July 27, 1943. V. BOHM 2,325,301

FULLING OR PLANKING MACHINE

Filed Sept. 20, 1941 2 Sheets-Sheet 1

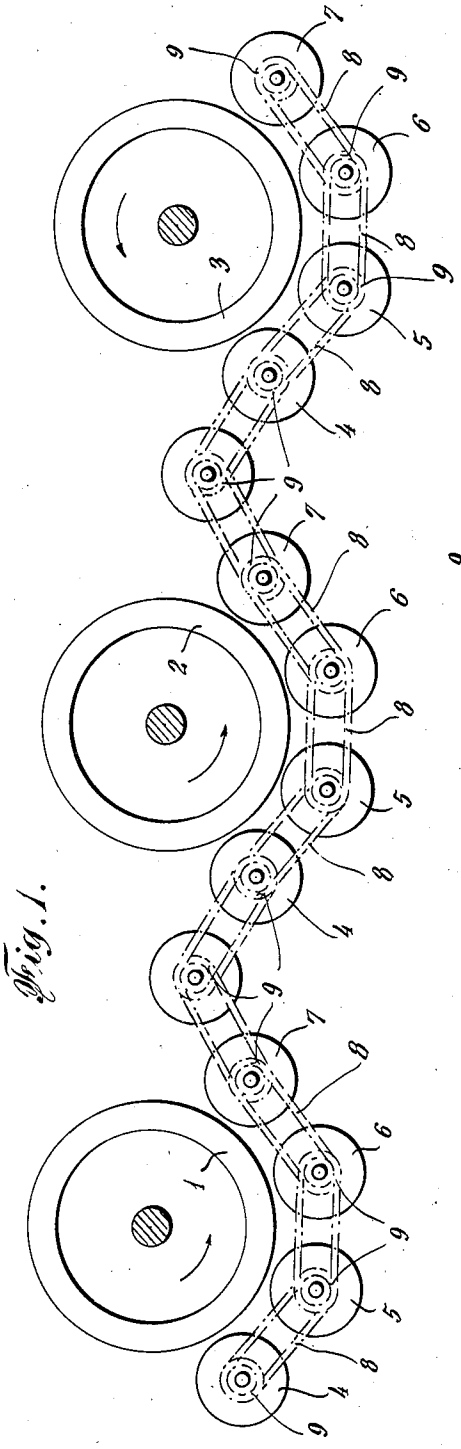


Fig. 1.

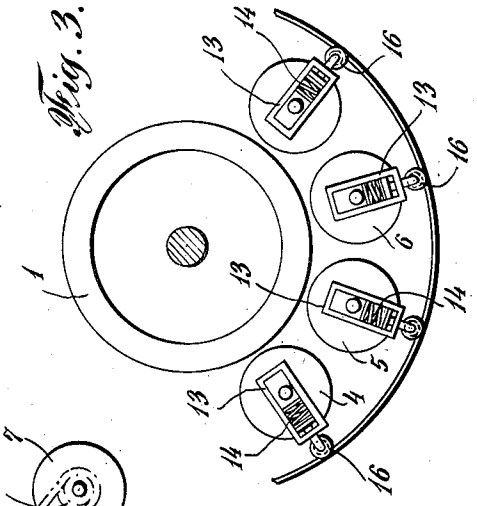


Fig. 3.

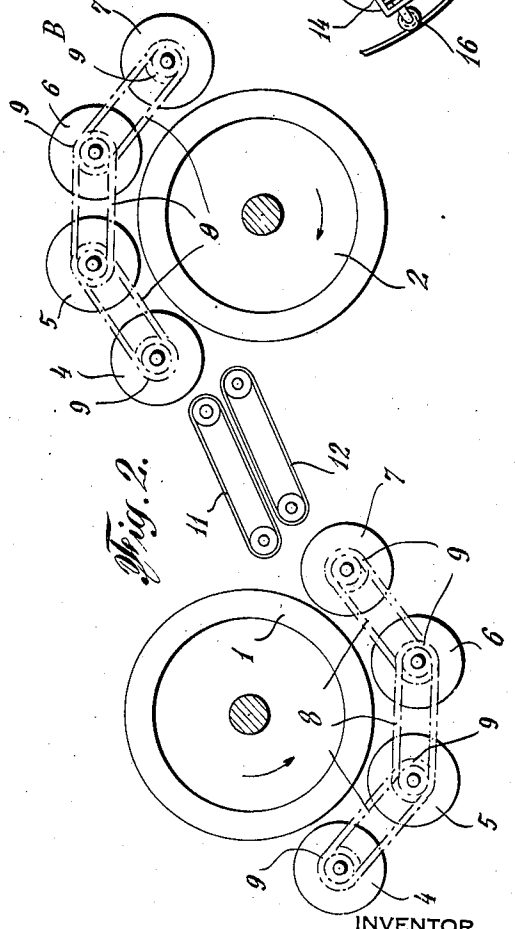


Fig. 2.

