Nov. 1, 1938. H. E. COX ET AL 2,135,174

ROLLER AND ROLLER AND BREAST MILLS

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Fig. 1.

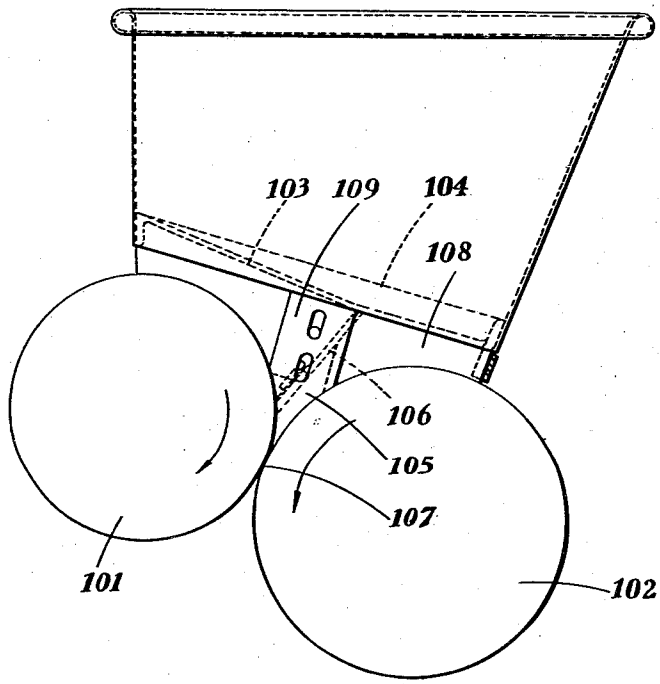
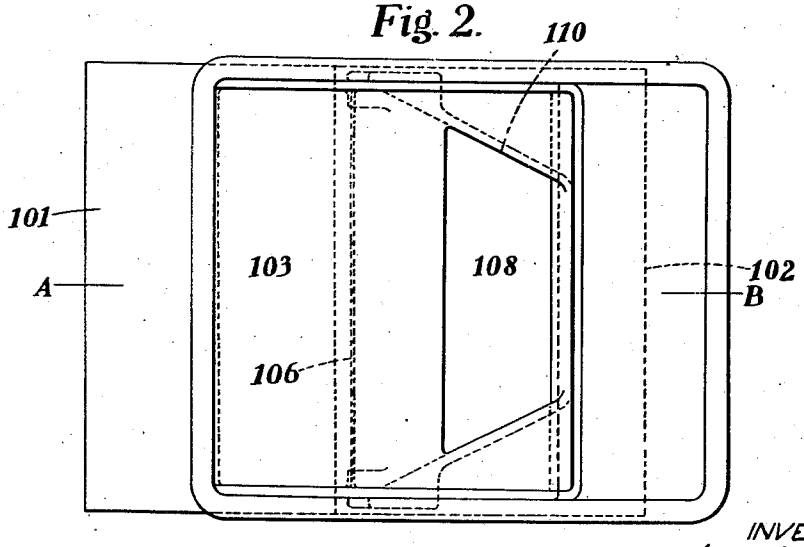


Fig. 2.



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Fig. 3.

