US 20070292547A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2007/0292547 A1**

Christensen (43) **Pub. Date: Dec. 20, 2007**

(54) **FORMER HEAD WITH ROTARY DRUM**

(76) Inventor: **Kenn Mosgaard Christensen**, Risskov (DK)

Correspondence Address:
James C Wray
1493 Chain Bridge Road Suite 300
Mclean, VA 22101 (US)

(21) Appl. No.: **11/659,385**

(22) PCT Filed: **Jul. 2, 2005**

(86) PCT No.: **PCT/DK05/00459**

§ 371(c)(1),
(2), (4) Date: **May 9, 2007**

(30) **Foreign Application Priority Data**

Aug. 5, 2004 (DK) ..... PA 2004 01185

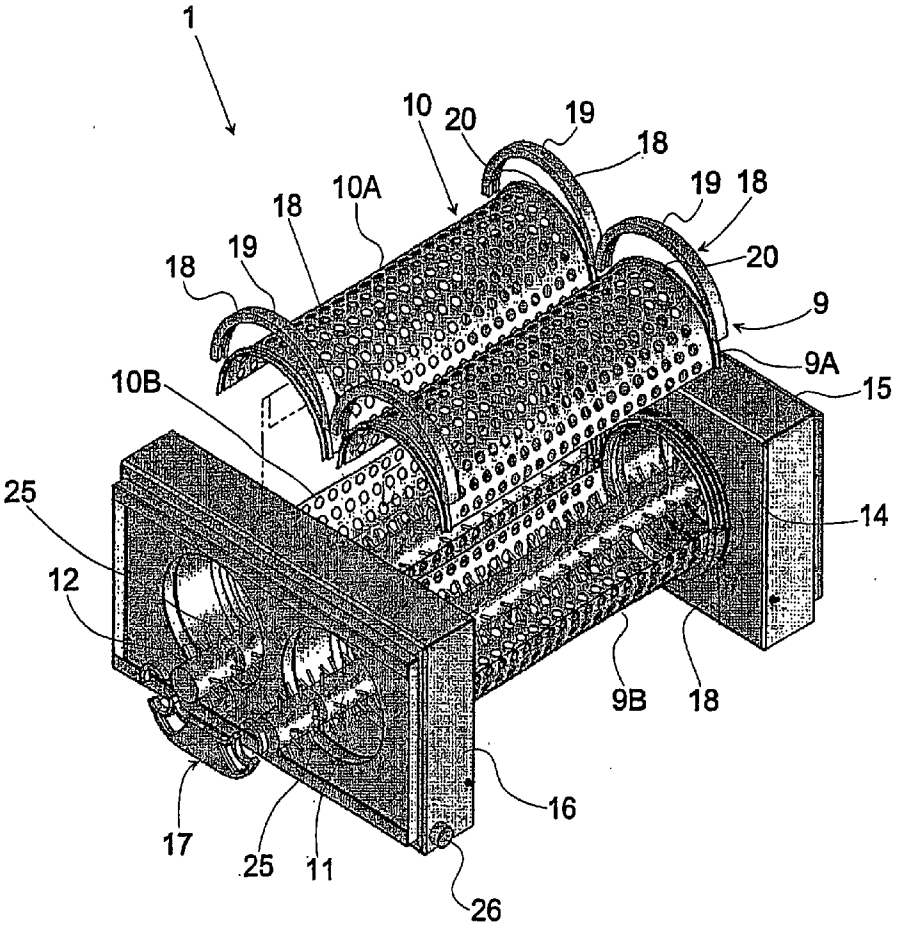
Publication Classification

(51) **Int. Cl.**
D04H 1/70 (2006.01)

(52) **U.S. Cl.** **425/80.1**

(57) **ABSTRACT**

There is disclosed a former head (**1**) with rotating drums (**9, 10**), in which is mounted needle rollers (**11, 12**), and which is used in dry forming of fibrous web or tissue (**4**). The drums (**9, 10**) are composed of at least two semi-cylindrical segments (**9**A, **9**B; **10**A, **10**B) readily separating in axial direction, and which are mounted on a bearing ring (**14**) protruding into the drums (**9, 10**). The drum segments are held together on the bearing ring (**14**) by means of a segmented clamping ring (**18**). By such design, it is possible to perform rapid mounting and dismounting of the drum without need for dismounting the needle rollers (**11, 12**).



