United States Patent [19]

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[54] BARKING DRUM

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[52] **U.S. Cl.** ..... **144/208 B,** 241/178

[51] **Int. Cl.** **B27l 1/04**

[58] **Field of Search** .... 144/208 B; 241/178, 176, 278

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[57] **ABSTRACT**

A drum barker including an elongated drum arranged to rest in a horizontal position and supported for rotation by several systems of motor driven wheels placed in a row on both sides of the drum and for axial movement by a set of wheels engaging a pair of guiding rings situated on the drum. The drum is adapted to receive through one end the timber to be debarked. The inner surface of the drum is provided with projections for removing the bark, while the outer surface is provided with slots through which the detached bark is discharged. Alternatively, the outer surface is provided with a plurality of reinforcing hoops with a set of wheels symmetrically disposed on either side thereof. A spray system is included for spraying a liquid on the timber either as it enters the drum to soak the bark or as it leaves the drum to facilitate the removal of loose bark from the timber, or both. The spray system may also spray the rotating and axially movable drum and the system of wheels to reduce the friction between the outer surface of the drum and its points of contact with the system of wheels. Alternatively to, or in conjunction with, the spray system a parallel switching system may be utilized for equalizing the operation of the motor driven wheels.

10 Claims, 13 Drawing Figures

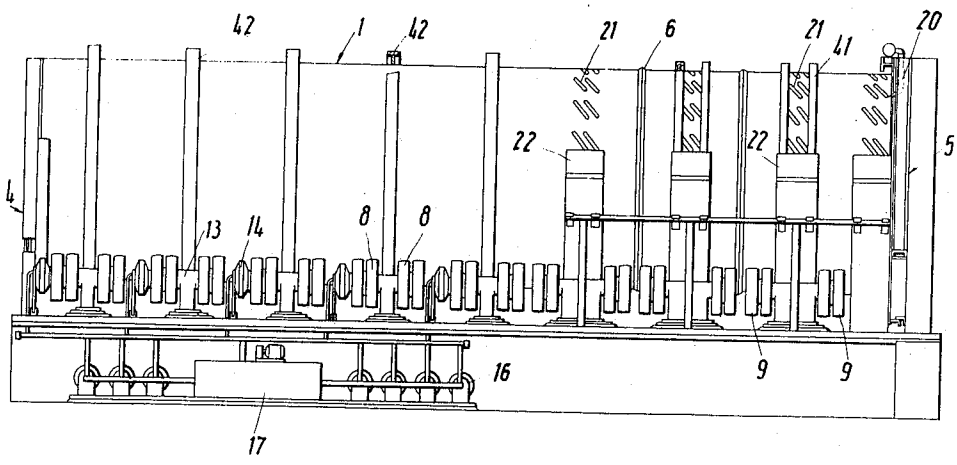


Fig. 1

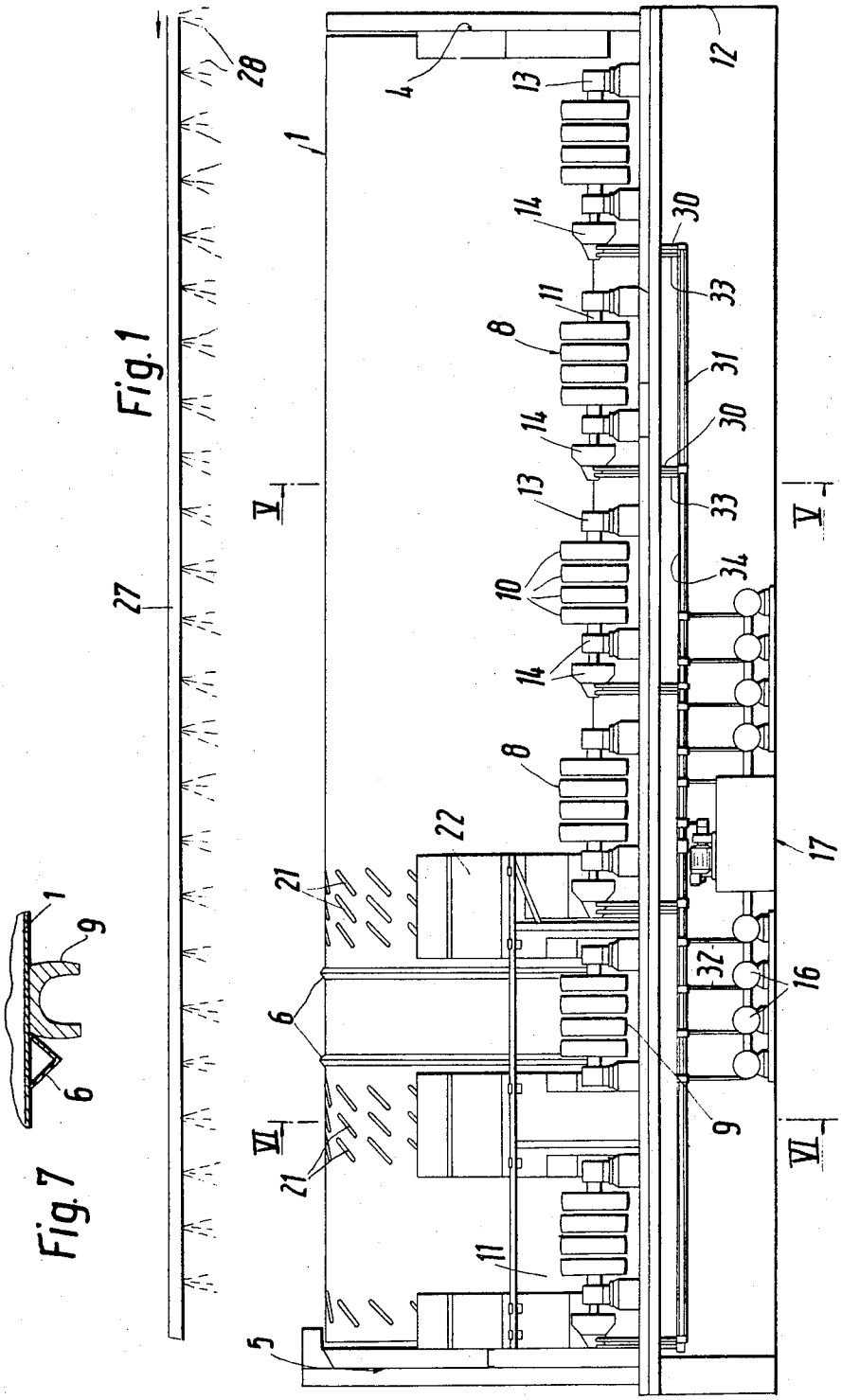


Fig. 7

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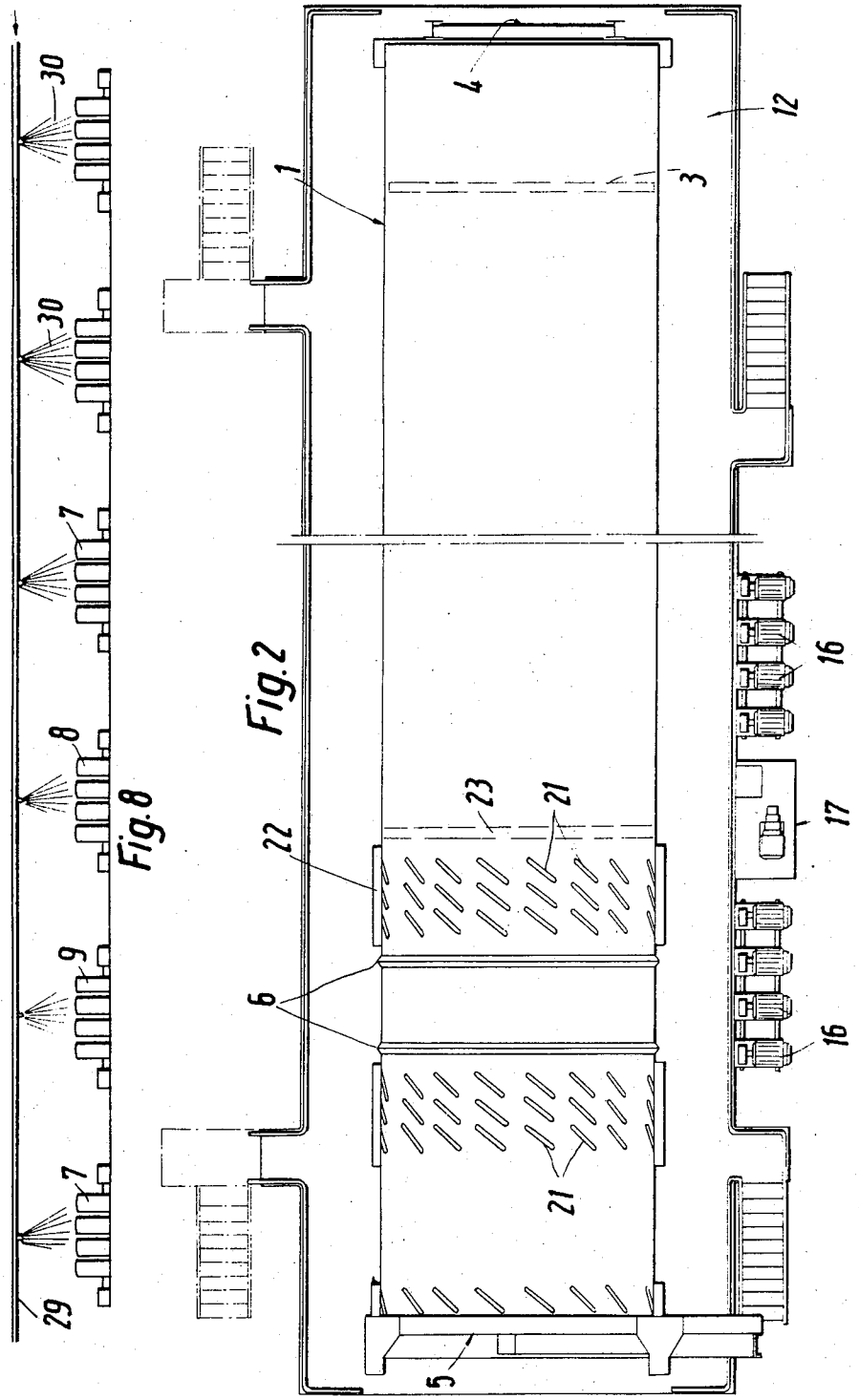


Fig.8

Fig.2

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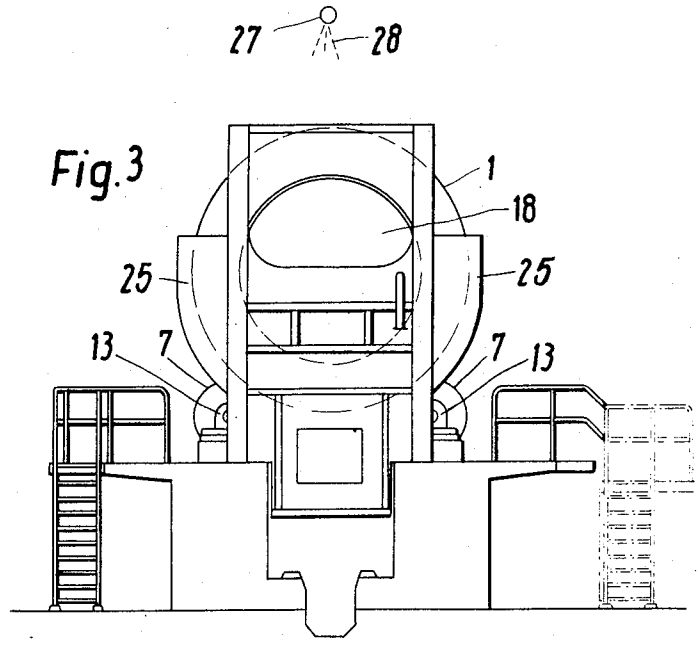


