Aug. 29, 1967 K. A. OESTERHELD 3,337,922

DEVICE FOR DRESSING CRUDE ASBESTOS

Filed March 5, 1964 2 Sheets-Sheet 1

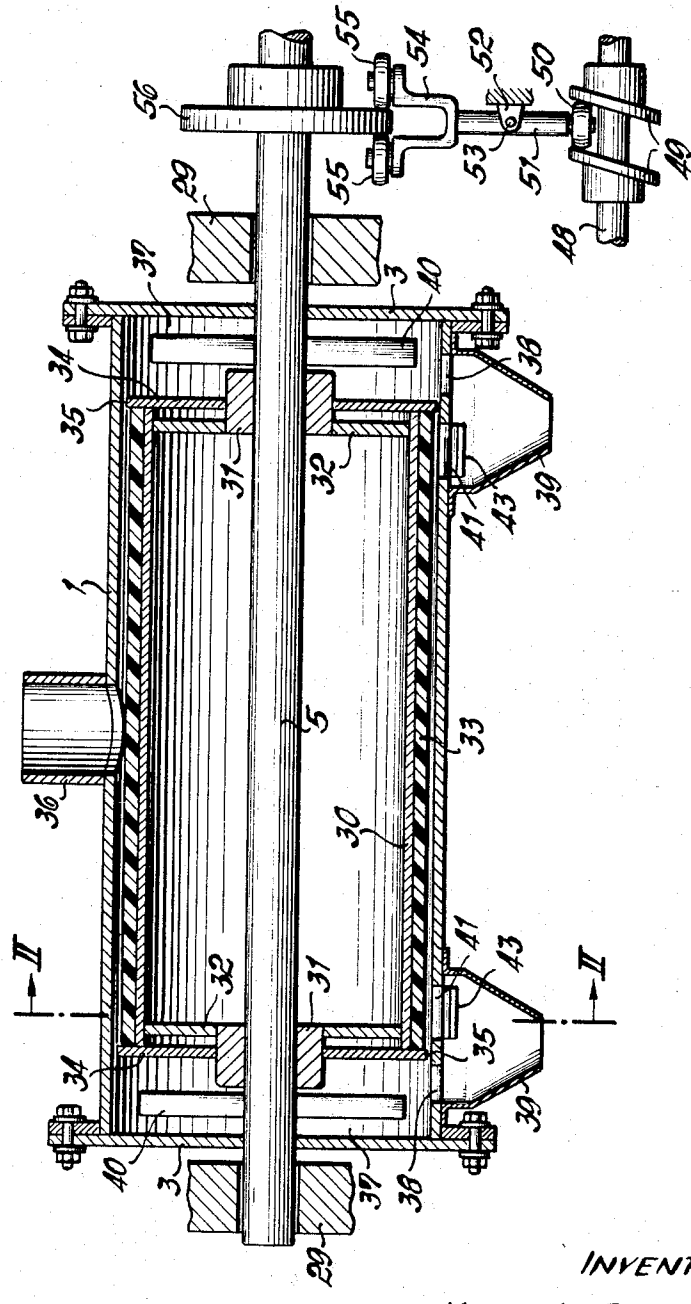


FIG. 1

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FIG. 3

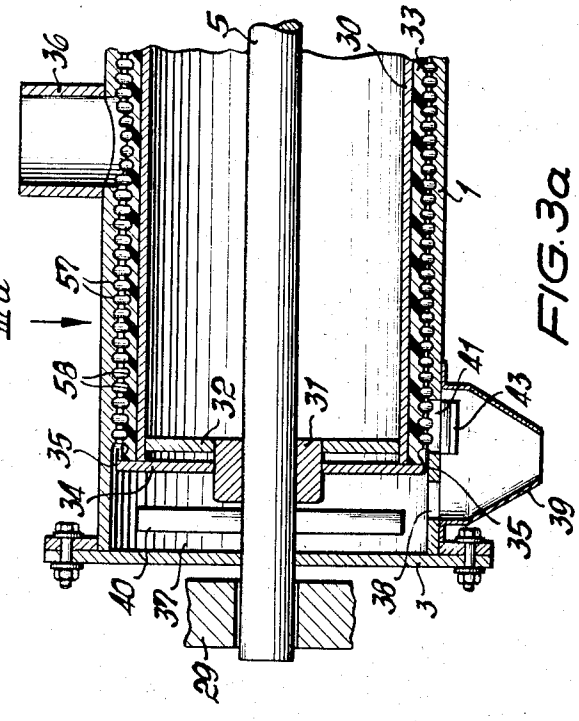


FIG. 3a

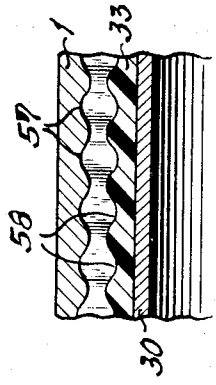
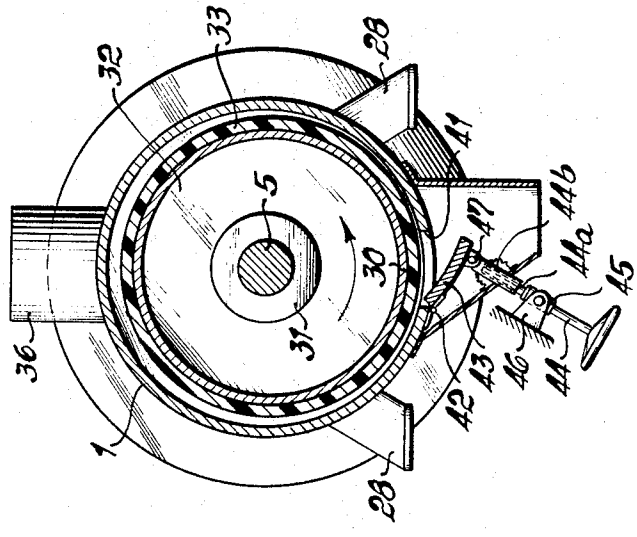


FIG. 2



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DEVICE FOR DRESSING CRUDE ASBESTOS

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8 Claims. (Cl. 19—66)

This invention relates to a device for dressing the bunch-like adhered asbestos natural state fibres separated from the source rock, in which the fibre bunches suspended in a liquid are passed between friction surfaces under high, controllable hydraulic pressure so that the fibres are bent to and fro in constantly varying directions and thereby the fibre bunches are opened up. For carrying out this method a device has become known in which a narrow passage gap is defined between a rigid shaft rotatably mounted in a cylindrical housing provided with an elastic lining, and the housing surrounding the shaft, which gap is of equal width all through or in which narrow and wide passage gap sections alternate with each other. Further it has been suggested to mount a conical drum on the shaft and to devise at least the outer cone shell thereof so as to be resilient or to provide the inner surface of the tapered housing with a resilient lining so that between the conical drum and the inner wall of the housing there is available a narrow passage gap of equal width all through, which lies on the conical surface of a frustum.

Bending the fibres to and fro in constantly varying direction represents a fulling action which has proved very advantageous for completely dressing the bunch-like adhered asbestos natural state fibres at the same time avoiding injury to the fibres.

It is the object of the present invention to produce a dressing device of the specified type which has an improved fulling capacity and thus an increased fibre dressing capacity.

