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2,134,897

AUTOMATIC MIXING AND FINE GRINDING MILL FOR CHOCOLATE, COLORS, ETC

Filed April 17, 1937

3 Sheets-Sheet 1

Fig. 1

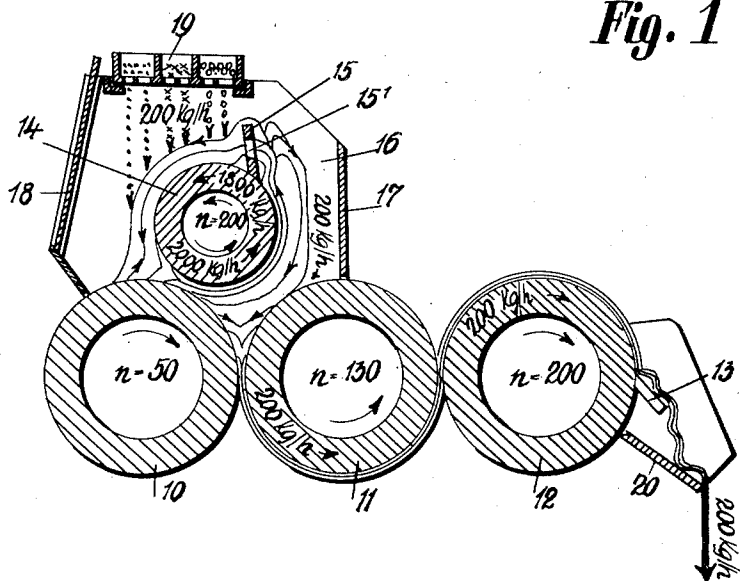
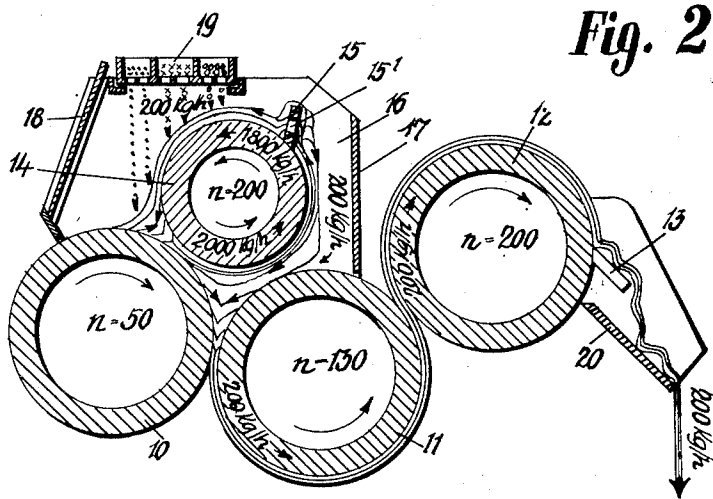


Fig. 2



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Fig. 3

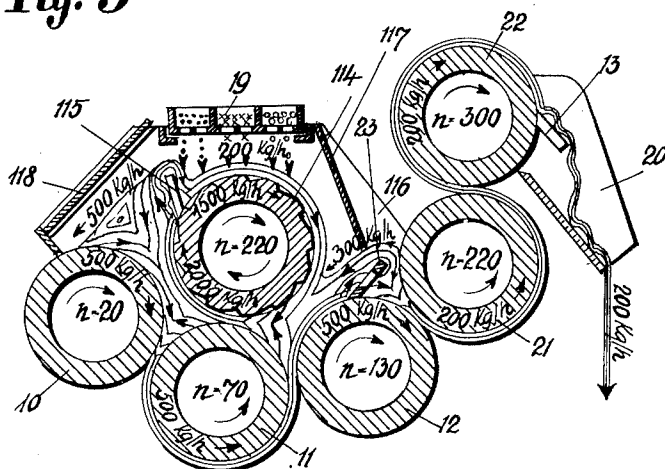
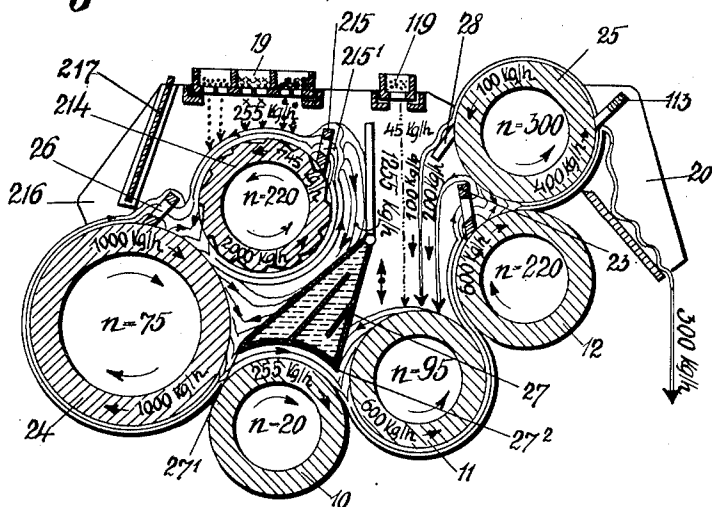