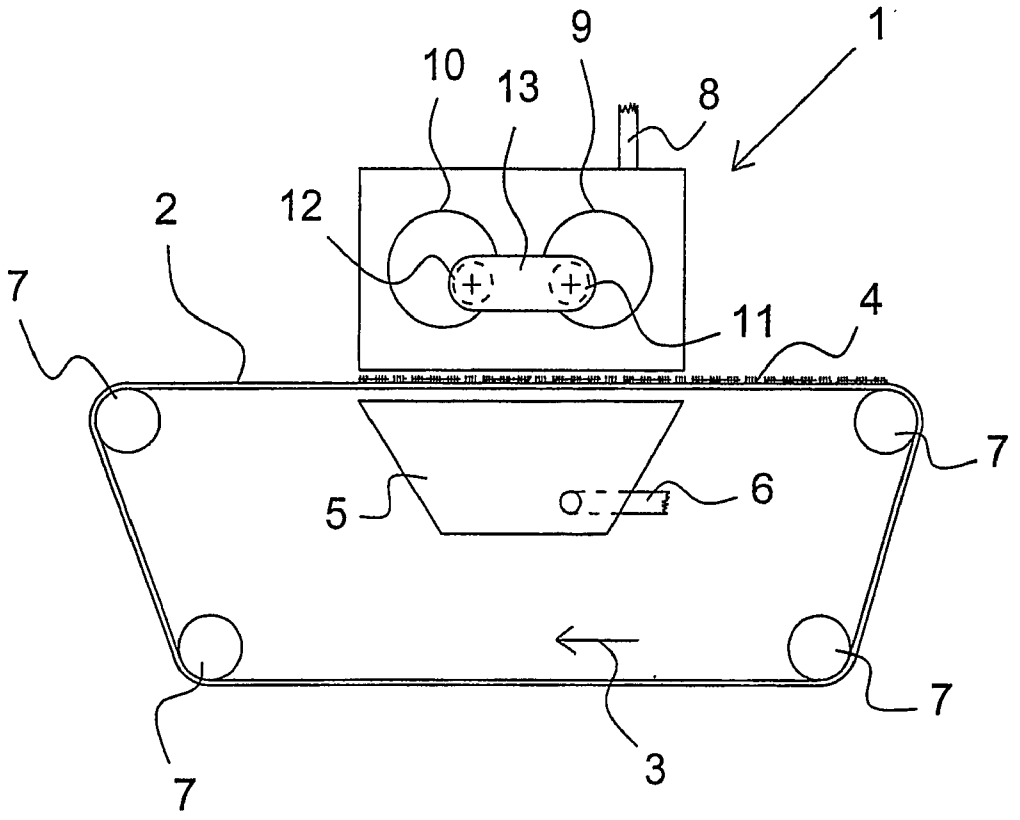


Fig. 1

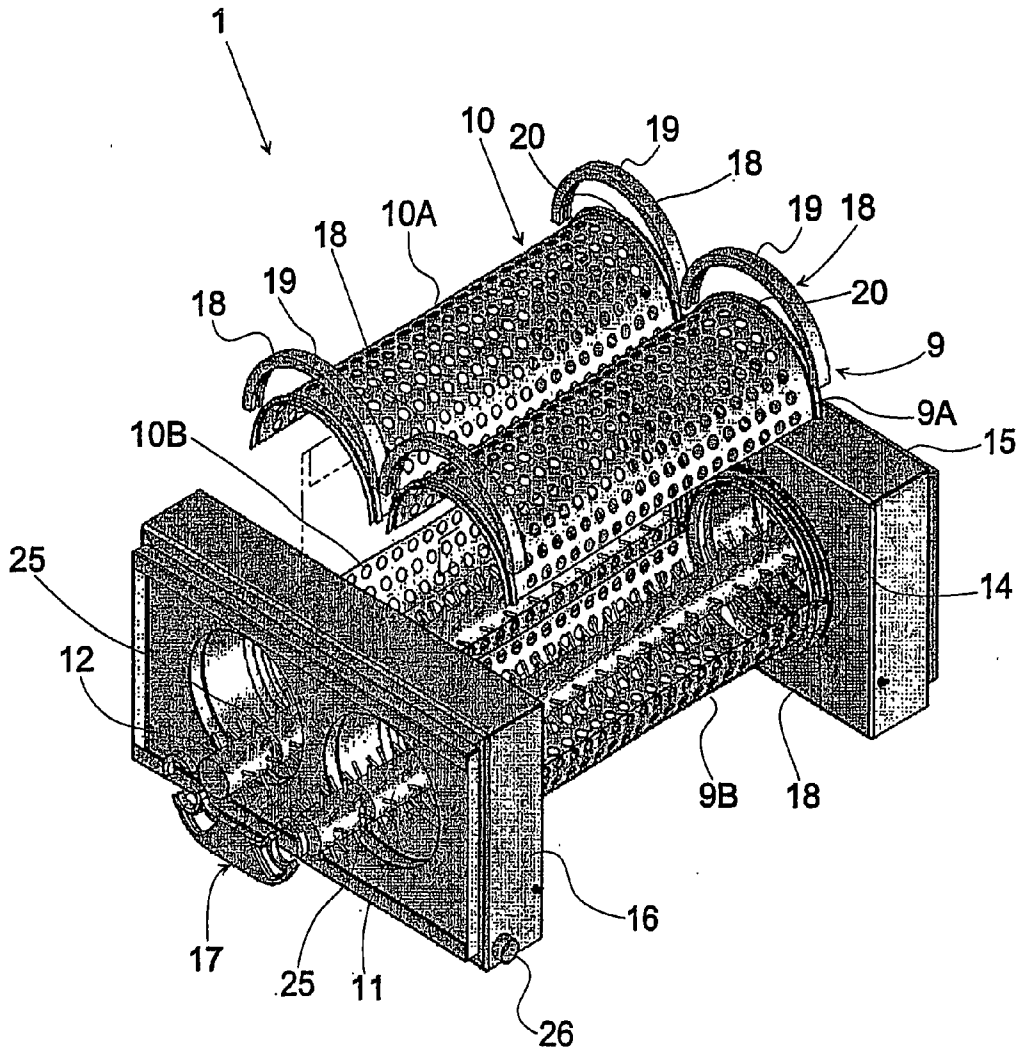

1
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Fig. 2

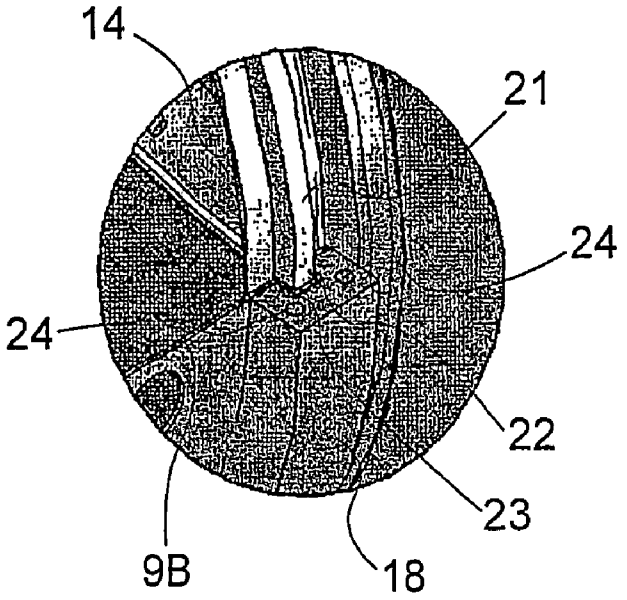

Fig. 3

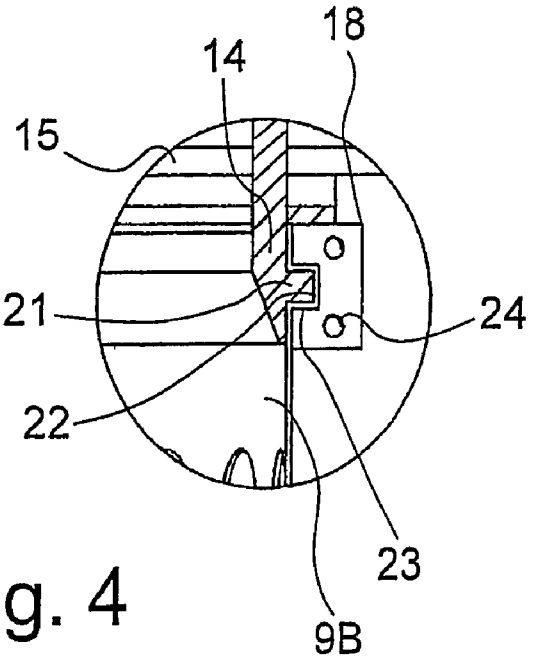

Fig. 4

FORMER HEAD WITH ROTARY DRUM

[0001] The present invention concerns a former head of the kind that includes at least one rotary drum, which at each end is mounted in a bearing gable in which a needle roller is mounted, and which is used for dry forming of fibrous web, where a fibre material mixed with air may be fed by injection into the rotary drum.

[0002] From the industry there are known former head where a mixture of fibres and air is injected into the ends of rotating perforated drums. Inside the drums, a needle roller is mounted which is also rotatable, and which keeps the individual fibres floating so that no clotting occurs. The former head is disposed over an endless running former wire opposite a vacuum box so that the fibres, under the action of the vacuum, are sucked through the perforation in the drum and fixed on the underlying former wire.

[0003] In the known former heads, usually there are two drums, where one is rotated in the direction of movement of the former wire and the other is counter-rotated in relation thereto. Alternatively, there may be another number of drums. The needle rollers, which are provided with radially extending spikes, are usually rotated against the direction of rotation of the respective drums.