Fig.3

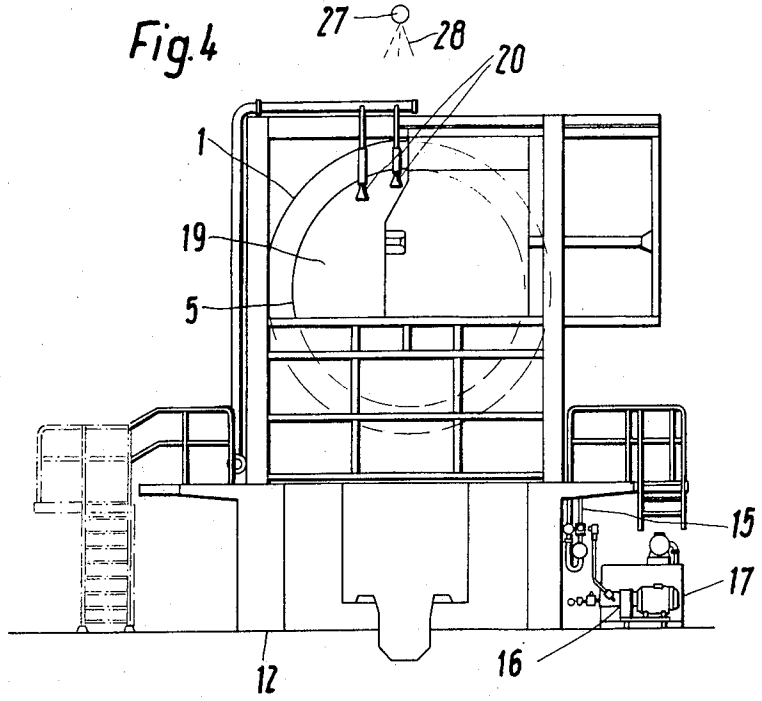


Fig.4

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Fig.5

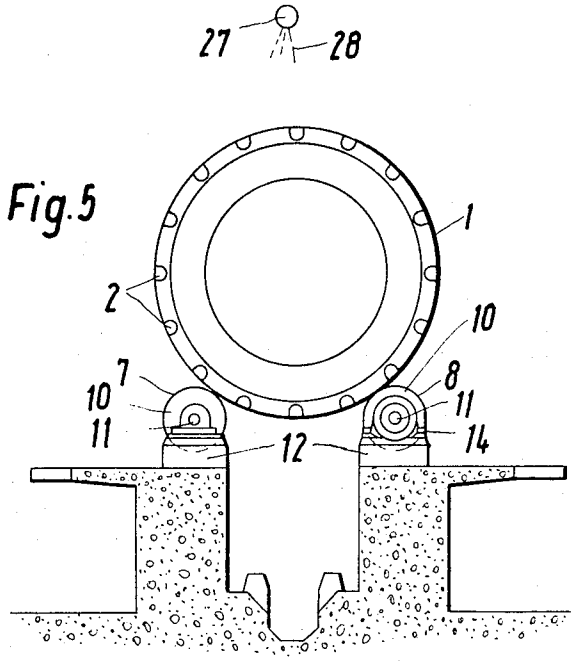
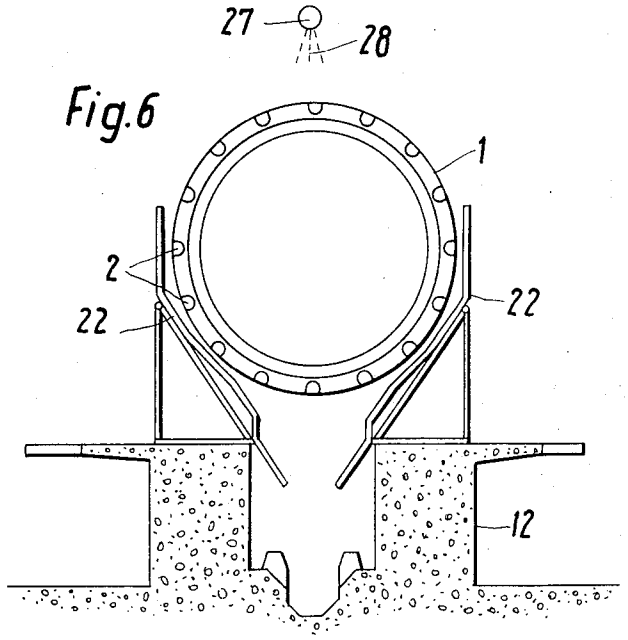


Fig.6



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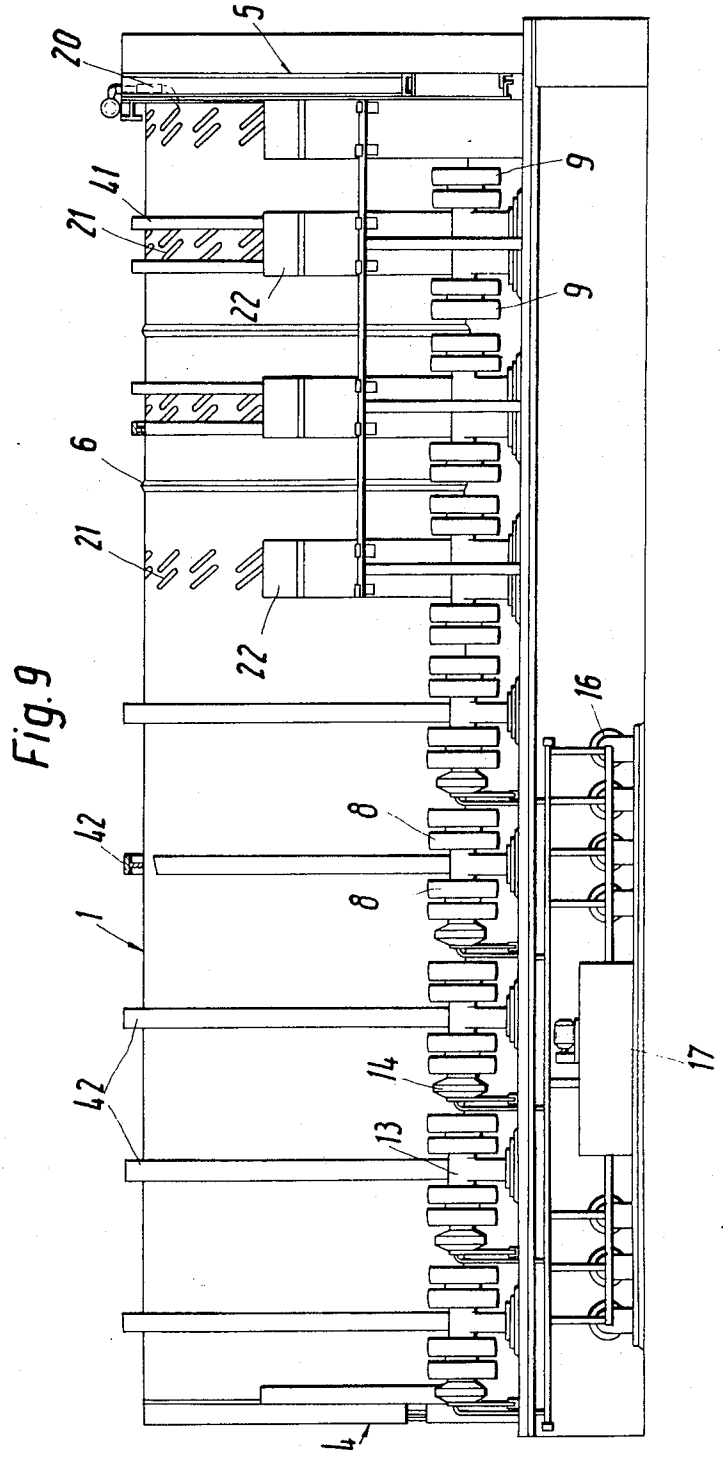