Fig. 4



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Fig. 5

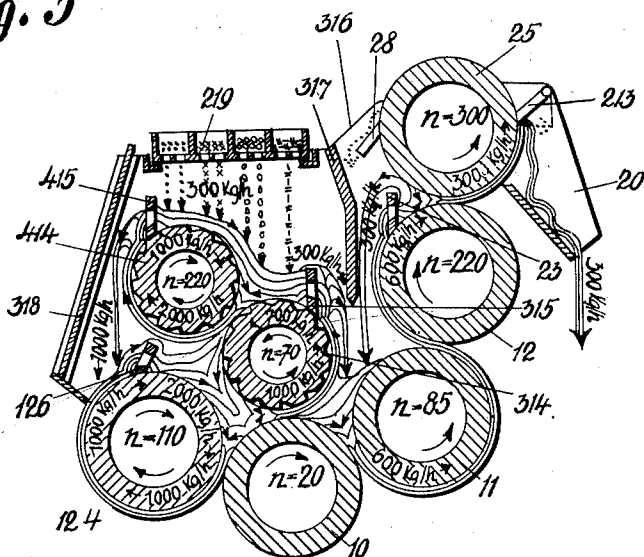
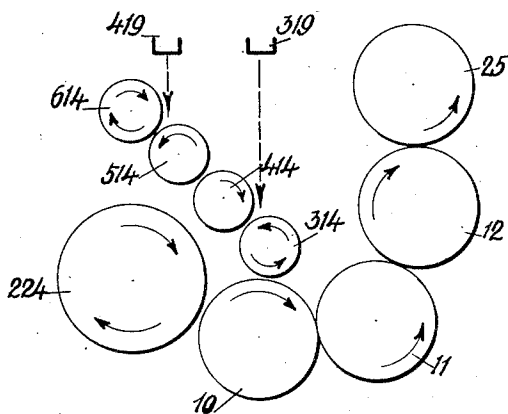


Fig. 6



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AUTOMATIC MIXING AND FINE-GRINDING
MILL FOR CHOCOLATE, COLORS, ETC.

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8 Claims. (Cl. 83—12)

This invention relates to an automatic mixing and fine-grinding mill for chocolate, colors etc. in which containers or sieve boxes, capable of being shaken, are arranged above the grinding rollers for separately feeding various constituents of the mixture into the mill.

In certain rolling mills of a well-known type a mixing roller rotating in an opposite direction to and at a higher speed than the first grinding roller is arranged at such a distance of its circumference from the circumference of said first grinding roller that a larger quantity of the mass to be treated rotates with the mixing roller than with the first grinding roller. Hitherto it was necessary in mills of this type to arrange a return roller for the mass in front of the mixing roller in order to prevent the mass loosened on the mixing roller by a scraper to drop from this roller.

An object of the invention is to make such return roller unnecessary, and to reduce the structural length of the rolling mill, and another object of the invention is to provide means for achieving, directly in the rolling mill, a thorough mixing and grinding of coarse constituents of the mixture, such as crushed cacao beans in the manufacture of chocolate, or lumps of dye-earth in the production of colors, etc.

