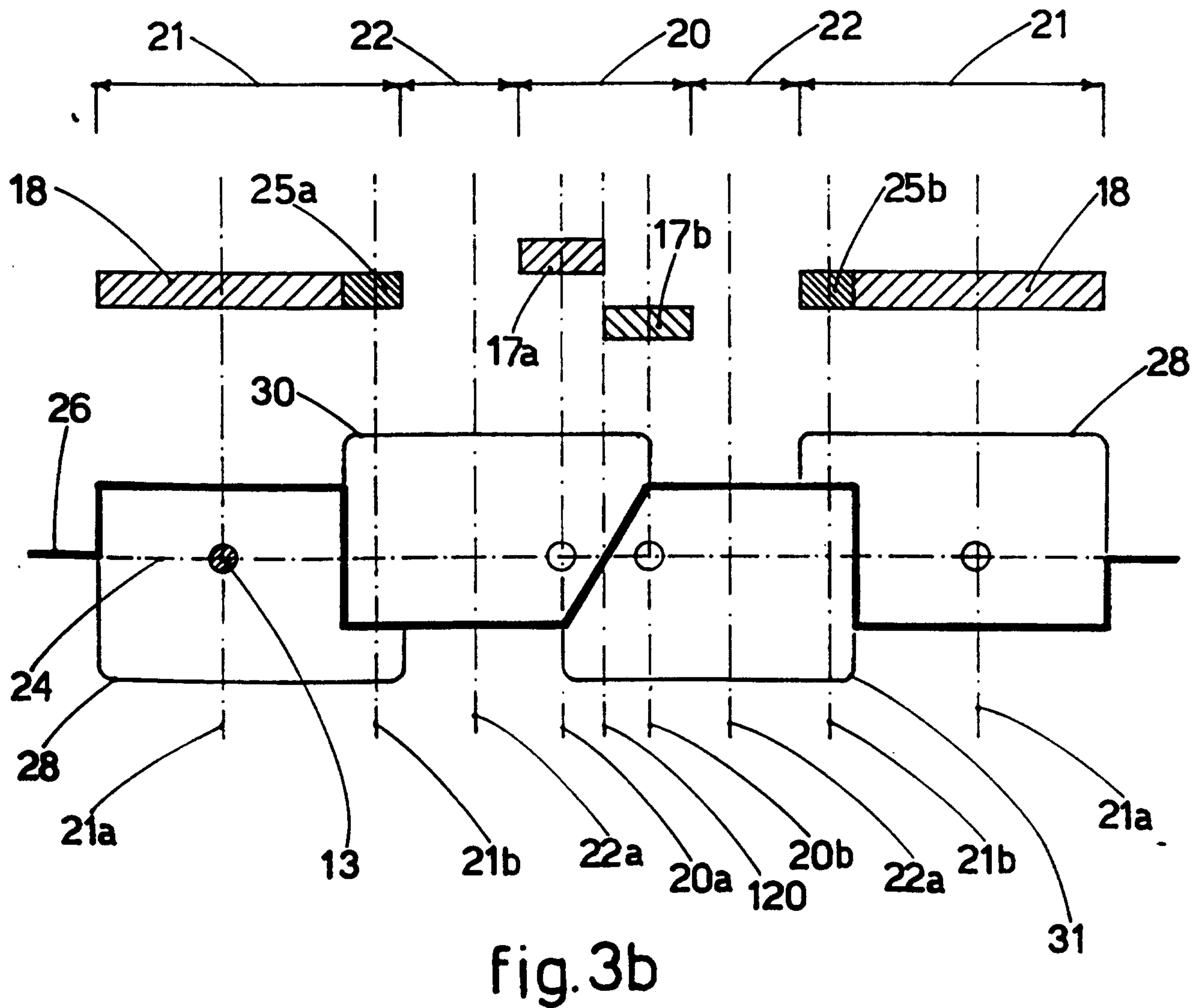
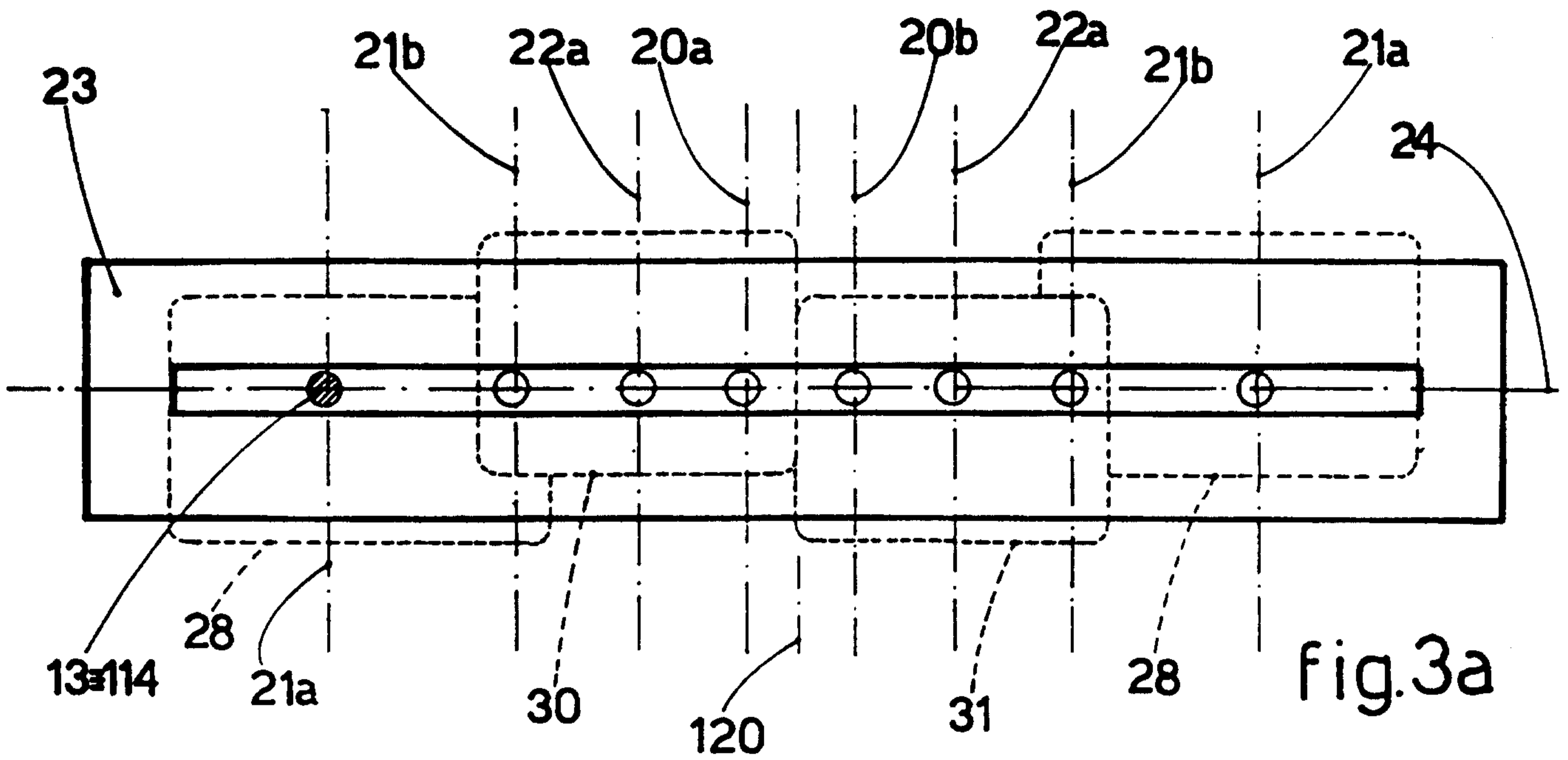
guide and convey said scrap segments towards the respective second reception means.