[0004] Until now the drums have been suspended in bearing gables in a frame supporting the former head, and usually also the vacuum box and the former wire. The needle rollers have been supported in bearing brackets disposed beyond the ends of the drums.

[0005] Typically, the former heads have a width of about four meters. In such former heads, it is normal that the needle rollers are to rotate with a speed up to 1200-1400 rpm in order to attain desired capacity. The drums are normally rotated with a speed of about 200 rpm. Thus demands are made on the suspension of both drums and needle rollers.

[0006] If a former head is to have an operational width of about 4 m, the needle rollers cannot be rotated with the desired speed without risking occurrence of natural oscillations. This impairs the quality of the dry formed product.

[0007] The perforations in the drum have a design which has been determined from the fibres, used for the manufacturing of the fibrous web or tissue. There is a need for changing the drums so that perforations with suitable shape are used when making fibrous webs or tissues of different types of fibres and/or fibre mixtures. For example, for making paper products or napkin products, cellulose fibres are primarily used which may be mixed with longer binding fibres.

[0008] By changing former heads from one type of fibres/fibre mixture to a different kind, it is necessary to replace the drums. Until now, this replacement has been slow and space demanding. In order to replace a drum, it has been necessary to dismount the needle roller and to pull it out of the end of the drum. Thus there was need for free space beside the former head corresponding to the width of the former head, as the needle roller extends throughout the entire length of the drum, and thereby also the width of the former head. After taking out the needle roller, the drum may be dismounted from its bearing brackets and removed, whereafter a new drum is mounted. Then the needle roller can be re-mounted in the new drum. The period of time for such a replacement would be up to about 10 hours.

[0009] It is the purpose of the present invention to indicate a former head which is designed in a way that enables simple replacement of the drums, and where no demands are made to substantial space beside the former head for performing the replacement, and where at the same time it is possible to reduce the risk of natural oscillations in the needle roller.