If coarse mixture constituents are worked by means of a helically grooved or ribbed mixing roller arranged in front of the first fine-grinding roller, and rotating with higher speed than the latter, it happens frequently that, due to the centrifugal force, portions of the mass are hurled out of the grooves of the mixing roller. Therefore, it is a further object of the invention to provide means for preventing such hurled-off mass portions from remaining above the rollers and from escaping the automatic circulation of the mass in the mill.

It happens also frequently in the manufacture of chocolate that a rotating cylinder of mass forms in front of the entrances to the first grinding rollers due to the fact that the mass not yet thoroughly mixed is dammed back at these points. In such an event, first the outer portions of the mass cylinder which are richer in fat, and, thereafter only the drier portion within the interior of the cylinder are drawn in by the rollers, with the result that the constituents of the mixture are not well mixed and that the product is not uniform. For this reason it is another object of the invention to provide means for preventing the formation of such rotating mass cylinder at the mentioned points.

Together with this mixing roller, other smooth

or grooved mixing rollers may cooperate, and above such other mixing rollers additional containers may be provided for feeding the ingredients of the mixture.

According to the invention, edges of damming bodies provided above some or all of the rollers may be arranged near the entrances of the rollers in such a manner that the formation of rotating cylinders of mass is prevented.

Further objects and details of the invention will be apparent from the description hereinafter and the accompanying drawings illustrating several embodiments thereof by way of example.

In the drawings are:—

Fig. 1 a schematical section of a fine-grinding rolling mill with three rollers on one and the same level, and with a smooth mixing roller cooperating with the first fine-grinding roller;

Fig. 2 a similar section of a modification, the fine-grinding rollers being arranged different levels;

Fig. 3 a section of a fine-grinding five rollers mill having a grooved mixing roller cooperating with the second fine-grinding roller;

Fig. 4 a section of a fine-grinding four rollers mill with two mixing rollers and an adjustable damming body;

Fig. 5 a section of another fine-grinding four rollers mill with a smooth mixing roller in front of the first fine-grinding roller, and a pair of grooved mixing rollers cooperating with the first fine-grinding roller, and

Fig. 6 a diagrammatic view of another embodiment with four mixing rollers above the fine-grinding part of the mill.

In all embodiments of Figures 1 to 6, the directions of rotation of the individual rollers are denoted by arrows. In Figs. 1, and 3 to 5, the quantities conveyed by the individual portions of the roller surfaces are entered in the hatched space of the roller sections in units of kilograms per hour, and the numbers of revolutions are indicated in the hollow spaces of the rollers by an $n=$ followed by the respective number.

In the embodiment of Fig. 1, a smooth mixing roller 14 is arranged above rollers 10 and 11 of the fine-grinding part of the mill 10, 11, 12. The mixing roller 14 rotates in opposite direction to, and with higher speed than the first fine-grinding roller 10, and its circumference is at a greater distance from the circumference of fine-grinding roller 10 than the circumferences of rollers 10 and 11 are from each other. At the upper right hand quadrant of mixing roller 14, a scraper 15 leans against it. The scraper is provided with

apertures 15'. At the front sides of mixing roller 14, there are arranged shields 16, partitions 17 and 18 for preventing hurled-off mass portions from escaping the automatic circulation of the mass. A shaking sieve box 19 with divisons for the individual components or ingredients of the mixture is mounted above the mixing roller 14. Against the last fine-grinding roller 12, a scraper 13 bears beneath which a downwardly inclined channel 20 is arranged.

The rolling mill operates in the following manner: Due to the higher circumferential speed of the mixing roller 14, a film of mass is carried along at a rate depending upon the size of the gap between the said roller and the fine-grinding roller 10. This film is scraped off mixing roller 14 by scraper 15. A portion of this mass flows through the apertures 15' of scraper 15 and is again taken along by mixing roller 14. Upon this portion, the ingredients of the mixture are strewed from the shaking sieve box 19. This portion of the mass gets mixed and ground when passing between rollers 14 and 10, and is taken on by mixing roller 14.

The other portion of the mass scraped off mixing roller 14 by scraper 15 flows upon fine-grinding roller 11 therebelow, and is carried on by this roller to the entrance between this roller and fine-grinding roller 10. There it gets mixed and ground, and then, being taken along by fine-grinding roller 11, is ground between rollers 11 and 12. Finally, as a finished mass, it is scraped off the last fine-grinding roller by scraper 13, and drains through channel 20.