20. The shears as in any one of claims 12 to 19, which
5 includes guide means for said single-channel switching device.

21. The shears as in claim 20, characterised in that said guide means define a horizontal shearing plane.

10 22. The shears as in claim 20, characterised in that said guide means define a shearing plane at least partly zigzag or similar.

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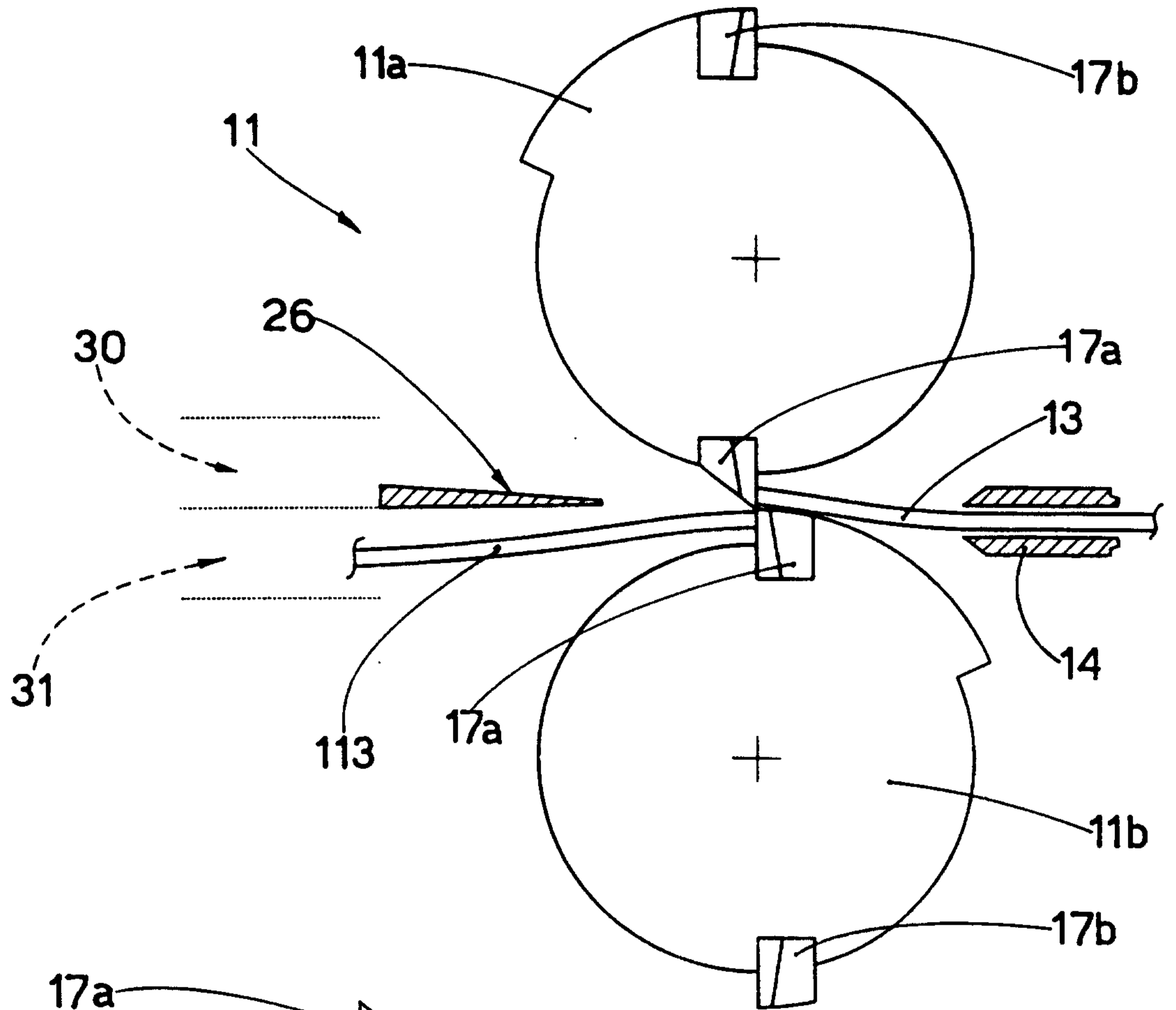


fig.5a

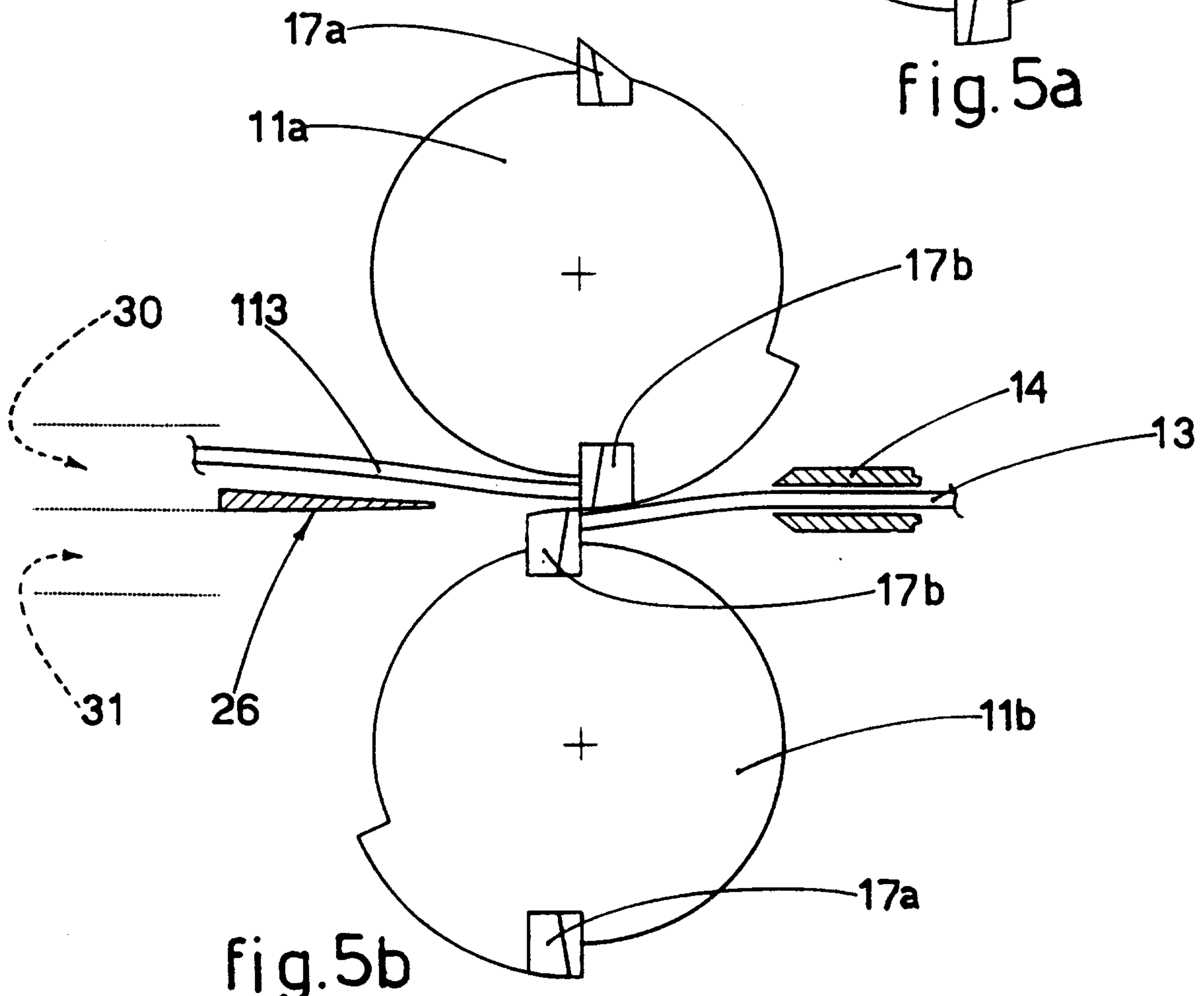