Fig. 9

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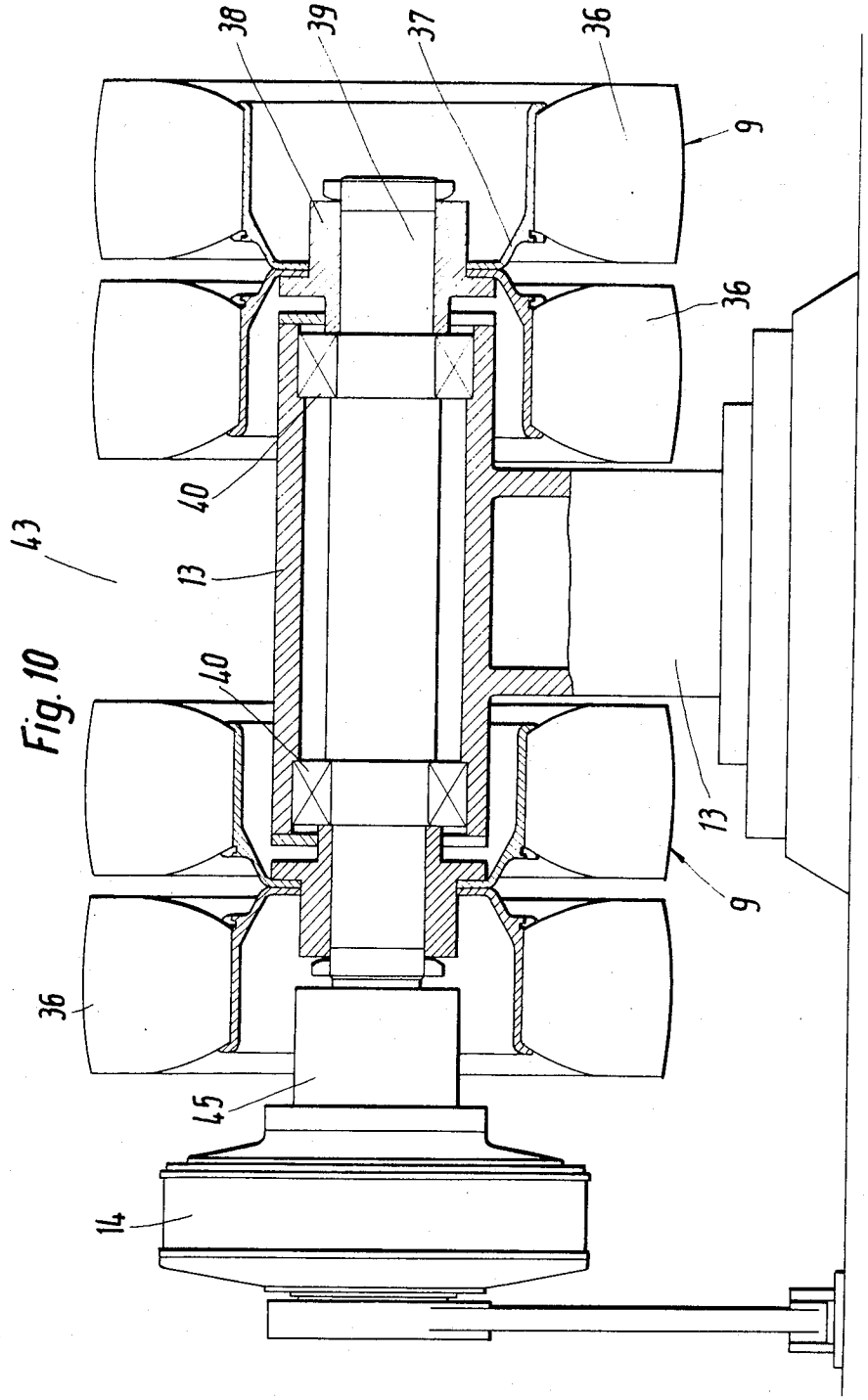


Fig. 10

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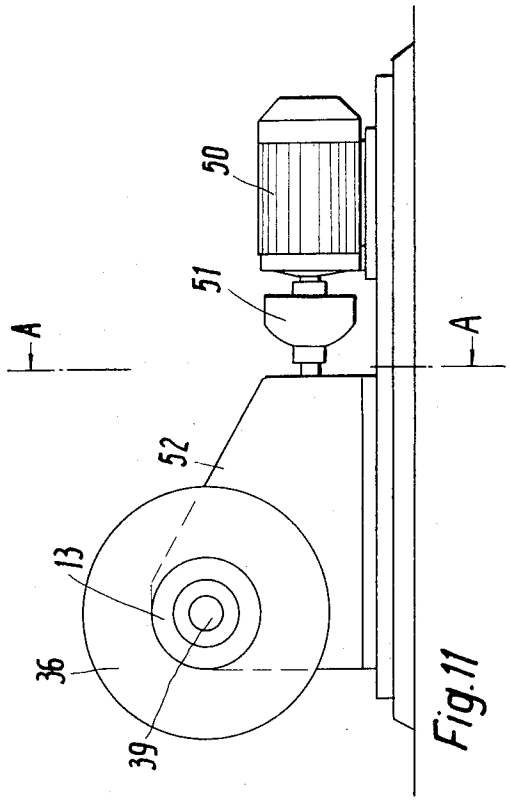