The described arrangement of mixing roller 14 above the fine-grinding part of the mill saves the application of a return roller which otherwise has to be provided in front of the mixing roller. This saving and the arrangement of mixing roller 14 above the fine-grinding part of the mill reduces the structural length of the entire machine by the diameters of two rollers.

Fig. 2 illustrates a rolling mill similar to that of Fig. 1 as to structure and operation with the difference, however, that the fine-grinding rollers 10, 11, 12 are on different levels.

In the embodiment according to Fig. 3 a grooved or fluted roller 114 is arranged above the second roller 11 of the fine-grinding part 10, 11, 12, 21, and 22 of the roller mill. Mixing roller 114 rotates in opposite direction to and at a higher speed than roller 11, and the distance of its circumference from the circumference of roller 11 is greater than the distances of rollers 10 and 11, and of rollers 11 and 12 from each other. A scraper 115 bears against roller 114 at its upper, left-hand quadrant, and a shaking sieve box 19 is arranged above said roller. The front sides of mixing roller 114 are shielded by shields 116 and between these shields partitions 117 and 118. A scraper 23 provided with perforations 23' above its scraping edges leans against the third fine-grinding roller 12. At the last fine-grinding roller 22, a scraper 13 for the finished mass is arranged above the downwardly inclined channel 20. Thus, mass ground between the fine-grinding rollers 11 and 12, is brought together in this case with the not yet mixed mass on mixing roller 114. This helps to improve the quality of the mixture. With this arrangement, the mass particles hurled from the grooves of the mixing roller hit the mass moving on top of the other rollers. In consequence thereof, such particles cannot be eliminated from the automatic circulation of the mass in the mill.

In Fig. 4, a smooth mixing roller 24 cooperating with roller 10 is arranged in front of the fine-grinding parts 10, 11, 12, 25 of the roller mill and rotates in the same direction to and at a higher speed than roller 10. A perforated scraper 26 leans against the upper portion of roller 24. On top and towards the right-hand side of mixing roller 24, a fluted mixing roller 214 is provided which rotates in opposite direction to and at a higher circumferential speed than mixing roller 24, and which forms a wider gap with this mixing roller than the gap which is adjusted between rollers 10 and 11. A perforated scraper 215 bears against the upper right hand quarter of mixing roller 214, and a perforated scraper 23 against the upper left-hand quarter of fine-grinding roller 12. A toothed scraper 113 is provided at the right-hand side of the last fine-grinding roller 25 above the downwardly inclined channel 20, and another scraper 28 at the left-hand side of said roller. Above fine-grinding roller 10, an adjustable water-heated damming body is arranged the edge 27' of which lies near the entrance between mixing roller 24 and fine-grinding roller 10, and the edge 272 of which is located near the entrance between fine-grinding rollers 10 and 11. A shaking sieve box 119 for additional mixture ingredients is mounted above fine-grinding roller 11. Shields 216 for preventing the mass from flowing off laterally are provided at the front sides of mixing roller 214 and a movable partition 217 is arranged at the left side of the mixing roller 214.

The mass interspersed with the mixture components strewed on from the shaking sieve boxes 19 is taken along by mixing roller 214. It mixes with the mass scraped off mixing roller 24 by scraper 26, and is ground and mixed therewith between mixing rollers 214 and 24. The so mixed mass is carried on by the grooved mixing roller 214 and scraped off by scraper 215 in such a manner that one portion thereof passes through the perforations 215' of said scraper, and is further mixed with the mixture components of shaking sieve box 19, while the other portion flows down and along the wall of the damming body 27 into the entrance between mixing roller 24 and fine-grinding roller 10. Due to an accumulation of mass, a rotating cylinder of the mass may tend to form in front of this entrance. Such formation, however, is prevented by edge 27' of damming body 27. Mixing roller 24 is suitably so adjusted in relation to the fine-grinding roller 10 that the entire mass cannot be taken along by mixing roller 24, but that a portion of the mass is carried on also by fine-grinding roller 10 so as to be ground between this roller and roller 11. The mass is, then, passed on by roller 11 to be finally comminuted between rollers 11 and 12 and scraped off by scraper 23. Since rollers 12 and 25 are adjusted closer to each other, only a portion of this mass is ground between these rollers. The other portion being dammed flows back upon the fine-grinding roller 11, and is again passed on by this roller to be comminuted between roller 11 and fine-grinding roller 10 in front of the latter. The mass ground between fine-grinding rollers 12 and 25 is partly scraped off by the teeth of scraper 113, and drains, as finished mass, through channel 20. The film of mass between the teeth is carried on by fine-grinding roller 25 and, then, scraped off by scraper 28. It flows back upon fine-grinding roller 11 and is again ground between this roller and fine-grinding roller 10. Simultane-