[0010] According to the present invention, this is achieved with a former head of the kind mentioned in the introduction, which is peculiar in that the drum is composed of at least two partly cylindric, readily separatable segments which are mounted on a bearing ring at each of their ends, the bearing ring projecting from the bearing gable and into the drum, that the drum segments are held together on the bearing ring by a corresponding segmented clamping ring, and that the needle roller is mounted on a bearing bracket in the bearing gable.

[0011] Since the drum is made of segments, it is possible to let the needle roller remain on its bearing brackets when replacing the drum. It is only required to open the clamping ring and release the drum segments. These drum segments may be lifted up freely in the interspace between the bearing gables. This or those additional drum segment(s), which is/are not lifted free and which is/are disposed on a downwards facing side of the bearing ring, is/are turned upwards, whereafter they are also lifted free from the bearing ring. After removing the drum segments, it will be possible to place new drum segments, as these are lifted in place on the bearing ring between the two bearing gables. When the drum segments are placed on the bearing ring, the clamping ring is mounted again, whereafter the former head is ready for operation.

[0012] Where dealing with the prior art former heads replacement would take up to 10 hours, replacement of the drums may now be effected in about one or two hours. Furthermore, there will be no need for free space at the side of the drum, as there is no need of drawing the needle rollers out of the drums laterally before replacing the drum.

[0013] In order to release the drum it is just required to loosen the clamping ring. The clamping ring will typically be made of a number of segments corresponding to the number of drum segments, and these segments will typically be provided with clamping surfaces or flanges, needing 1-2 screws for clamping the clamping ring segments together. Thus there will only be a need for loosening a few screws in order to release the clamping ring segments, and thereby the drum segments, from the bearing ring which extends a distance into each end of the drum.

[0014] According to a particular embodiment, the former head is peculiar in that clamping ring segments, drum segments and bearing rings have means for releasable securing of the clamping ring segments and the drum segments to the bearing rings. Such means may preferably be provided in the form of screws passing through holes in the clamping ring segments and drum segments and which are screwed into the bearing rings.

[0015] As the clamping ring segments and drum segments are secured on the bearing ring, all clamping ring segments may be separated from each other without any risk of the downwards facing drum segments and clamping ring seg-

ments falling down. During dismounting and mounting thus there will be no risk of damaging the drum segments during mounting and dismounting.

[0016] According to a further embodiment, the former head according to the invention is peculiar in that the bearing ring has an outer diameter corresponding to the inner diameter of the drum, that a projecting back is provided on the outer side of the bearing ring, and that the end parts of the drum segments are profiled for forming a groove for accommodating the back of the bearing ring. Alternatively, it is possible to profile the end parts of the drum segments so that they have an inwards facing back, and to design to the bearing ring with a groove for accommodating such a profiling. By this embodiment, it will be possible to avoid the risk of an axial displacement of the drum in relation to the bearing ring. The interaction between the projecting back and the groove with simultaneously serve as secure and correct positioning of the drum segment during mounting.

[0017] If the clamping ring segments are made with an internal groove which is adapted for accommodating the profiled end parts of the drum segments, a further advantage is obtained by a secure clamping with the end parts of the drum securely clamped between the bearing ring disposed inside the drum and the clamping ring disposed externally on the drum. It is preferred to use a number of clamping ring segments corresponding to the number of drum segments. However, it will also be possible to use different numbers of clamping ring segments and drum segments.

[0018] If former heads with very great width are used, further segmented clamping rings may be disposed at one or more intermediate positions between the ends of the drum. It is noted that such further clamping rings will be disposed at mutually displaced positions over the length of the drum on succeeding drums. Hereby is enabled a uniform laying of fibres, even if such additional clamping rings are used. The need for additional clamping rings will depend on the width of the former head/length of the drum and the dimensions of the drum segments.

[0019] By making the former head with the bearing brackets for the needle rollers disposed inside the bearing gables, it will be possible to obtain a shorter length of the free part of the needle roller.