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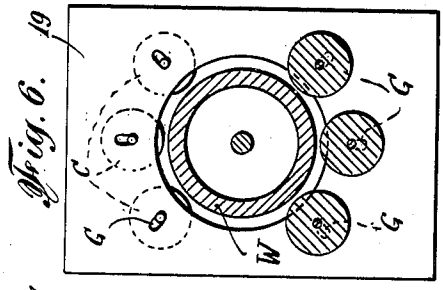


Fig. 6.

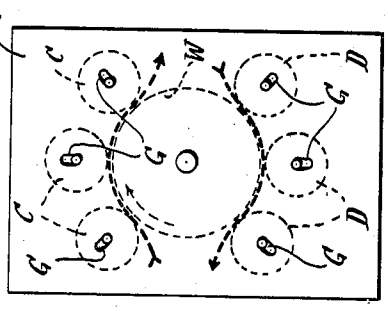


Fig. 5.

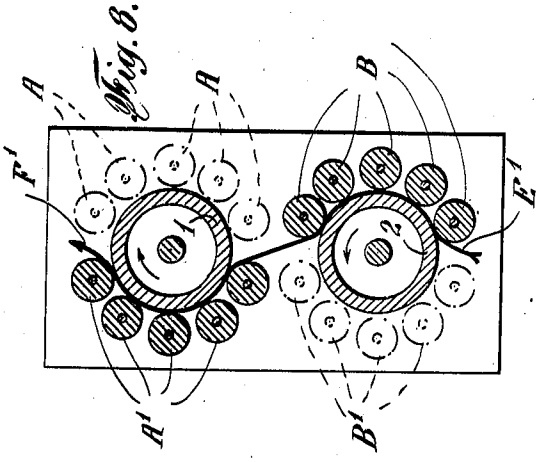


Fig. 8.

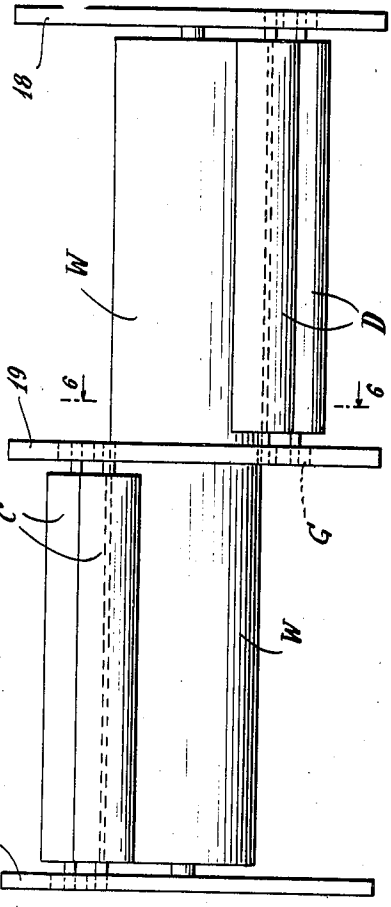


Fig. 4.

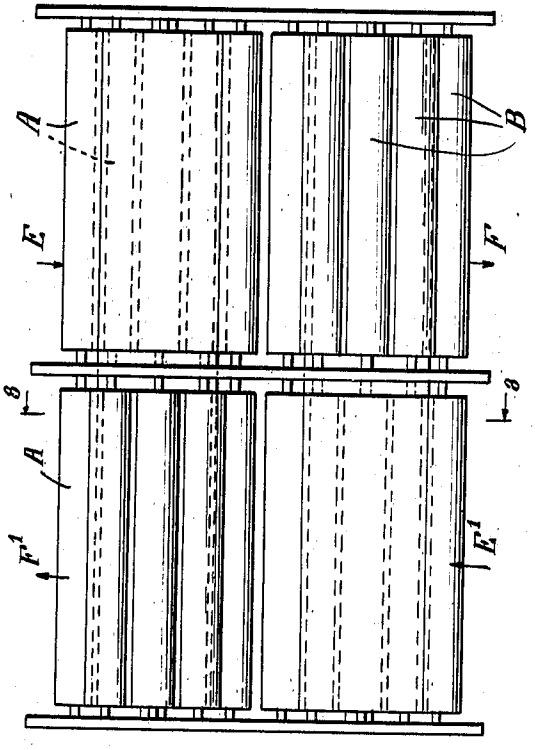


Fig. 7.