ously, mixture ingredients of the shaking sieve box 119 may be added another time to this mass. The formation of a mass cylinder in front of the entrance of rollers 10 and 11 is prevented by the edge 27² of damming body 27 arranged at this place. In this embodiment the mass particles hurled off mixing roller 214 also remain in the automatic mass circulation within the roller mill.

10 In the embodiment according to Fig. 5 a mixing roller 124 is arranged in front of the fine-grinding part 10, 11, 12, 25 of the roller mill and rotates in the same direction to and at a higher speed than roller 10. The circumference of the
15 the mixing roller is more remote from the fine-grinding roller 10 than the circumferences of rollers 10 and 11 from each other. Above fine-grinding roller 10, a grooved mixing roller 314 cooperating therewith is provided which cooperates as well with a mixing roller 414 also arranged in the trough-shaped space formed by rollers 124, 10, 11, 12, and 25. Mixing roller 314 rotates in opposite direction to and with higher speed than fine-grinding roller 10, and mixing
25 roller 414 rotates in opposite direction to and with higher speed than mixing roller 314. Perforated scrapers 126, 315, 415, and 23 are provided at mixing roller 124, at the right-hand upper quadrant of mixing roller 314, at the left-hand upper quadrant of mixing roller 414, and at the left-hand upper quadrant of fine-grinding roller 12 respectively. A removable scraper 213 is arranged at the right-hand side of the last fine-grinding roller 25 on top of the downwardly inclined channel 20, and a stationary scraper 28 at the left-hand side of roller 25. A shaking sieve box 219 is mounted above mixing rollers 314 and 414. At the front sides of mixing rollers 314 and 414, shields 316 are provided which are connected with one another by a partition 317. Another movable partition 318 is arranged at the left side of the roller 414.

The mass interspersed with the mixture ingredients strewed thereupon from shaking sieve box 219 is ground and mixed between the grooved mixing rollers 314 and 414; then, partly carried along by mixing roller 414 and scraped off the latter by scraper 415 in such a manner that one portion is passed on for another mixing with mixture ingredients out of shaking sieve box 219. The other portion flowing upon the mass rotating with mixing roller 124 is scraped off together with this mass by scraper 126. A portion of the entire mass scraped off by scraper 126 is mixed and ground between mixing roller 124 and fine-grinding roller 10, and taken along by said mixing roller. Another portion is ground and mixed between this mixing roller and fine-grinding roller 10, together with the mass revolving with mixing roller 314. This mass is scraped off mixing roller 314 by scraper 315. One portion thereof passes on to be again mixed and ground with the mixture ingredients strewed thereupon from shaking sieve box 219, while another portion flows downward to the entrance between fine-grinding rollers 10 and 11 to be ground here, and, then, to be moved on for further comminution between fine-grinding rollers 11 and 12. This mass is scraped off roller 12 by scraper 23. Due to the narrower adjustment of rollers 12 and 25, only part thereof passes on to be comminuted between these two rollers, and is, then, scraped off roller 25 by scraper 213 as finished mass which drains through channel 20.
75 The excess portion of the mass dammed back in

front of the entrance between rollers 12 and 25 returns downward to the entrance between rollers 10 and 11 in order to be again ground and mixed. By lifting scraper 213 from the last fine-grinding roller 25, the entire mass can be caused to be scraped off by scraper 28 and to return into the rolling mill for repeated grinding and mixing.