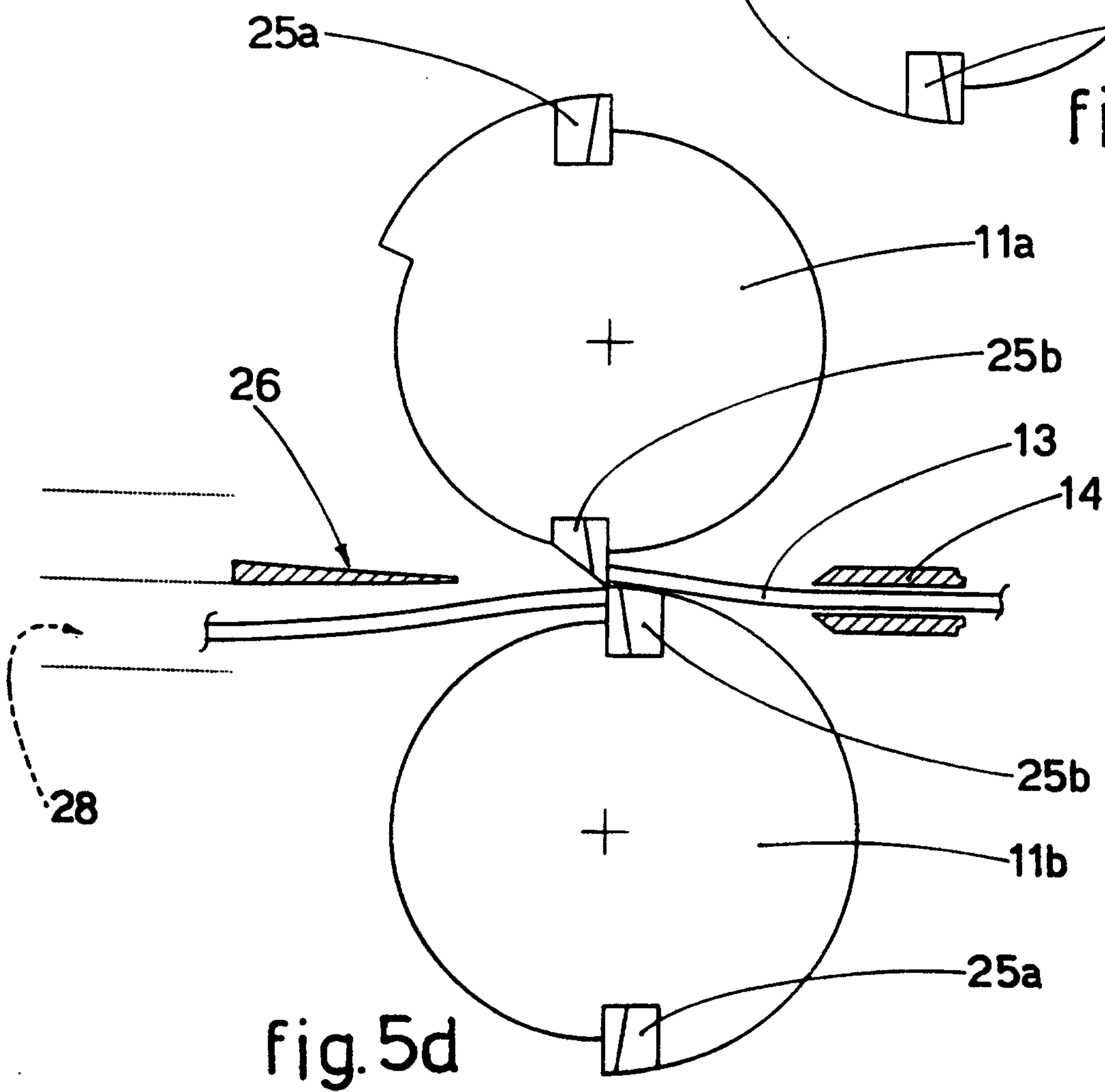
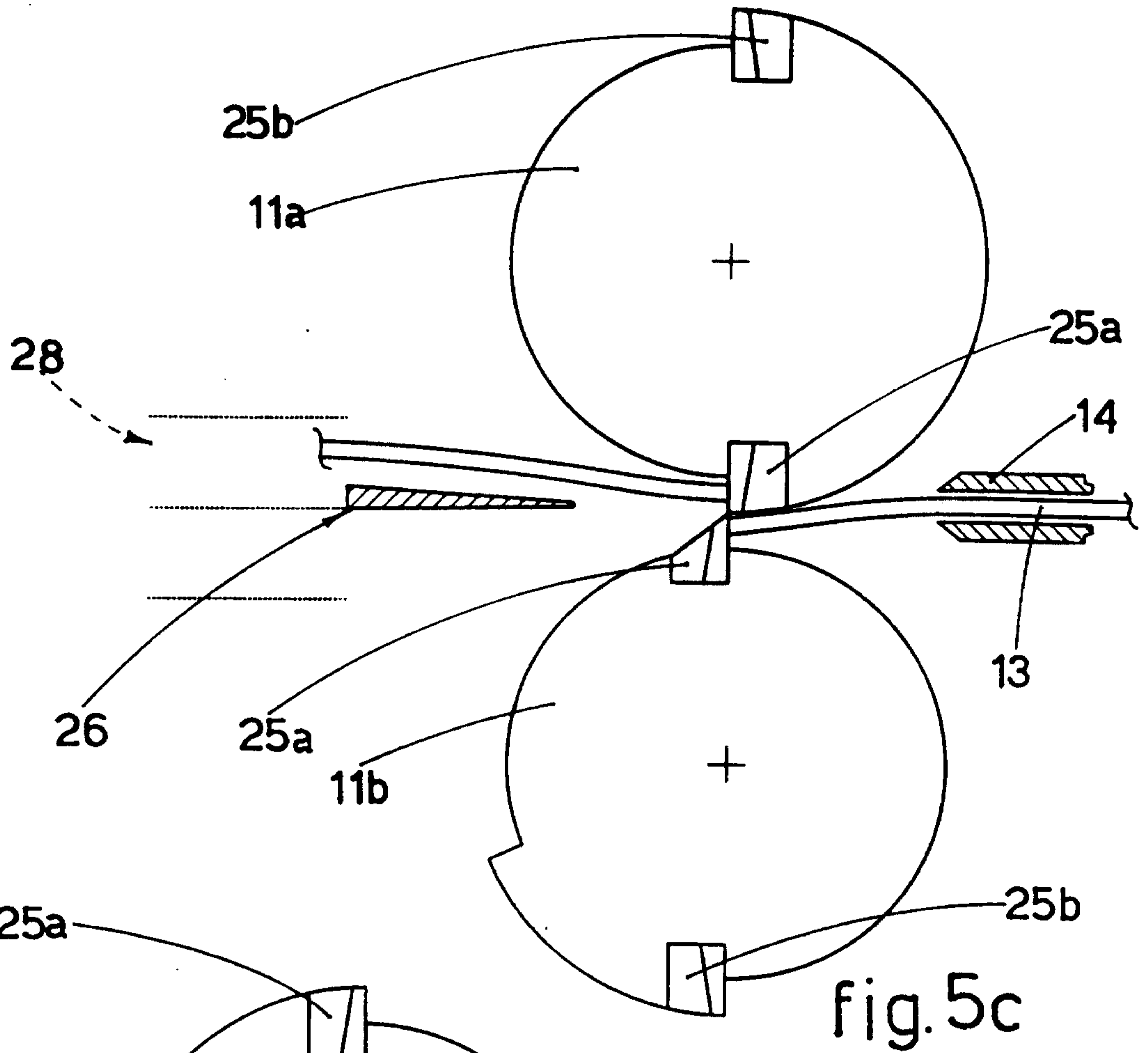


fig.5b

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