Fig.11

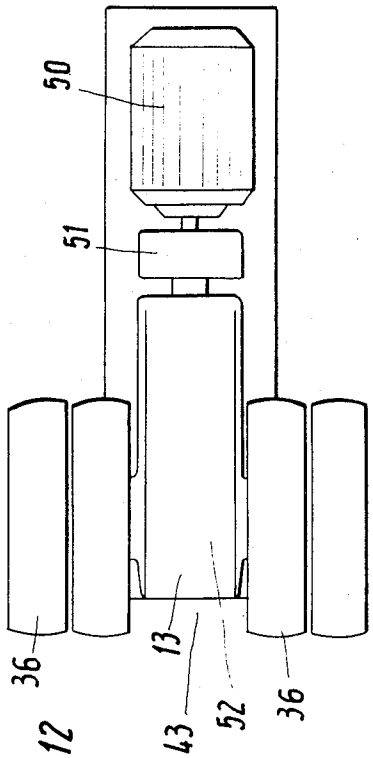


Fig.12

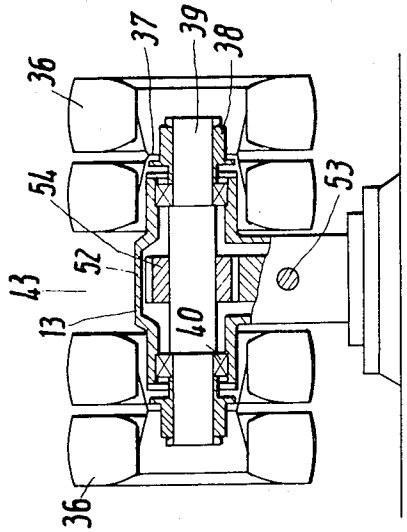


Fig.13

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BARKING DRUM

This invention relates to a barking drum, the cylindrical drum of which is supported by supporting wheels on both sides.

Barking drums described above, in which rubber tires contact the outer surface of the drum and which, or a part of which, tires are used to make the drum rotate while serving as supporting wheels, are generally known. Known also are barking drums in which the axial steering of the drum is accomplished by supporting wheels covered with rubber or provided with rubber tires, and by steering hoops made of an angle bar and fastened to the outer surface of the drum, the bevelled side faces of which hoops come in contact with the steering wheels, for instance with their air-filled rubber tires, when the drum strives to move in its axial direction.

Further barking drums are known in which, by moistening or otherwise, friction is reduced in all the points, where supporting or steering wheels have a contact connection with the surface of the drum or of the steering hoop.

It is known that the operating wheel or wheelworks are provided with devices causing uniform operation, e.g., hydraulic motors running the operating wheels with a common liquid feeding lead connecting both of them or possibly with a common liquid removal lead.

It has been found that in order to place as many supporting wheels and steering wheels as possible in two lines in the longitudinal direction of the drum, the bearings of the supporting wheel, and/or of the steering wheel, and/or of pairs of supporting and/or steering wheels are positioned so that they are situated in the center of the wheels. In addition to corresponding wheelworks, parts supporting the bearings, and possibly also the operation motor and/or parts attached to it are placed, at least partially so that they are situated in the center of the above mentioned wheel or wheels, when seen vertically towards the axis of the drum. When seen from said direction the bearing bracket or brackets are located between two wheels or the pair of wheels or wheelworks, in the space therebetween are located a reinforcement hoop, or hoops, and/or removal openings of the casing with gathering funnels of the casing.

In cases where the diameter of the drum is relatively large compared with its length, difficulties may turn up in obtaining a sufficient amount of supporting and steering wheels located on a drum side, and at the same time to get space enough for reinforcing hoops, as well as removal openings and gathering funnels of the casing. in object of this invention is to improve the situation on the outer surface of the drum described above.

In order to make the invention clear, reference is made to the accompanying drawings, in which FIGS. 1–10 show barking drums already known and FIGS. 11,12, 13 the drum according to this invention and its supporting and/or steering wheels.

In the drawings, FIG. 1 shows a side view of a barking drum,

FIG. 2 is a top view of a barking drum, same as in FIG. 1,

FIG. 3 shows a barking drum according to FIGS. 1 and 2 seen from the feeding or filling end,

FIG. 4 shows a barking drum according to previous figures seen from the removal end,

FIG. 5 is a sectional view taken along the line V—V in FIG. 1,

and FIG. 6 is a sectional view taken along the line VI—VI in FIG. 1,

FIG. 7 shows an enlarged detail of previous figures and a partial view of the longitudinal section of the drum right close to the steering hoop,

FIG. 8 is a partial top view of wheelworks on the other side of the drum showing only the halves and a jet pipe, which are located on the outermost side of the axes of the wheelworks,

FIG. 9 is a side view of a drum according to another realization form and

FIG. 10 is an enlarged and partly cut side view of the supporting wheelwork of the previous drum,

FIG. 11 is a side view or seen in the direction of the axis of the drum of the supporting wheelwork with its operation motor and power transmission devices according to this invention, FIG. 12 shows the same as the previous figure but is a top view with some small changes belonging to appearances of the devices and

FIG. 13 is a partly cut section from FIG. 11 taken along the line A—A in the direction of arrows.

The level of the previously known technique will now be described with reference first to FIGS. 1–8.

According to this, the barking drum comprises a cylindrical drum 1, partly opened in its ends, which is provided along its inner surface with longitudinal ribs or barking irons or similar projections 2 (FIGS. 5 and 6) in order to improve the barking effect. Besides, one or more transverse reinforcement hoops 3, 23 may be fastened to the inner surface of the drum. This kind of reinforcement hoops are shown in dotted lines in FIG. 2.

Instead of, or in addition to, the hoop being fastened to the inner surface of the drum it is possible to attach a similar reinforcement hoop or hoops also to the outer surface of the drum, which also seems to be advantageous in practice though such a reinforcement hoop fastened to the outer surface is not shown in the drawings.