According to diagrammatic Fig. 6, mixing rollers 514, 614 may be provided in addition to the mixing roller 414 of Fig. 5, each mixing roller rotating in opposite direction to and with higher or lower speed than the preceding one. Two or more than two shaking sieve boxes 319, 419 may be arranged above mixing rollers 314, 414, 514, and 614.

I claim:

1. In an automatic mixing and fine-grinding rolling mill for chocolate, colors and similar masses, the combination of a plurality of milling rollers being arranged side by side with respect to each other, at least one mixing roller adapted for uniform distributing and mixing raw materials in and with the mixture mass rotating with said mixing rollers, at least one of said mixing rollers adapted for co-operating with one of said milling rollers, said mixing roller arranged above the milling roller with which it co-operates and at least with its lower part within the space formed by the upper parts of the milling rollers, said mixing roller revolving at a much greater peripheral speed than and in opposite direction to the milling roller with which it co-operates, means adapted to scrape off the mixture mass from said mixing rollers and being so arranged and constructed as to guide a portion of said mixture mass further again to said mixing roller from which it is scraped off, and further so arranged as to direct the other portion of said mixture mass scraped off by it into the space formed by the upper parts of said milling rollers, individual feeding means in consecutive arrangement substantially above at least one of said mixing rollers, said feeding means adapted for strewing raw materials upon the mixture mass scraped off and rotating with said mixing rollers.

2. In an automatic mixing and fine-grinding rolling mill for chocolate, colors and similar masses, the combination of a plurality of fine-grinding rollers, at least three of said fine-grinding rollers being so arranged with respect to each other as to form a trough-like space for the accumulation of mixture mass, a mixing roller adapted for uniform distributing and mixing raw materials in and with the mixture mass rotating with said mixing roller, said mixing roller co-operating with one of said fine-grinding rollers, said mixing roller arranged above the fine-grinding roller with which it co-operates and at least with its lower part within said trough-like space for the accumulation of mixture mass, said mixing roller revolving at a much greater peripheral speed than and in opposite direction to the fine-grinding roller with which it co-operates, said mixing roller being furthermore so arranged that the gap between said mixing roller and the co-operating fine-grinding roller is larger than the gaps between two of said fine-grinding rollers, means adapted to scrape off the mixture mass from said mixing roller, and being so arranged and constructed as to guide a first portion of said mixture mass further again to said mixing roller, and so arranged as to direct the other

portion of said mixture mass into said trough-like space for the accumulation of mixture mass, individual feeding means substantially above said mixing roller for strewing raw materials upon said first portion of the mixture mass scraped off and rotating with said mixing roller.

3. In an automatic mixing and fine-grinding rolling mill for chocolate, colors and similar masses, the combination of a plurality of fine-grinding rollers arranged side by side with respect to each other, a first mixing roller arranged before and co-operating with the first one of said fine-grinding rollers, said first mixing roller revolving at a much greater peripheral speed than and in the same direction to said first fine-grinding roller with which it co-operates, a second mixing roller adapted for uniform distributing and mixing raw materials in and with the mixture mass rotating with said second mixing roller, said second mixing roller co-operating with and being arranged above said first mixing roller, and at least with its lower part within the space formed by the upper parts of said first mixing roller and said fine-grinding rollers, said second mixing roller revolving at a much greater peripheral speed than and in opposite direction to said first mixing roller, scraping means at each of said mixing rollers, said scraping means at said second mixing roller being so constructed and arranged as to guide a first portion of the scraped off mixture mass further again to said second mixing roller and to direct the other portion of said mixture mass in the space formed by the upper parts of the fine-grinding rollers, means so arranged as to guide said other portion of mixture mass to the entrance of the mass between said first mixing roller and said co-operating first fine-grinding roller, individual feeding means in consecutive arrangement substantially above said second mixing roller for strewing raw materials upon said first portion of said mixture mass scraped off from said second mixing roller and guided by said scraping-means further again to said second mixing roller.