The invention provides a device for dressing adhered asbestos natural state fibres separated from the source rock and suspended, in a liquid, of the type including a housing closed at least at one end by a cover, and a drum rotatably mounted within said housing by means of a drum shaft so as to define an annular passage between said drum and said housing surrounding said drum, said passage being adapted to receive said fibres suspended in the liquid to form a fibre-liquid mixture forced through said passage under controllable hydraulic pressure and repeated bending of said fibres to and fro in constantly varying directions, characterized in that said housing and said drum are of cylindrical shape, said cylindrical drum has two circular end walls, an eccentric bore is provided in either of said circular end walls of said cylindrical drum, a hub is seated in either of said eccentric bores and on said drum shaft so that said cylindrical drum extends within said cylindrical housing in eccentric relationship to said cylindrical housing, at least one end of said cylindrical drum is adapted to define a discharge end for treated fibre-liquid mixture, a baffle plate is associated with said discharge end and mounted on the respective hub so as to be concentric with said cylindrical housing and to define together with said cylindrical housing a circular ring gap narrowed in relation to said annular passage.

Conveniently, a mechanism may be provided and connected with the drum shaft for reciprocating the drum shaft by relatively short strokes in the axial direction and during rotation thereof.

By a dressing device designed in this manner, the fibres will be repeatedly subjected to momentary increased pressure and thus still more intensively fulled.

With certain kinds of asbestos, e.g. South African blue

asbestos, the complete dressing of which is very difficult owing to their particular fibre structure, faster disentangling of the fibre bunches and a better degree of dressing will be attained by the increased fulling. Damage to the fibres owing to the action of mechanically applied pressure brought about by the eccentric rotation of the drum in the housing or by the axially reciprocating motion of the drum is avoided because the fibres are acted upon by the pressure substantially transversely of the longitudinal direction of the fibres so that the fibres, consequently, are not subjected to tension which might rupture the fibres.

The eccentric rotation and the oscillating motion of the drum result in the best fulling effect possible when both measures are applied in combination. In some cases, however, where it is the question of dressing soft fibres, the application of eccentric rotation will generally be sufficient.

To permit regulation of the transit time of the fibre-liquid mixture in the dressing device in accordance with the kind and quality of the asbestos material to be dressed, it is provided by a further development of the invention that an adjustable and lockable hinged trap may be incorporated in a recess in the bottom of the cylindrical housing in the region of the discharge end portion of the horizontally arranged drum and serve as a regulating trap for draining off the treated fibre-liquid mixture or any desired portion thereof before this passes through the narrowed circular ring gap. Conveniently, a discharge funnel may be connected to the bottom of the housing to receive the quantities of the fibre-liquid mixture issuing through the open hinged trap as well as through the narrowed circular ring gap. Whereas with completely closed regulating trap the fibre-liquid mixture fed under high hydraulic pressure will issue through the narrowed annular gap defined by the baffle plate, after having rotated several times together with the rotating drum, the number of rotations of the fibre-liquid mixture within the housing can be reduced as desired by opening the hinged trap more or less, thereby to adapt the duration of the fulling treatment in a simple manner to actual requirements so that the best degree possible of opening the asbestos material is attainable at any time.

According to a preferred embodiment of the invention, the cylindrical drum extends in a horizontal position within the cylindrical housing, a bottom aperture is provided between the baffle plate and the cover of the housing, an opening is defined in the bottom of said housing in the region covered by the discharge end of the drum, a hinged trap is incorporated in the opening so as to be adjustable and lockable, the hinged trap serving as a regulating trap for discharging a controllable quantity of the treated fibre-liquid mixture from the housing before said quantity of treated fibre-liquid mixture passes through the circular ring gap, and a discharge funnel is connected to the bottom of the housing at said discharge end of the drum and extends across the bottom aperture and the opening including the regulating trap.

For producing the reciprocating motion of the drum shaft, a suitable gearing may be incorporated and connected in series with the motor driving the shaft. However, since the drum shaft is not intended to effect such reciprocating motion upon each rotation thereof, the mechanism for reciprocating the drum shaft may include a flange seated on the drum shaft outside the cylindrical housing, an auxiliary shaft, two cam plates mounted on the auxiliary shaft in axially spaced relationship to each other, a double-armed lever, a sliding member secured to one lever arm of the double-armed lever and guided between the cam plates, and a pair of rollers provided on the outer lever arm of the double-armed lever and contacting opposite end faces of the flange.