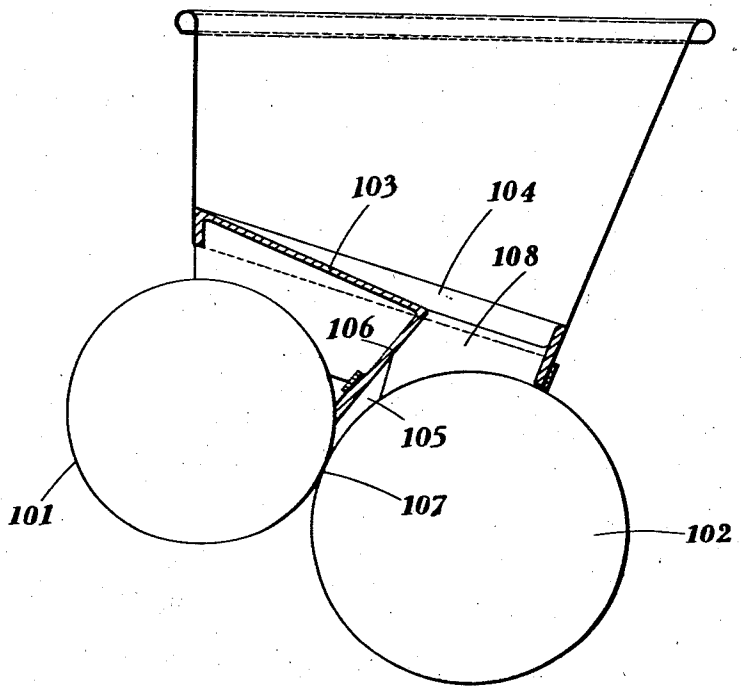
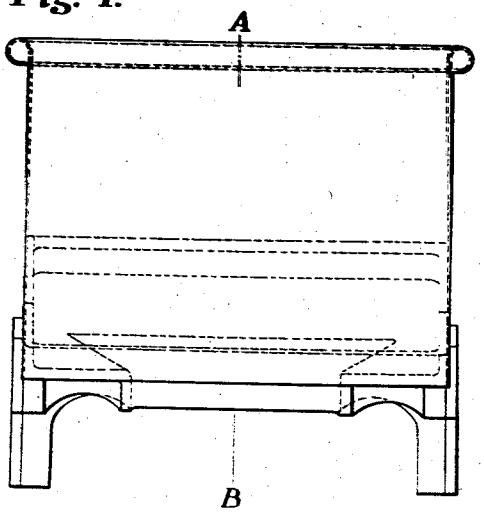


Fig. 4.



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Fig. 5.

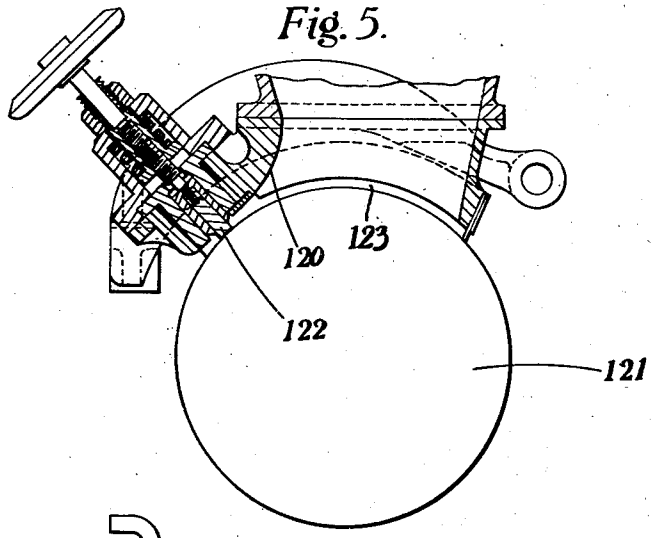
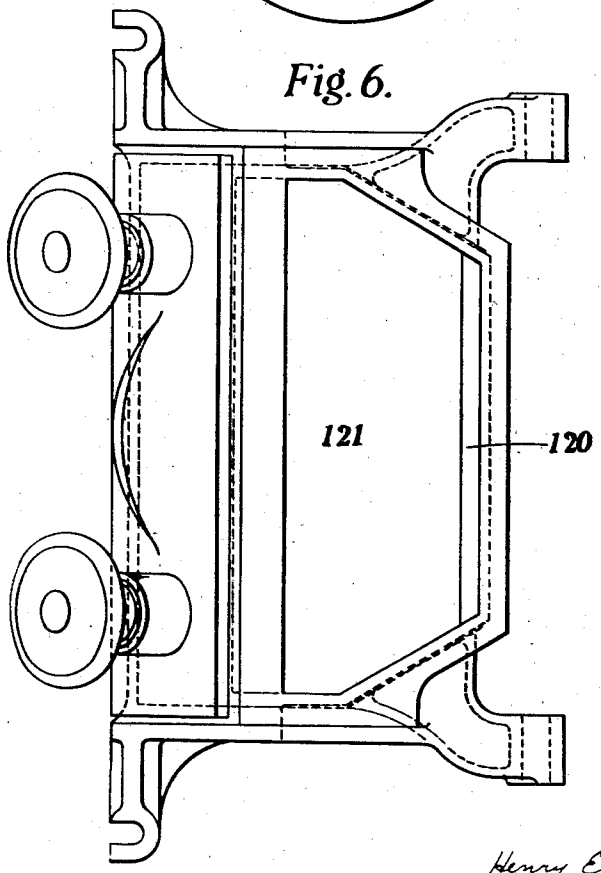


Fig. 6.