4. In a device of type described, the combination of a plurality of fine-grinding rollers, a first mixing roller arranged before and co-operating with the first one of said fine-grinding rollers, said first mixing roller revolving at a much greater peripheral speed than and in the same direction to said first fine-grinding roller with which it co-operates, said first mixing roller being so arranged that the gap between said first mixing roller and said co-operating first fine-grinding roller is larger than the gaps between two of said fine-grinding rollers, said first mixing roller and at least two of said fine-grinding rollers being so arranged with respect to each other as to form a trough-like space for the accumulation of mixture mass, a second mixing roller adapted for uniform distributing and mixing raw materials in and with the mixture mass rotating with said second mixing roller, said second mixing roller co-operating with and being arranged above said first mixing roller, and at least with its lower part within said trough-like space for the accumulation of mixture mass, said second mixing roller revolving at a much greater peripheral speed than and in opposite direction to said first mixing roller, said two mixing rollers being so arranged with respect to each other that the gap between the circumferences of said cooperating mixing rollers is larger than the gaps between two of said fine-grinding rollers, scraping means at said first

mixing roller arranged before the entrance between said two mixing rollers, and other scraping means at said second mixing roller being so constructed and arranged as to guide a first portion of the mixture mass scraped off from said second mixing roller, further again to said second mixing roller and to direct said other portion of said scraped off mixture mass into said trough-like space for the accumulation of mixture mass, individual feeding means in consecutive arrangement substantially above said second mixing roller for strewing raw materials upon said first portion of said scraped off mixture mass rotating with said second mixing roller.

5. A combination as claimed in claim 4 in which a damming body is arranged above said milling rollers in said trough-like space in which mixture mass may accumulate, said body having guiding surfaces for the flowing accumulate mass and being provided with edges protruding in the space before the entrance of said flowing mixture mass between at least two of said cooperating rollers of the rolling mill for preventing the formation of a revolving mass cylinder before said entrances.

6. A combination as claimed in claim 4 in which said first mixing roller is smooth and said second mixing roller grooved.

7. In an automatic mixing and fine-grinding rolling mill for chocolate, colors and similar masses, the combination of a plurality of fine-grinding rollers, a first mixing roller before the first one of said fine-grinding rollers and co-operating therewith, said first mixing roller revolving at a much greater peripheral speed than and in the same direction as said first fine-grinding roller, a plurality of co-operating second mixing rollers arranged especially above said first fine-grinding roller and said first mixing roller, one of said second mixing rollers co-operating with said first fine-grinding roller and revolving at a much greater peripheral speed than and in opposite direction to said first fine-grinding roller, said first mixing roller and said second mixing rollers co-operating with said first fine-grinding roller being so arranged with respect to said first fine-grinding roller that the gap between each of said mixing rollers and said first fine-grinding roller with which they co-operate is larger than the gaps between two of said fine-grinding rollers, scraping means at said first mixing roller, scraping means at each of said second mixing rollers so constructed and arranged as to direct portions of the mass scraped off from said second mixing rollers back into the space formed by the upper parts of said first mixing roller and said fine-grinding rollers and to permit other portions of said scraped off mass to be carried on by the same rollers from which they are scraped off, and individual feeding means for strewing mixture ingredients upon the mass taken along by said second mixing rollers.

8. In an automatic mixing and fine-grinding rolling mill for chocolate, colors and similar masses, the combination of a plurality of fine-grinding rollers, a first mixing roller arranged before and co-operating with the first of said fine-grinding rollers, said first mixing roller revolving at a much greater peripheral speed than and in the same direction as said first fine-grinding roller, said first mixing roller and said fine-grinding rollers being so arranged with respect to each other as to form a trough-like space for the accumulation of mixture mass, a plurality of co-operating second mixing rollers substantially

5 within said trough-like space, one of said second mixing rollers co-operating with said first fine-grinding roller and revolving at a much greater peripheral speed than and in opposite direction to said first fine-grinding roller, scraping means at said first mixing roller, scraping means at said second mixing rollers, so constructed and arranged as to direct portions of the mass scraped off from said second mixing rollers upon the mix-

ture mass rotating with said first mixing roller and into said trough-like space for mixture accumulation, and to permit other portions of said scraped off mass to be carried on by the same rollers from which they are scraped off, individual feeding means for strewing mixture ingredients upon the mass taken along by said second mixing rollers. 5

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