Since the crude asbestos material is to be dressed in a manner taking care of the fibres in the best way possible,

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it is advisable to provide either the cylindrical inner wall of the housing or the cylindrically curved outer surface of the drum, which constitute cooperating friction surfaces, with a resilient coating of rubber or rubber-like plastic. In order to produce in this case an intense friction in addition to the fulling effect, small circumferential grooves may be provided in the cooperating friction surfaces, for example in the cylindrical inner wall of the housing and in the rubber or plastic coating of the drum.

Two preferred embodiments of the invention will now be described by way of example and with reference to the accompanying drawings, in which:

FIG. 1 is a vertical longitudinal central section through a schematically drawn device according to the invention;

FIG. 2 is a cross section taken on the line II—II of FIG. 1;

FIG. 3 is a partial longitudinal section, as in FIG. 1, through a similar device having cooperating friction surfaces of a different design;

FIG. 3*a* shows a detail of FIG. 3 on an enlarged scale; and

FIG. 3*a* is an enlarged sectional view taken generally along line III*a* of FIG. 3, and more clearly illustrates the configuration of the rubber coating carried by the drum and the generally complementary configuration of the cylindrical housing.

FIG. 1 shows a dressing device according to the present invention, having a cylindrical housing **1**, which is stationarily arranged on supporting legs **28** on a horizontal position and closed at both ends by covers **3** bolted thereto. A shaft **5**, which is rotatably and axially displaceably supported in two bearings **29** disposed at either end of the housing **1**, extends through central bores in the two covers **3**. The shaft **5** carries a drum consisting of a cylindrical rigid drum shell **30** and of two circular end walls **32** provided with eccentric bores.

Hubs **31** are fitted in the eccentric bores in the end walls **32** of the drum and fixed on the shaft **5** so that the drum occupies an eccentric position in the housing **1** and a resilient coating **33** of rubber or plastic, which is applied to the curved outer surface of the drum shell **30**, is spaced along a certain apex line thereof, from the cylindrical inner wall of the housing **1** by the smallest distance of, for example, 0.5 mm. and along the diametrically opposite apex line by the largest distance of, for example, 5 mm., leaving between the drum shell **30** or its coating **33** and the inner cylindrical surface of the housing an annular passage of varying clearance for a fibre-liquid mixture to be forced therethrough during the dressing operation. Either end of the drum is associated with a baffle plate **34** seated with a central middle bore on the respective hub **31**. The baffle plates **34** are so dimensioned with regard to their outer diameter that their rim edges terminate at a small distance, for example, of 0.5 mm., from the cylindrical inner wall of the housing **1** and in conjunction with the inner wall of the housing define circular ring gaps **35** narrowed in relation to the annular passage. When the drum shaft **5** is rotated by a variable speed electric motor, not shown, or another suitable driving motor, the cylindrical drum shaft **30** will eccentrically rotate within the housing **1** so that the largest clearance of the annular passage between the drum shell coating **33** and the inner wall of the housing, which largest clearance in the position of rotation of the drum plotted in FIGS. 1 and 2 is situated at the upper apex line of the drum shell **30**, and consequently also the smallest clearance of the annular passage will continuously change their position during rotation of the drum.

The fibre-liquid mixture with the bunch-like adhered asbestos fibres to be dressed will be forced under high hydraulic pressure by means of a feed pump, not shown, through a short feed pipe **36**, which is arranged in the central region of the housing **1** on an upwards facing portion of the wall of the housing, into the eccentric annular

passage between the resilient drum coating **33** and the inner wall of the housing **1**. The fibre-liquid mixture will be forced in opposite directions through the annular passage and dragged along by the rotating drum in the circumferential direction thereof. During rotation, the bunches of fibres repeatedly reach the smallest passage clearance and are vigorously fulled between the resilient drum coating **33** and the rigid inner wall of the housing **1**, with the result that the individual fibres are separated from the bunches of fibres and dressed without being damaged or ruptured.