[0020] This is an advantage, as hereby it becomes possible to rotate the needle rollers with higher speed without risk of them being brought into natural oscillations that may influence the distribution quality of the fibres. Natural oscillations in needle rollers occur when the rotational speed of the needle roller becomes too high, or the length of the needle rollers becomes too great. A former solution to this problem has been to make the needle rollers and the drums with greater diameter, whereby it is possible to change the critical rotational speed for natural oscillations. However, this prior art solution is unnecessarily space demanding and expensive. By placing the bearing brackets of the needle rollers as close to each other as possible, it becomes possible to rotate the needle rollers with higher rotational speed and thereby attain a higher production capacity simultaneously with a better quality of the fibre distribution in a former head having a large effective operational width.

[0021] It is possible that the bearing brackets of the needle rollers are supporting the needle rollers spaced apart from the ends thereof. Hereby, part of the needle rollers may be situated in the bearing gable or outside these bearing gables in the connecting pipes that connect succeeding drums with each other for achieving a circulating flow of fibres through the drums.

[0022] By using drums made of drum segments, it is possible to assemble a drum from segments having different perforations in order thereby to adapt the properties of the product. Thus variation in hole shape and hole size may be performed. However, it will also be possible to compose a drum of drum segments having the same perforations.

[0023] The invention will then be explained in more detail with reference to the accompanying drawing, where:

[0024] FIG. **1** shows a side view of a former head according to the invention,

[0025] FIG. **2** an exploded perspective view of drums and needle rollers for a former head according to the invention;

[0026] FIG. **3** an enlarged partial view illustrating a detail in FIG. **2**; and

[0027] FIG. **4** a partial sectional view corresponding to FIG. **3**.

[0028] In the various figures identical or corresponding elements will be designed with the same reference designation and will therefore not be explained in detail in connection with each figure.

[0029] In FIG. **1** is seen a former head **1** according to the invention. The former head **1** is disposed over an endless former wire **2** which is moved according to the arrow **3**, so that a fibrous web or tissue **4** is formed at the top side of the former wire **2**. Below the former wire **2**, at a position opposite to the former head **1**, a vacuum box **5** is provided which via conduit **6** is connected to a source of vacuum (not shown). The former wire is passed around reversing rollers **7**. The formed fibrous web or tissue **4** is removed from the former wire by means of transfer unit that are known in the art.

[0030] Fibre material mixed with air is supplied to the former head **1** via a pipe **8** for injection at the end of one of two drums **9**, **10** provided in the former head. The supply pipes **8** are connected to shredding devices in form of hammer mills or other equipment which shreds the fibre material so that individual fibres, or individual fibres containing very few agglomerates, are formed. The former head includes two rotating drums **9**, **10**, each containing a needle roller indicated by **11**, **12**. The fibres fed into the drum **8** is circulated through the two drums **9**, **10**, as these are connected with transfer pipes **13** at both sides, which are well-known in this type of former head.

[0031] FIG. **2** shows a perspective view of certain parts from the former head **1**. It appears that the drums **9**, **10** are made of two semi-cylindric segments **9**A, **9**B, **10**A, **10**B. The drums **9**, **10** are mounted on bearing rings **14** (only one is visible) which is projecting from bearing gables **15**, **16** at each end of the drums **9**, **10**. The needle rollers **11**, **12** at each end is mounted on a bearing bracket **17** (only one is visible) which is disposed in or directly on the bearing gables **15**, **16**. The drum segments **9**A, **9**B, **10**A, **10**B are secured on the bearing rings **14**, using clamping ring segments **18** which are provided as semi-circular clamping ring segments as well.

Each of the clamping ring segments have a hole **19** that may be aligned with a hole **20** in the associated drum segment for receiving a screw which is used for securing the drum segments and the clamping ring segments on the bearing ring **14**.

[**0032**] FIG. **3** shows an enlarged view illustrating the joining of drum segment **9**B and clamping ring segments **18** on bearing ring **14**.