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Patented Nov. 1, 1938

2,135,174

UNITED STATES PATENT OFFICE

2,135,174

ROLLER AND ROLLER AND BREAST MILLS

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Application April 27, 1932, Serial No. 607,830
In Great Britain June 12, 1931

6 Claims. (Cl. 83—22)

The present invention relates to improvements in or relating to roller and roller and breast mills for grinding and/or refining paints or fluids or mixtures which become fluid after grinding.

An object of the present invention is to realize a more even consistency of the delivered product so that this shall not substantially vary in shade or strength of colour or specific gravity at any stage in progress of the delivery. Thus where the treated material is run direct from the mill into a succession of like size vessels, the contents of each and every vessel filled from the mill can be relied upon to be correct to formula or colour shade and weight per unit volume.

It is well known that when paints, enamels, inks, etc., are placed in the hopper of a grinding mill in an unground or partially ground condition for final grinding, or in a ground condition for refining there is always a tendency for the oil or other medium to be strained off gradually, resulting in a varying consistency of the ground or refined material delivered to the delivery scraper, and often a considerable proportion of the paint, etc., towards the end of the charge passes the rolls in a very dry condition, and not properly ground, as it is difficult to grind or break up the colour particles when an insufficient quantity of oil or other medium is present.

With paste the effect is not so serious because the aforesaid separating tendency is not so pronounced in pastes as in liquids and semi-liquids; also as pastes generally have to pass through the mill at least twice, the disadvantage is not so serious as the rolls can be set somewhat coarsely for the first pass so that the separation effect is to some extent avoided, and this first pass serves to condition the paste and ensure better mixing of the colour particles and the medium, so that at the second grinding the tendency to separate is still further lessened.

When the mill is used for grinding and finishing liquids and semi-liquid materials the matter becomes more serious, as the separation not only militates against fine grinding, necessitating putting the material through the mill several times when once should suffice, but it is also impossible to run the paint, etc., direct from the mill into the tins ready for use, as every tin varies in proportion of colour to medium and the specific gravity is incorrect, the shade varies and so on, and often there is a percentage of partially dry colour left in the hopper at the end of the run, so that even the bulk would not be correct to formula or shade and weight per gallon, etc.

With roller mills having a considerable difference in peripheral speed of the grinding rolls such as those described in our prior United States Patents 1,713,487 and 1,902,680 this defect becomes more aggravated, as the higher the difference in periphery speed between the rolls, the greater is found to be the tendency towards the aforesaid separation, and as high peripheral differential is important in obtaining superfine grinding and finish which is essential for high class paints, enamels, cellulose products, inks, etc., the separation often becomes a serious factor and extremely difficult to control, sometimes making it necessary to pass the material through the mill many times at different settings of the rolls before the separation can be sufficiently prevented to give the finished product its desired qualities.

The present invention, which is applicable to mills with any number of rolls and also to mills of the single roller and breast bar type, broadly consists in so contracting the feeding throat to the grinding nip and/or refining slot of the mill that a mixing or agitating action, e. g., a searching return flow of material fed to the nip or slot by the roller in excess of the quantity which the roller and member co-operating therewith to form the grinding nip can pass in a given time is produced which keeps the colour and medium thoroughly mixed and sets up a throat feed pressure such that the coarser colour is passed gradually through with the finer colour and reduced.

In this way a fine consistent product is realized which is consistent both as regards weight and colour throughout its bulk or separately collected quantities, and only the dirt, dross, skins, etc., are rejected owing to their size, and varying specific gravity.

The ordinary roller and breast mill has its hopper base feed throat face either vertical or substantially so or inclined at an obtuse angle to the roller so that little or no mixing or agitating action or searching return flow of excess material is produced and the throat feed pressure is so relieved as to be insufficient to pass the coarser colour which gradually falls back and is deposited on the roll and breast, causing a partial choke which reduces output and promotes the undesirable separation of colour and medium.