Finally, the fibre-liquid mixture will pass together with the fibres separated from the bunches through the narrow circular ring gaps **35** into chambers **37** defined between the baffle plates **34** and the covers **3** of the housing **1**, from which chambers **37** it is guided through funnels **39** arranged under bottom apertures **38** of the housing **1** and through a conduit, not shown, to a further processing station or back into the dressing device for repeated treatment when, in the case of asbestos material particularly hard to dress, during the first transit through the dressing device the desired degree of dressing of the fibrous material has not yet been attained. Stirring paddles **40** secured to the drum shaft **5** within the chambers **37** take care that the fibre-liquid mixture is continuously discharged from the chambers **37**.

When dressing asbestos material in which the individual fibres are not tightly adhered, it is possible to shorten the duration of treatment to a period of time sufficient for this material, in that the discharge throttling brought about by the baffle plates **34** is partly or even completely eliminated. For this purpose, openings **41** are defined in the bottom portion of the housing **1** in the regions covered by the discharge ends of the drum and regulating traps **43** are hinged on axles **42** (FIG. 2) on the rear transverse edges, with respect to the direction of rotation of the drum, of the openings **41**, and cover the openings **41** when being in their closed positions. Either of the two traps **43** can be swung away from the wall of the housing to the extent desired by operating an adjusting spindle **44**, so that it clears with its side opposite the hinge axle **42** a more or less large discharge gap in the wall of the housing **1**, through which a controllable portion of the fibre-liquid mixture or, in the case of completely opened traps **43** all of the supplied fibre-liquid mixture can bypass the narrow circular ring gap **35** and issue from the housing **1** without having to pass through the circular ring gap **35**. By appropriately adjusting the regulating traps **43** it is possible to reduce the number of rotations, which the fibre-liquid mixture carries out together with the drum in the housing **1**, and thus to accurately adjust in each case the transit time for the kind of asbestos material to be dressed.

As shown particularly in FIG. 2, each adjusting spindle **44** consists of a threaded rod **44***a*, which is rotatably but axially immovably mounted on a rotatable sleeve **45** of a bracket **46** arranged outside the discharge funnel **39**, and of a threaded tube **44***b*, screwed on the threaded rod **44***a*, which tube **44***b* is led by means of rubber bellows in a liquid-tight manner through an opening in one of the walls of the funnel **39**, and pivoted to an eye **47** on the hinged trap **43**. By turning the threaded rod **44***a* fitted with a hand wheel so that the threaded tube **44***b* is screwed further on to the threaded rod **44***a*, the hinged trap **43** is moved away from the wall of the housing **1**, whereas by turning the threaded rod **44***a* in the opposite direction of rotation, the hinged trap **43** will be swung towards the wall of the housing **1** and close the opening **41**.

The discharge funnels **39** are so designed that they extend across the permanently open bottom aperture **38** situated under the chamber **37** in the housing **1** and across the adjacent opening **41** with its regulating trap **43**, to receive the quantities of the fibre-liquid mixture which issue through the latter as well as, if desired, through the

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bottom aperture **38** via the baffle plate **34** and the chambers **37**.

During its rotatory movement, the drum shaft **5** is adapted to perform together with the drum mounted thereon an axially reciprocating short-stroke motion within the housing **1**, which motion is so harmonized with the number of revolutions of the drum that the drum is pushed to and fro once upon a determined number of revolutions. The axially reciprocating motion of the drum shaft **5** is derived, as can be seen from FIG. 1, from an auxiliary shaft **48** rotated by the motor driving the drum shaft **5**, through the intermediary of a reduction gear, both not shown. Between two cam plates **49** fixed on the auxiliary shaft **48** there is guided a sliding member **50**. The sliding member **50** is seated at the end of an arm of a double-arm lever **51** which is pivoted about a hinge bolt **53** on a stationary bracket **52**. On the two legs of a fork **54**, which is disposed on the other arm of the double-armed lever **51**, two convexly turned rollers **55** are rotatably mounted to contact the two opposite end faces of a flange **56** fixed on the drum shaft **5** for transmitting the rocking movement of the double-armed lever **51**, which is caused by the cam plates **49**, to the drum shaft **5**. The short-stroke reciprocation of the rotating drum shaft **5** assists the fulling of the fibre bunches to be dressed and, together with the eccentric rotation of the drum in the housing **1**, results in extraordinarily intensive fulling of the fibres. In this manner it is achieved to completely dress even such asbestos material as has been hitherto particularly hard to dress. At the same time, the resilient coating **33** of the rigid drum shell **30** ensures careful treatment of the delicate fibres.