The drum 1 is arranged in a horizontal position against several wheelworks aligned on both sides of the drum. In the shown case, four wheels 10 belong to each wheelworks 7, 8, 9 and are fastened side by side to the horizontal axis 1, which axis is attached by bearings to bearing brackets mounted on a suitable base 12. Wheels 10 may be provided with full rubber tires or with solid tires fastened to their outer spheres or wheels may be provided like car tires with air-filled tires, for instance with car tires in the wearing surfaces of which are made any kind of suitable figures, roughnesses, grooves or the like, as exist in car tires.

To rotate the drum 1 all wheelworks, or part of them, on the other or both sides of the drum, for example, wheelworks shown in FIG. 1, may serve as operation wheelworks run by electric motors 14 or by any other engine or device for transmission of power.

When the barking drum is operating, trees for barking are continuously conveyed by some suitable apparatus through the feeding opening 18 (FIG. 3) in the feeding end 4 into the drum 1. These are rubbed against each other, against the wall of the drum and projections or barking irons 2, thus becoming stripped travelling to the removal end 5, where they depart

through the removal opening **19** (FIG. **4**). Right close to this, water is squirted on the trees from the nozzles **20** to clean the trees from loose barks and other material. It is possible however, to arrange waterspouts also as the feeding end of the drum in order to soak the barks, and in winter time to melt frozen logs and ice stuck to them. Because of this, water coming to the feeding end will be sufficiently warm or hot.

Reference mark **23** indicates the circular wall inside the drum, the inner diameter of which is a bit larger than the inner diameter of the circular wall **24** in the feeding end. Because of this, water squirted to the feeding end gathers between the hoops **23** and **24** in running to the left over the lower edge of the opening centered in the hoop **23** according to FIG. **2**. A part of warm water squirted to the drum thus stays, during a certain time, between the hoops **23** and **24** so that the warming effect and the bark-soaking effect of water can be profitably utilized in this manner. In front of and right close to the circular wall **24** that partly closes the feeding end, parallel to the plane of the hoop **24**, there is a firm platelike wall **25**, over the upper edge of which logs are fed into the drum. When the drum is rotating, the logs fed into it travelling across the lower edge of the opening centered in the hoop **23**, spread towards the removal end, departing further on from the removal end **5** through the opening **19** located therein to a conveyer, to be transported forwards.

Barks loosened from trees depart through openings **21** on the surface of the drum **1** to funnels **22** on the sides of the drum, wherefrom they are conveyed further on to be handled with running water in water flumes located, for instance, beneath the funnels, or by conveyer belts.

Axial steering is carried out so that, on the outer surface of the drum, has been fastened a so called steering hoop or hoops **6**, which together with a supporting wheel or wheels of wheelworks **9** placed close to them accomplish the axial steering. Last mentioned supporting wheels of wheelworks **9** may at the same time serve as operating wheels or, as usually is the the case, they do not serve as operating wheels. In case according to FIGS. **1**, **2** and **7** the steering hoop **6** is made of angle bar bent to the shape of a hoop. The outermost ends of the branches or flanges of the bar cross section touch the surface of the drum, which they are firmly attached to for instance by welding. Steering hoops **6** can be manufactured also of angle bars, the angle between the flanges of which is either larger or smaller than 90°. When the drum strives to move axially to the right according to FIG. **7**, the right-hand bevelled surface of the angle bar strives to force to the right the side face of the air-filled tire **9**. The upwards directed component of this forcing power against the drum is not capable of lifting the drum to any noteworthy degree because of the heavy weight of the drum and as a result consequently will cause an air-filled tire to be flattened a little from one side at in the point of contact with the steering hoop.

A pipe **27** is mounted firmly in its place above the drum, as shown in FIG. **1**, into which pipe water is conveyed in the direction of the arrow, spurting downwards as fine jets through holes, nozzles, or equivalent, in the pipe to the upper surface of the drum **1**, which in this manner is continuously kept damp. In the wearing surfaces of tires of wheelworks **7**, **8** and **9** rolling against the damp outer surface of the drum, and in surfaces that come in the contact with rolling hoops **6** there occurs a considerably smaller wearing out than otherwise due to a small sliding, which thus originates between the outer surface of the drum or outer surfaces of steering hoops and outer surfaces of wheels. To prevent this sliding to become too significant, however, may the spurting of water from the pipe **27** to the surface of the drum be regulated by, in itself known, suitable faucet devices or corresponding contrivances. Nozzles may also be of such a known quality or type that water arrives at the surface of the drum as finely divided as possible, for example as fog.

Instead of the pipe **27** one may also use brush devices that are kept damp and that moisten the surface of the drum **1** or of steering hoops **6** when touching them. Instead of, and in addition to a brush of a pipe or brushes of pipes such as described above one may use for instance cloths, rags or pieces, plates or slabs of foamy plastics, which are kept sufficiently damp so that they will moisten the drum in desired points.

In FIG. **8** is shown how water conveyed to the pipe **29** in the direction of the arrow is spurted as jets **30** from holes or the nozzle to wheels **10** of wheelworks **7**, **8**, **9**.

Since friction and sliding are greater at least periodically in contact points between tires of the wheelwork **9** and steering hoops **6** than in contact points of other tires **8** and the drum, one may, when needed, convey more water to wheels **9** by special nozzles. In some cases one may direct the spurt straight to contact points of hoops **6** and wheels or wheelworks **9** especially, in regard to the rotation direction, to points in front of said contact points. In some situations one may also spurt water only to contact points of steering wheels or wheelworks **9** and steering hoops **6** or to points close to them and entirely leave other wheels and/or the surface of the drum unmoistened in other parts.

In lieu of water one may use other liquids also when needed and various solutions, emulsions, etc. In some circumstances it may be desirable, instead of or in addition to water, to use some solid slipperiness-causing substances, e.g., talcum powder or something like that.

In addition to, or instead of, using above mentioned greasing and/or slipperiness causing substances one may also use parallel switching that equalizes operation motors. This means that when for example wheelworks are run by hydraulic motors **14**, to each motor is conveyed liquid under pressure through pipes **30**, which are fed with liquid from a common connection pipe **31**. Compressors **16**, run by electric motors, feed liquid under pressure through pipes **32** into pipe **31**. One or more of the compressors **16** may be at rest getting started according to the need of power appearing at each time.