In order that the invention may be the more readily understood, reference is made to the accompanying drawings which illustrate examples of mills made according to the invention.

In the drawings:—

Fig. 1 is a side elevation,

Fig. 2 a plan.

Fig. 3 a section through the line A—B of Fig. 2, and

Fig. 4 an end view of a hopper for a two roller mill.

Fig. 5 is a sectional elevation of a roll and breast bar mill, and

Fig. 6 a plan of a roll and breast bar mill.

In the example of two roller mill shown by Figs. 1–4, in which there is a considerable difference in peripheral speed between the two rollers 101, 102, a downwardly slanting plate 103 is provided in the hopper base 104 so as to allow the hopper contents to drain towards the feed throat 105, and formed or provided on this plate 103 is a downwardly or backwardly projecting portion 106 which extends into contact with the slow running roll 101 and is so disposed as to form a contracted V throat between the fast running roll 102 and such downwardly projecting portion 106, the narrow end of the throat being towards the grinding nip and/or refining slot 107.

Such throat surface is thus overhung and leans over or towards the fast running roll 102 and the resultant action is that the material is thrown or carried forward to the nip or slot 107 by the fast running roll 102 which is trying to force more material between the rolls 101, 102, than they can possibly pass. The paint or other material is therefore forced upwards against the throat surface 106 by the oncoming flow of paint being fed to the nip or slot 107 by the fast running roll 102, so that there is a mixing or agitating action or searching return flow of excess material having the mixing and pressure effect hereinabove mentioned.

The hopper base may be a frame casting preferably of bronze, but it can be made of any suitable metal or alloy. The sides 108 of the frame project downwards and are shaped to form the hopper cheeks which are fitted to the contour of the rolls and form the seals at the ends of the rolls, and at the roll contacts.

If desired plates 109 shaped to the contour of the rolls may be provided to form auxiliary adjustable outer sealing plates which may be slotted so that they can be let down or refitted as desired.

The portions 110 of the cheeks forming the seal on the fast running roll are preferably splayed inwards on the roll to prevent the formation of radial grooves on the fast running roll.

Referring to Figs. 5 and 6 it will be seen that the hopper base feed throat of a roller and breast mill is overhung at 120 so as to lean over or towards the roll 121, being inclined at an acute angle to the horizontal, such acute angle being the angle nearer to the roll 121. The breast bar is designated by the reference numeral 122.

The hopper base may be cast in one piece as described and shown fitted into a steel hopper, or the cheeks may be cast separately and the base framed up with suitable end plates, screwed or riveted, or the hopper base can be cast integral with the hopper in any suitable metal or alloy, and if necessary independent bronze or other metal or alloy sealing plates 123 attached to the hopper base and fitted to the contour of the rolls to form seals.

It is to be understood that the term grinding nip in the claims includes refining slot.

We claim:—

1. A roller mill, comprising in combination, fast and slow running rolls, a feed hopper overlying said roll pair, said hopper having a bottom plate or floor with a discharge opening overlying the fast roll a throat forming plate extending from the edge of said opening nearest the slow roll to the surface of the slow roll adjacent the bight of said rolls, and forming a continuous tapered throat between the fast running roll and said plate, the narrow end of the throat being towards the grinding nip.

2. A roller mill, comprising in combination, fast and slow running rolls, a feed hopper overlying said roll pair, and having its sides shaped to form end seals for the rolls, said hopper having a bottom plate or floor with a discharge opening overlying the fast roll, a throat forming plate extending from the edge of said opening nearest the slow roll to the surface of the slow roll adjacent the bight of said rolls, and forming a continuous tapered throat between the fast running roll and said plate, the narrow end of the throat being towards the grinding nip.