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2,325,301

FULLING OR PLANKING MACHINE

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Application September 20, 1941, Serial No. 411,693
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7 Claims. (Cl. 26—20)

This invention relates to fulling or planking machines for felts, including both hair felts and wool felts, and more particularly for hat bodies and hats, especially to fulling or planking machines of the kind known also as multiroller machines.

The known fulling machines, which are employed for the fulling or milling of felts, hat bodies and the like, consist essentially of at least two superposed groups of rollers, between which is passed the felt, felt body, hat body or the like to be fulled. In such machines each individual roller executes a continuous rotary movement about its longitudinal axis and at least one of the two rollers of each cooperating pair of rollers executes an oscillating or reciprocating movement in a generally axial direction in such a way that one roller executes a movement relatively to the other roller wherein by the continuous rotation of the individual rollers about their axes the felt, hat body or the like is drawn in between the cooperating pairs of rollers and passed through the machine, while by means of the movement, which is obtained owing to the axial motion of at least one of the rollers of each pair, the actual fulling or planking of the felt body is effected.

In the known machines the axial motion of the rollers is obtained for the most part, by supporting the rollers in carriages, and imparting a shaking or oscillating motion to the carriages. Machines are known in which axial motion is imparted to the upper and lower rollers and for this purpose the upper rollers are journaled in an upper carriage and the lower rollers in a lower carriage, and to each of these two carriages a reciprocating or an oscillating movement is imparted. Machines are, however, also known in which only one group of rollers, for instance the upper rollers, are mounted in a carriage, to which a reciprocating or oscillating movement is imparted, while the other group of rollers is not reciprocated or oscillated, so that each roller in this group executes only rotation about its own axis.

The output capacity of the known machines is limited, mainly by the weight of the rollers subjected to the reciprocatory or oscillatory motion; that is to say, in the known machines the weight of all of the rollers of a group is taken by a single carriage with the result that the frequency of the oscillation is limited notwithstanding the fact that the amplitude of the reciprocating or oscillating movement, as the case may be, is very small, amounting in most cases to only a few millimetres. In consequence of the magnitude of the masses that are exposed to such motion in these known machines, the number of rollers is also limited and the output capacity of these machines can not be increased. If it be desired to accelerate the fulling process, a plurality of machines must be arranged in parallel or in series and the work to be fulled must be passed through these machines in succession.

The present invention is based upon the discovery that the cooperation of one roller (the main roller) with a number of rollers (secondary rollers), offers a means of increasing the number of points of contact and therefore the number of points of treatment, thus multiplying the action of a roller and increasing the output capacity of a machine. The invention is based upon the discovery that the number of points of contact and points of treatment in a fulling machine can be increased by allowing a roller to cooperate with rollers so arranged that the points of contact of the rollers cooperating with one another are angularly spaced from one another by less than 180 degrees. Such an arrangement enables the number of treatment points to be increased at will, particularly when the device is such that the cooperating rollers are not of the same size, but that a roller of greater diameter (the main roller) cooperates with a plurality of rollers of smaller diameter (secondary rollers), the points of contact of which with the main roller are angularly spaced from one another at an acute angle.

The fulling machine forming the subject of this invention is readily capable of being constructed with a main roller of such length that a plurality of working tracks can be formed side by side. This also renders possible a form of construction of fulling machine in which the main roller cooperates with groups of rollers in different parts of its length, in such a way that the main roller, in different portions of its length, cooperates with differently arranged groups of rollers. This offers a means for reducing the bending stress on the long roller. For instance the main roller may, for example, also be arranged to cooperate throughout a portion of its length with lower rollers and throughout another portion of its length with upper rollers, thereby rendering it possible for the felt treated to make a circuit through the machine and even, if desired, for the points of entry and exit to be provided side by side in the same plane, that is to say, the felt treated can be guided in the machine back into the plane in which it had been introduced into the machine.

In a fulling machine according to the invention,

in which a roller executing an axial oscillating movement and a rotary movement cooperates with a plurality of rollers executing at least a rotary movement, preferably with the same peripheral velocity, the operative length on this roller and therefore also its action are, therefore, multiplied to an extent corresponding to the number of cooperating rollers.

A machine consisting of a plurality of units, at least two, each consisting of a main roller and associated secondary rollers wherein in each unit the points of contact or treatment, in relation to the points of contact of the preceding unit, are in a suitable radially displaced relationship, and the rollers of one unit revolve in the opposite direction to those of the other unit, enables the work to be treated on different sides of the surface, that is, on the upper side and on the under side, without a turning appliance being required.