In the dressing device shown in FIG. 3, small circumferential grooves **57** and **58** are defined in the inner wall of the housing **1** and in the outer surface of the resilient rubber or plastic coating **33** of the drum, i.e., in the cooperating friction surfaces. For the sake of clearness, the grooves **57** and **58** are represented excessively large in FIG. 3; in reality they have but a depth of about 3.0 mm. and a width of about 15.0 mm. The grooves **57** and **58** cause an increased friction of the material to be treated between the cooperating friction surfaces constituted by the resilient coating **33** of the drum shell **30** and the inner wall of the housing **1**, which again has a favourable effect on the fulling of the fibers.

I claim:

1. A device for dressing adhered asbestos natural state fibers separated from the source rock and suspended in a liquid comprising a cylindrical housing, a cover for each end of the housing having aligned drum shaft openings therein, a drum shaft extending through said cover openings, a cylindrical drum rotatably mounted on said drum shaft and rotatable within said housing and defining an annular passage between said drum and said housing, said passage being adapted to receive asbestos fibers suspended in a liquid that is forced through said passage under controllable hydraulic pressure, the opposed faces of the housing and drum being grooved, means for reciprocating the drum longitudinally of the housing for repeated bending of said fibers in constantly varying directions, a cylindrical end wall for each end of said cylindrical drum with a bore therein, a hub in each bore through which the drum extends, each end of said cylindrical housing having a discharge aperture for the treated fiber liquid mixture, a baffle plate in each end of the housing outwardly of the end walls of the drum and mounted on said drum shaft inwardly of said discharge apertures for cooperation with said cylindrical housing to form a circular ring gap narrowed in relation to said annular passage.

2. A device as set forth in claim **1**, wherein the means for reciprocating the drum shaft includes mechanism connected with said drum shaft for reciprocating said drum shaft by relatively short strokes in the axial direction and during rotation thereof.

3. A device as set forth in claim **1** wherein said cylindrical drum extends in a horizontal position within said cylindrical housing, there being an opening in the bottom of said housing adjacent each end thereof inwardly of the baffle plates in the region covered by each end of said drum, a hinged trap incorporated in said opening so as to be adjustable and lockable, said hinged trap serving as a regulating trap for discharging a controllable quantity of said treated fiber liquid mixture from said housing before said quantity of treated fiber liquid mixture passes through said circular ring gap and a discharge funnel connected to the bottom of said housing at each end of said drum and extending across said discharge aperture and said opening including said regulating trap.

4. A device as set forth in claim **1** wherein the mechanism for reciprocating said drum shaft includes a flange on said drum shaft exteriorly of one end of said cylindrical housing, an axiliary shaft, two cam plates mounted on said auxiliary shaft in axially spaced relationship to each other, a double-armed lever, a sliding member secured to one lever arm of said double-armed lever and guided between said cam plates, and a pair of rollers provided on the other lever arm of said double-armed lever and contacting opposite end faces of said flange.

5. A device as set forth in claim **1** wherein the inner cylindrical surface of said housing and the outer cylindrical surface of said drum have cooperating friction surfaces.

6. A device as set forth in claim **5** wherein one of said cooperating friction surfaces is provided with a coating of resilient material.

7. A device as set forth in claim **6** wherein said resilient material is rubber.

8. A device as set forth in claim **6** wherein said resilient material is plastic.

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