3. A mill for refining paint or similar materials containing fine particles of colouring material in a viscous liquid medium comprising in combination, a rotatable roll, a normally stationary grinding bar disposed edgewise to said roll to form a fine, narrow grinding nip, a guide for said bar, said bar being slidable along said guide towards and away from said roll, a hopper overlying the vertical center of the roll adapted to receive the material to be refined and to allow such material to be fed by its own weight on to the periphery of the said roll, a shallow tapered feed throat which converges towards said nip and terminates at the nip with an approximately radial surface, said feed throat being situated in the lower part of said hopper immediately in advance of the grinding nip and extending substantially unobstructedly over the grinding length of the roll, said feed throat comprising a roof portion in spaced overlying relation with a considerable part of the periphery of said roll, said roof portion being of considerably greater length in the direction of flow than the width of the nip-forming surface of the bar and being inclined upwardly and backwardly with respect to said surface so as to lean over towards the center line of the feed throat to form in conjunction with the periphery of the roll a tapering throat larger at its entrance end than at the nip end, said throat being shaped and proportioned to permit inflow and outflow of material in the tapering throat in advance of the nip under the propelling action of the roll.

4. A mill for refining paint or similar materials containing particles of colouring matter already brought to a fine state of division and incorporated in a viscous medium, comprising in combination, a rotatable roll, a member cooperating therewith to form a fine, narrow grinding nip, a hopper overlying the approximate vertical center of the roll adapted to receive the material to be refined and allow such material to be fed by its own weight on to the periphery of the said roll, a feed throat in open communication with the hopper which converges towards said nip, said feed throat being defined by a roof portion extending the effective width of the roll and formed separately from said cooperating member and parts movable therewith by a diverging roll-overlying lower wall of said hopper and a floor portion formed by the peripheral surface of said roll, and the narrow end portion of said tapering throat being closed except for the nip by a transverse wall disposed at a substantial angle relative to the center line

of the throat, said roof portion being spaced from and overlying a considerable part of the periphery of said roll so that the width of the throat in the direction of flow is produced at least mainly irrespective of said front wall by said roll-overlying wall of the hopper and said roll, the said end wall of the throat and said roof and floor portions being located in advance of the nip and proportioned to deflect excess material carried towards the nip by the roll to flow generally up over the transverse wall and along the roof portion and back towards the hopper and permit the material in front of the nip to be kept in a continual state of turbulence whilst the mill is working.

5. A mill for refining paint or similar materials comprising in combination, a rotatable roll, a normally stationary grinding bar disposed edgewise to said roll to form a fine, narrow grinding nip, a guide for said bar, said bar being slidable along said guide towards and away from said roll, a hopper overlying the vertical center line of the roll adapted to receive the material to be refined and to allow such material to be fed by its own weight on to the periphery of the said roll, a feed throat in open communication with the hopper which converges towards said nip, said feed throat being defined by a roof portion formed separately from said grinding bar and the parts movable therewith by a diverging roll-overlying lower wall of said hopper and a floor portion formed by the surface of said roll, the narrow leading portion of said throat being closed except for the nip by an approximately radial end wall formed by said bar, means at the side ends of the roll for closing the ends of the said converging throat, said roof portion of the throat being spaced from and overlying a considerable part of the periphery of said roll and being of considerably greater width in the direction of flow of material than the nip-forming surface of said bar and being inclined backwardly and upwardly with respect to said surface, the said width of the throat from front to rear being produced by said roof portion and said roll, said end wall of the throat and said roof and floor portions being proportioned and arranged to deflect excess material carried into the throat and towards the nip by the roll back towards the hopper and permit the material in front of the nip to be kept in a continual state of turbulence whilst the mill is working.

6. A mill for refining paint or similar materials comprising in combination, a rotatable roll, a second rotatable roll co-operating therewith to form a fine, narrow grinding nip and a hopper overlying the vertical center line of the said first roll adapted to receive the material to be refined and allow such material to be fed by its own weight on to the periphery of the said first roll, a feed throat in open communication with the hopper which converges towards said nip, said feed throat being defined by a roof portion spaced from the said first roll and formed separately from the said rolls by a diverging lower wall of said hopper and a floor portion formed by the surface of said first roll and a narrow end portion formed by the surface of said second roll, said roof and end portions forming together a bent path for the flow of material, means at the ends of the rolls for closing the ends of the throat, said spaced roof portion overlying a considerable part of the periphery of said first roll so that the width of the throat from beginning to end is produced by said roof portion and said first roll, and the said end wall of the tapering throat formed by said second roll being of sufficient radial depth to enable excess material carried into the tapering throat towards the nip by the roll to flow upwardly over the end wall and along the throat adjacent the roof and towards the hopper and permit the material in front of the nip to be kept in a continual state of turbulence whilst the mill is working.

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