Such a machine, consisting of a plurality of main rollers, may be constructed either with main rollers arranged parallel to one another, or else in such a way that the axes of the main rollers are in alignment with one another.

According to the invention, in a machine consisting of a plurality of main rollers, each main roller receives its own oscillating drive. Owing to the diminution, hereby rendered possible, in the swinging masses, as compared with a fulling machine in which the swinging masses are supported for example in a carriage executing the oscillation, it is possible to manufacture machines with an almost indefinitely high frequency of vibration. The individual drive provided for each main roller for the production of the swinging motion renders it possible, however, even in multi-roller machines, to increase the length of each swinging roller quite considerably and it is thereby also made possible to provide the contact points or treatment points at different parts of the roller length or in different portions of the length of the main roller, in such a way that the main roller, at different parts of its length, cooperates with differently arranged rollers, the roller or rollers of one portion of the length being radially displaced in relation to the roller or rollers of the other portion of the length, preferably a main roller of greater diameter cooperating at different parts of its length or in different sections of its length with smaller rollers. This renders possible an embodiment in which a main roller cooperates for one part of its length with lower rollers and for another part of its length with upper rollers, and paths in opposite directions through the machine are provided for the work-piece, the number of such paths being determined by the length of the rollers.

Several embodiments of the invention are diagrammatically illustrated in the accompanying drawings in which—

Figure 1 is a diagrammatic representation of one construction.

Fig. 2 is a similar view of a second construction.

Fig. 3 is a view of a detail of each of these constructions.

Fig. 4 is a view of the front elevation of a third construction.

Fig. 5 is a side elevation.

Fig. 6 is a section of the same; and

Figs. 7 and 8 are, respectively, views in front elevation and in section along the plane of the line 8—8 of Fig. 7 of a fourth construction.

In the example of construction illustrated in Figure 1 of the drawings, the fulling machine consists of main rollers 1, 2 and 3 which in any convenient number are arranged side by side, or side by side with a suitable gap between them. Each of these main rollers 1, 2, 3 cooperates with a group of rollers (secondary rollers) consisting of a number of rollers 4, 5, 6, 7 of smaller diameter. The arrangement is such that the main rollers 1, 2, 3 execute on the one hand a rotation about their own axes and on the other hand an axial reciprocating or oscillating movement, for instance as is known in multi-roller machines. The rollers 4, 5, 6, 7 of each group, which cooperate with the main rollers, rotate about their own axes with the same peripheral velocity as the main rollers so that, in the embodiment illustrated in the drawings, the felt (hat body or the like) passing between the main rollers and the associated secondary rollers is treated at four places on each main roller, the felt (hat body or the like) being fed forward between the rollers by their rotation and being fulled by the axial oscillatory or reciprocating motion of the main roller 1, 2 or 3 at each point of contact with the rollers 4, 5, 6, 7.

The main rollers 1, 2, 3 are so supported as to be capable of oscillation or reciprocation in an axial direction, such motion being secured for example in a known manner by means of eccentrics, the rotation of which is effective in imparting axial movement to the rollers, each roller being arranged individually to be so moved. Each of the main rollers also has its own rotational drive, so that by the avoidance of a common driving arrangement for the main rollers the construction is substantially simplified, and each roller may be driven in a different direction.

The driving of the secondary rollers 4, 5, 6, 7 is effected in the embodiment illustrated by means of a chain gear, for instance by means of a chain 8, which meshes with sprockets 9 on the shafts of the several secondary rollers.

In the embodiment illustrated in Figure 2 the main rollers 1 and 2 are driven in opposite directions, and the group B of rollers 4, 5, 6, 7 associated with the main roller 2 may be angularly displaced in relation to the group A of rollers 4, 5, 6, 7 associated with the main roller 1; for instance the roller group A may be arranged below the associated main roller 1, and the roller group B above the associated main roller 2, so that the work (hat body or the like) is fulled on one side in passing over the main roller 1 and on the other side in passing over the main roller 2, that is to say, it is subjected to the fulling treatment on different sides in passing the two main rollers.

It is therefore possible on such a machine, to treat the work on both sides, even when passing it only once through the machine.

If the fulling machine consists of more than two main rollers 1, 2, in the third main roller the arrangement of the roller group consisting of the rollers of smaller diameter is angularly displaced relatively to the arrangement in the case of the preceding main roller 2, and so on.

The transport of material from the one to the other of the main rollers 1, 2 may if required be secured by endless bands 11, 12.

In order to render the machine according to Figure 1 or 2 capable of treating felts of different thicknesses, or to allow for the thickness of the felt varying during the treatment, the rollers of smaller diameter are yieldingly supported in which case, by the employment of a chain drive,

the displacement of the individual rollers is permitted without interfering with the drive.