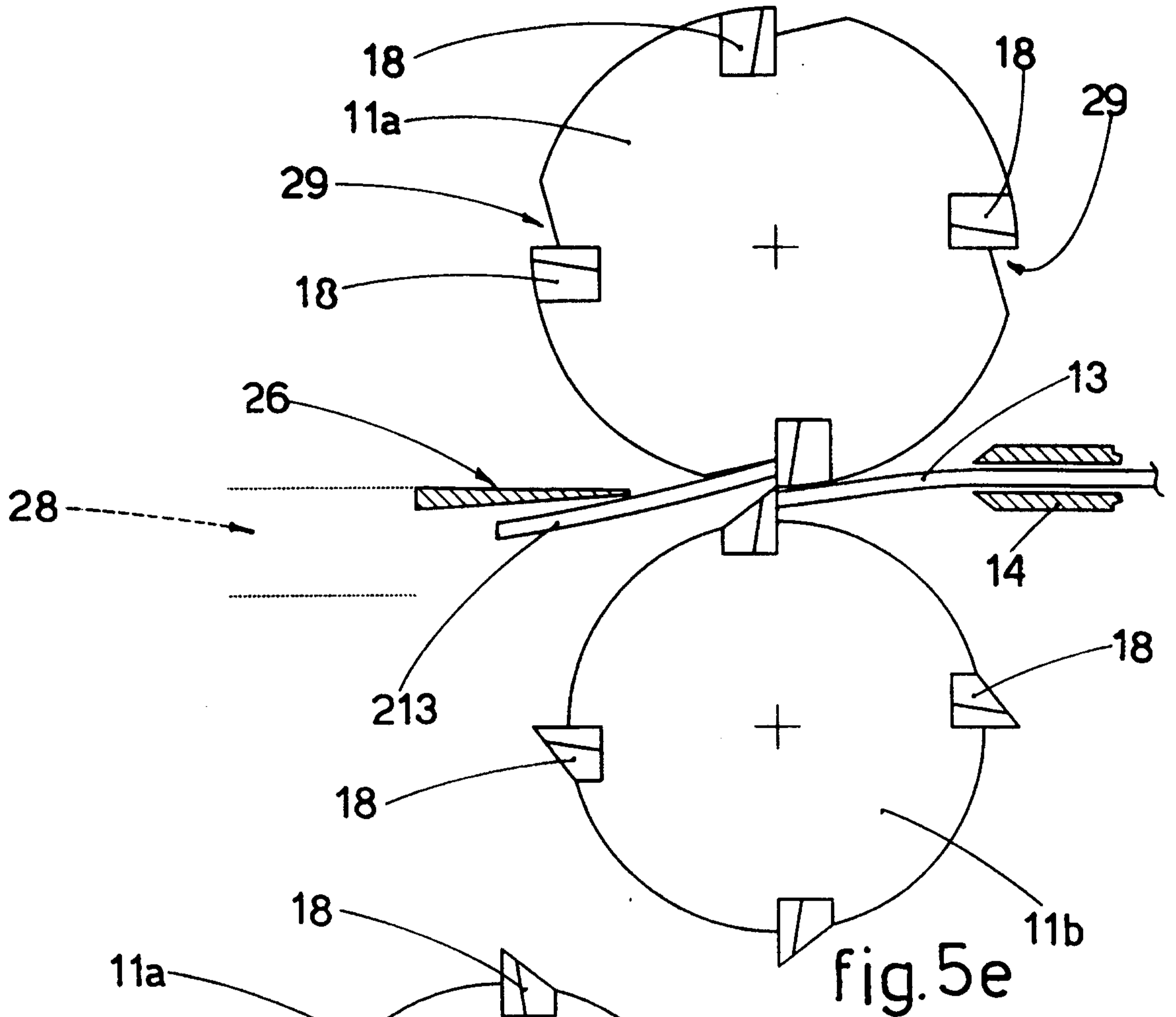


fig. 5e

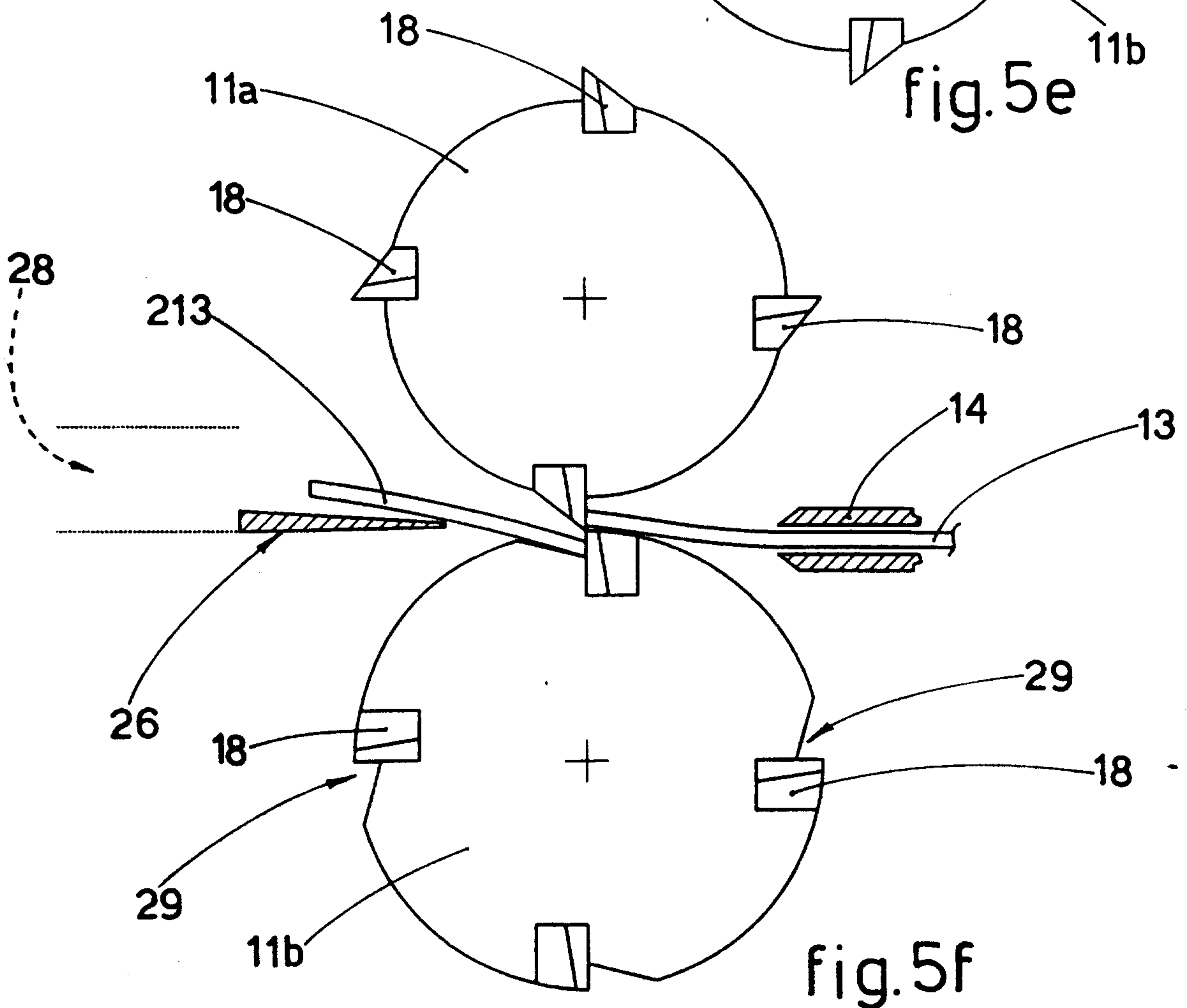


fig. 5f