[**0033**] It appears that bearing ring **14** has a projecting back **21**, and that the end part of the drum segment is profiled for forming a groove **22** for accommodating the back **21**. Furthermore, it is seen that the clamping ring segment **18** is profiled with a groove **23** which serves to accommodate the projecting back **21**, with the profiling **22** of the drum segment **9**B interposed between. The clamping ring segments are provided with holes **24** for the reception of screws for joining and clamping the clamping rings.

[**0034**] In FIG. **3**, two holes **24** are shown on a clamping face, being threaded holes for receiving screws which are disposed in through-going holes (not shown) in the interacting clamping ring segment. With this embodiment, countersunk screws are used, so that no projecting parts appear on the cylindric clamping ring. Alternatively, it is possible to provide flanges with screw holes for clamping the clamping ring segments **18** together.

[**0035**] It appears that the formed clamping rings will clamp the drum around the bearing ring **14** for rotating together with it. In a way known per se, the bearing ring **14** will be seated in the bearing gable **15** in order to be rotated with a desired speed.

[**0036**] FIG. **2** shows that the needle rollers are provided with a groove **25** in which they rest upon the bearing bracket **17**. The bearing bracket **17** is mounted on the side plate of the bearing gable **16**. Also, there is provided a bearing bracket for the second end of the needle rollers and drive means for these, so that they are driven with a desired rotational speed in a known way.

[**0037**] FIG. **4** shows a sectional view through the bearing ring at a position opposite the joint of the clamping ring segments and the drum segments, as illustrated in FIG. **3**. It appears that the bearing ring **14** is disposed in the bearing gable **15** where it is seated.

[**0038**] The above Figures illustrate an embodiment of the invention, but other embodiments are possible, if only such embodiments apply the basic idea of the invention with segmenting of the drums **9**, **10**.

[**0039**] Further clamping rings may thus be disposed at one or more positions along the length of the drums. Also, it is noted that the drums can be made with other perforations than the shown circular openings. Any shape and size may thus be possible for the perforations of the drums.

[**0040**] Furthermore, it will be possible to make the bearing gables as an integrated part of a machine frame and/or as an integrated part of the vacuum box **5**. Furthermore, it is possible to make the bearing gables pressure-tight and to connect these with a pressure source via a pipe connection **26** so that maintaining an overpressure in the bearing gables is ensured.

1. A former head of the kind that includes at least one rotary drum, which at each end is mounted in a bearing gable in which a needle roller is mounted, and which is used for dry forming of fibrous web, where a fibre material mixed with air may be fed by injection into the rotary drum, characterised in that the drum is composed of at least two partly cylindric, readily separatable segments which are mounted on a bearing ring at each of their ends, the bearing ring projecting from the bearing gable and into the drum, that the drum segments are held together on the bearing ring by a corresponding segmented clamping ring, and that the needle roller is mounted on a bearing bracket in the bearing gable.

2. Former head according to claim 1, characterised in that clamping ring segments, drum segments and bearing rings have means for releasable securing of the clamping ring segments and the drum segments to the bearing rings.

3. Former head according to claim 2, characterised in that the means for releasable securing include a screw passing through holes in the clamping ring segments and the drum segments and which is screwed into the bearing ring.

4. Former head according to claim 1, characterised in that the bearing ring has an outer diameter corresponding to the inner diameter of the drum, that a projecting back is provided on the outer side of the bearing ring, and that the end parts of the drum segments are profiled for forming a groove for accommodating the back of the bearing ring.

5. Former head according to claim 4, characterised in that the clamping ring segments have an internal groove for accommodating the profiled end parts of the drum segments.

6. Former head according to claim 1, characterised in that further clamping rings are disposed at one or more intermediate positions between the ends of the drum, and that such further clamping rings are mutually displaced on possible succeeding drums.

7. Former head according to claim 1, characterised in that the bearing brackets for the needle roller are disposed inside the bearing gables.

8. Former head according to claim 8, characterised in that the bearing brackets of the needle rollers are supporting the needle rollers spaced apart from the ends thereof.

9. Former head according to claim 1, characterised in that the drum segments, which are assembled into forming a drum, have the same or varying perforations.

* * * * *