Removal pipes **33** convey liquid from each of the hydraulic motors to a common removal pipe **34**, wherefrom liquid returns to compressors **16** through a condensor equipment **17**. When liquid under pressure is fed from operating compressors **16** to the common connection pipe **31**, from which it so as to separate hydraulic motors **14** through feeding pipes **30** branching off the pipe **31**, an equalizing common use for each of the hydraulic motors is attained in this

manner. If above described changes of outermost diameters of supporting wheels and steering hoops and of diameters of the outer surface of the drum cause some differences in numbers of revolutions between separate wheels and wheelworks, so motors coming to rotate faster receive more liquid under pressure and motors rotating slower receive respectively less liquid. Now because of differences in numbers of revolutions wheelworks rotating slower do not come to hold back the movement of wheelworks rotating faster.

Though no significant sliding strives to originate at contact points between wheels and the drum, so if nevertheless, for example in consequence of too plentiful watergreasing described above friction between some wheel or wheelwork and the drum would become so small that the operating wheelwork in question when operating would easily slide relative to the surface of the drum, causing additional revolutions or so called rush revolutions to the motor in question. To provide against this kind of a danger one may, however, equip the liquid feeding pipes of the motor with special known accessory devices, which in these cases close the flow of the liquid or throttle it small. If the motor in its normal use takes liquid, for instance one liter per minute, so these accessory devices do not give more liquid to it, preventing in this way the danger of rush mentioned above in this way.

In cases when instead of hydraulic motors are used, for example usual electric or alternating current motors, so due to above described differences of diameters of operating wheels and the drum, and respectively to differences in numbers of revolutions of operating wheels, other motors would come to hold back the rotation of others. This is prevented by applying a so called common equalizing use of electric motors and/or by electric motors constructed and connected respectively.

It is also possible to carry out the equalizing common operation of operating wheels or wheelworks, for example in the same way as the equalization of differences in numbers of revolutions of car-gears, by so called differential gears or by corresponding hydraulic contrivances equalizing the numbers of revolutions.

The drum that will be described in the following with reference to FIGS. **9** and **10** is otherwise similar to the drum according to previously described FIGS. **1–8** but differs from it in regard to the mutual allocation of wheelworks, of reinforcement hoops **41, 42** outside the drum, and of removal openings **21** and gathering funnels **22** of the casing. Thus the same reference marks have been used in FIGS. **9** and **10** to refer to same or respective parts in FIGS. **1–8**, i.e., the parts of FIGS. **9** and **10** operating in a corresponding to the parts in FIGS. **1–8**.

As is shown in FIG. **10** a bearing bracket **13** is situated in the middle of two pairs of wheels comprising the wheels of wheelworks **8** and **9**. Air-filled rubber tires **36** (FIG. **10**) are mounted to spheres **37** of wheels which are attached side by side to a center support **38** which is in connection with an axis **39** that is able to rotate resting upon ball or roller bearings **40** supported by the bearing bracket **13**. In this way bearings as a whole, and a tubular part of the bearing bracket to some degree, are placed inside the tires of the pair of wheels. It is possible then to locate more wheels side by side in the direction of the longitudinal axis of the drum, particularly when also the part **45** connected to the axis **39** of the hydraulic motor is partially situated in the center of the tire of the wheel.

As is shown in FIG. **9**, in the place or area of bearing brackets i.e., within the remaining space between paris of wheels in the longitudinal direction of the drum, are located either the gathering funnels of the casing, in the place or area of which are situated the removal openings **21** of the casing on the surface of the drum. Possibly in addition to them reinforcement hoops **41** may be situated outside the drum beside the removal openings of the casing and being engaged to the drum, or broader reinforcement hoops **42** situated elsewhere on the surface of the drum.

As shown in FIG. **10**, space **43** remains between two pairs of wheels and having a dimension just to a proper extent, also in the radial direction from the drum, so that gathering funnels of the casing fit in this space in the axial as well as in radial direction of the drum as well as reinforcement hoops located outside. In this way it is possible to place on an outer surface of a barking drum, having even a very large diameter, a sufficient amount of reinforcement hoops and yet there will be supporting wheels in a proper degree.

Of course supporting wheels could be placed beneath the drum also in two lines placed one on top of the other, but the supporting capacity of the upper line would then remain relatively small, since the drum due to its curvature would at that time strongly strive to be wedged between upper supporting wheels. Under these circumstances it is important that there are supporting wheels only in one line on both sides of the drum and just in such a place, that the upward effective drum-bearing component of pressure of the supporting wheels, which pressure is effective towards the center of the drum, is large enough. On the other hand, however, lines of wheels have to be spaced from each other so that the drum keeps well between these lines of wheels supported by wheels. Using the construction described above it is possible to place supporting wheels in a proper degree in two lines in the longitudinal direction of the drum, the drum being also very large in its diameter and relatively short axially at the same time.

The wheelwork according to this invention, with its operation devices that will be described in the following in reference to FIGS. **11, 12** and **13**, is otherwise similar to the one shown before in FIGS. **9** and **10** described basically, but differs from it among other things in it that instead of the hydraulic motor an electric motor has been used as a power source, e.g., an usual short circuit motor **50** placed and connected to the wheelwork in a certain way. Thus in FIGS. **11, 12** and **13** the same reference marks have been used to indicate the same or similar parts as in FIGS. **1–10** and which operate in a corresponding way. The axis of the electric motor is connected to the primary or operation axis **53** of the gear wheelwork **52** through a hydraulic coupling **51**. The gear wheelwork may be considered to be constructed inside the bearing bracket of supporting wheels, or the gear wheelwork **52** may be considered as serving as a bearing bracket of the supporting wheels **37, 39** at the same time when the secondary axis or operation axis of the gear wheelwork serves as the axis **39** of the pairs of supporting wheels.

As described above, slight differences in numbers of revolutions of separate wheels or wheelworks may appear when the drum is rotating due to small differences of the diameter of the drum in several places as well as to differences of diameters of supporting wheels that which may be consequences of unequal atmospheric pressures in tires, of wearing away etc. This kind of differences in numbers of revolutions may be permitted though a separate short circuit motor independently used in each of the supporting wheelworks, this being made possible by the hydraulic coupling **51**.

The utilized hydraulic coupling **51** may be of known construction and may operate according to known principles, for example in which the motor operates a paddle wheel or turbine or corresponding device inside the coupling through the used utilized axis of the hydraulic coupling, which makes the liquid in the hydraulic coupling flow. This flow operates another paddle wheel, turbine or corresponding device in the hydraulic coupling thus rotating the axis that operates the hydraulic coupling, which is firmly fastened to the primary axis **53** of the gear wheelwork.

Now, for instance, upon starting the barking drum very great differences in numbers of revolutions may exist between the operation and used axes i.e., the input and output axes of the hydraulic coupling. This only causes a liquid flow greater than normally between the used paddle wheel and the wings of the turbine and a warming up of the liquid respectively. In normal operation circumstances, however, numbers of revolutions of the used and operation axes of the hydraulic coupling are same or substantially the same.

The hydraulic coupling makes possible also the slight differences of numbers of revolutions due to slight differences of the diameters of the before described drum and of the operation wheels.

Also in the case, when for example because of a too plentiful water-greasing or of some other reason, friction between operation wheels **37**, **36** would become too small, in which case for example using the hydraulic motor as a power source so called rush revolutions would strive to occur, no corresponding phenomenon will appear when using the electric motor and the hydraulic coupling and no safety contrivances are needed for it. If due to some exceptional disturbances in operation the movement of some operation wheel or wheels would entirely become held back to a standstill, then in the hydraulic coupling there occurs only more abundant flow of liquid between the utilized paddle wheels and a warming up of the liquid, but the motor may operate with a normal or nearly normal number of revolutions.

The diameter of a toothed wheel **54** attached to the secondary axis of the gear wheelwork, being at the same time the axis of the supporting wheelwork has to be so small that the distance of the bearing bracket in the radial direction from the drum provides a sufficiently large area **43** between the pairs of wheels, to enable the gathering funnels of the casing, as well as reinforcement hoops located outside (in a way shown in FIG. **9**), to fit in this area.

When electric motors may be attached to through the gear wheelwork on the sides of the gear wheelworks, shown in FIGS. **11–13**, then by substituting the hydraulic pressure motor with an electric motor connected to the gear wheelworks, the space (FIG. **9**) taken by the hydraulic motor **14** becomes free and the number of wheelworks in the same line may be increased. Thus, the percentage of the wheelworks utilized may be gained very high upon placing wheelworks side by side in the longitudinal direction of the drum. By leaving a small space between the wheelworks, it is possible to get hold of the wheelworks at their ends and detach, when needed, wheels **36**, **37** without a necessity to remove the hydraulic motor.

The invention is not restricted to performance examples described above but may vary in many ways within the limits of claims presented in the following. For example the axis of the electric motor **50** may be parallel with the axis of the drum, with the motor placed, however, close to the outermost part of the gear wheelwork.

I claim:

1. A drum barker comprising:
- a cylindrical drum, said drum including:
  - opening means for receiving material to be barked, and
  - bark discharge opening means disposed around the outer periphery of said drum;
- guide ring means disposed around said drum;
- a plurality of wheelworks disposed along opposite sides of said drum, said wheel works including:
  - a plurality of axially spaced wheels;
    - at least the outer portion of each wheel being composed of a resilient material and being arranged to contact and support the outer periphery of said drum;
  - bearing bracket means including:
    - bearing carrier means, and
    - bearing means mounted on said bearing carrier means for rotatably supporting said wheels;
    - said bearing carrier means and said bearing means being disposed within the axial extent of said wheelwork as defined by end wheels of said wheelwork;
- at least one of said wheelworks on each side of said drum being arranged to engage said guide ring means to resist axial movement of said drum.

2. A drum barker according to claim **1** and further including:
- axle means interconnecting said wheels;
- motor means being provided for driving respective ones of at least some of said wheelworks;
  - each motor means including a drive shaft being aligned with said axle means, and being at least partly disposed within an end one of said wheels.

3. A drum barker according to claim **1** and further including:
- axle means interconnecting said wheels;
  - said plurality of wheels including at least two wheels being axially spaced;
- said bearing means including a pair of bearings disposed adjacent opposite ends of said axle means;
- said bearing bracket including a gear housing extending within the space between said two spaced wheels;
- gear means being mounted in said gear housing and being operatively connected to said axle means; and

motor means disposed on a side of said bracket means away from said drum, and being operatively connected to said gear means for driving said wheels.

4. A drum barker according to claim 3 wherein:

said at least two wheels comprises two pairs of wheels

said gear housing being disposed between the innermost wheels of said pairs;

said motor means comprising an electric motor,

5. A drum barker according to claim 4 and further including:

a hydraulic coupling being operatively interconnected between said motor and said gear means.

6. A drum barker according to claim 5 wherein:

the power output axis of said motor extends generally perpendicular toward a vertical plane through the axis of said drum, and is aligned with the input axis of said gear means.

7. A drum barker according to claim 1 wherein:

said plurality of wheels include at least two wheels spaced axially;

said bearing means including a support housing disposed in the space between said spaced wheels;

said bark discharge openings being disposed adjacent the space between said spaced wheels;

a gathering funnel being arranged externally of said discharge openings between the space between said spaced wheels.

8. A drum barker according to claim 1 wherein:

said plurality of wheels include at least two wheels spaced axially;

said bearing means including a support housing disposed in the space between said spaced wheels; and

reinforcing hoop means being arranged around the outer periphery of said drum and being disposed within the space between said spaced wheels.

9. A drum barker comprising:

a cylindrical drum, said drum including:

opening means for receiving material to be barked, and

bark discharge opening means disposed around the outer periphery of said drum;

a plurality of wheelworks disposed along opposite sides of said drum, each of said wheelworks including:

at least two axially spaced wheels;

at least the outer portion of each wheel being composed of a resilient material and being arranged to contact and support the outer periphery of said drum;

axle means interconnecting said wheels;

bearing bracket means including:

bearing carrier means, and

a pair of bearings mounted on said bearing carrier means within said spaced wheels for rotatably supporting opposite ends of said axle;

gear housing means extending within the space between said spaced wheels;

gear means being mounted in said gear housing and being operatively connected to said axle means; and

motor means disposed on a side of said bracket means away from said drum, and being operatively connected to said gear means for driving said wheels.

10. A drum barker according to claim 9 wherein:

said motor comprises an electric motor; and

a hydraulic coupling being operatively connected between said motor and said gear means.

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