In the embodiment illustrated in Figure 3, the bearings of the secondary rollers, for example, are for this purpose supported in slot guides 13, and are subjected to spring or like action, the slot guides 13 running parallel to the plane passing through the axes of the cooperating rollers, as shown in Figure 3. The springs 14 that resiliently control the secondary rollers are preferably capable of being stressed or readjusted, for instance by means of a cable 15, which passes over pulleys 16, which are arranged on a movable abutment for each spring, so that by pulling the cable 15 the pressure exerted by the springs may be varied. By changing the loading of the springs it is therefore possible to vary the pressure under which the felt passes through the machine. This provides on the one hand a means for influencing the treatment of the felt, and on the other hand a means for allowing for the variation in the thickness of the felt due to shrinkage of the felt. It is therefore possible to pass the felt more than once between the rollers or through the machine with different spring stresses.

If in a machine according to the invention each main roller has its own oscillating or axial drive, it is possible to increase quite considerably the possible frequency of oscillation, since only the mass of one roller has to be set in motion and thus an increase in work done as compared with machines in which the oscillating rollers are journaled in a common carriage.

By the separation of the drive for the main rollers and by the individual driving of each main roller, the driving elements, such as eccentrics for example, of course become smaller, whereby also a diminution in the width of the machine is attainable, if importance is attached to the building of narrow machines.

By changing the speed of revolution of the cooperating rollers the passage of the work through the machine can be accelerated or retarded in a manner known in itself, according to the treatment that may be desired. By increasing the speed of revolution of the cooperating rollers in the successive units the treatment can be weakened or reduced, and by diminishing the speed it can be strengthened or increased.

The machine according to the invention may obviously be further developed in various ways. Thus for example the eccentrics that serve for the oscillating drive of the rollers may be adjustably mounted, and the amplitude of the oscillation may thereby be variable, the frequency of oscillation being also variable.

It is obviously also possible to combine two or more main rollers by common driving members.

It is, however, also possible to support the secondary rollers upon compressed air cylinders or the like devices providing a resilient support, and to effect similar modifications.

The individual driving of the rollers, however, also renders possible quite a considerable increase in the output of the machine; for owing to the fact that the rollers are only individually set in oscillation it becomes possible to employ heavier and therefore also longer rollers than in the usual machines, in which the rollers executing the oscillation movement are journaled in a common carriage. The employment of longer rollers makes it possible to pass more work-pieces (for instance hat bodies) than was hitherto possible through the machine side by side at the same time, and also to utilize part of the length of the roller for the return movement of the work, so that the work can be passed in a circuit, as it were, through the machine, and can traverse the machine in different directions, whereby two or even more machines can be replaced, according to the number of passages therethrough rendered possible by the length of roller.

Such a form of construction is diagrammatically illustrated in Figures 4 and 5. In the example of construction shown in these figures the main roller W cooperates for a part of its length with a roller group C, and for a part of its length with a roller group D, these two groups of rollers being arranged in such angular relationship to one another that the work can run in at one place and can run back at another place (Figure 5).

In a machine of this kind the main roller W forms in a sense part of two machines and such a machine can completely take the place of two multi-roller machines of ordinary construction.

For supporting the roller groups C and D there may be provided, between the side frames 17 and 18 in which the main roller W is journaled, a further frame 19 (Figure 6), the rollers of the groups C and D being supported by one journal in the frame 17 or 18 of the main roller and by the other journal in the further frame 19 which are provided between the main side frames and which may even be constructed so as to be common to both groups of rollers, as shown in the drawings. The rollers of the groups C and D may be yieldingly journaled in slotted guides G, as shown in Figure 6.

In the embodiment illustrated in Figures 7 and 8 the fulling machine consists of two main rollers 1 and 2, each of which cooperates with two groups of rollers A, A' and B, B' respectively, of which one group, A' or B', is angularly displaced in relation to the other group A or B, through an angle of 180 degrees. The work, a hat body for instance, enters the machine at E and leaves it at F, reenters it at E', and leaves it at F'.

In this form of construction, two paths in opposite directions through the machine are offered to the work, and in each passage the work is treated on both surfaces.

In order to prevent the work running freely between the rollers when passing through, the secondary rollers may be caused to abut against one another.

In order to make the main rollers as light as possible it is preferable to make them tubular. It is advantageous to employ as a main roller a tube provided with a coating of india-rubber, artificial resin or the like. The coating may best be made of thin rings of india-rubber or artificial resin, "Bakelite" for example, in such a manner that the discs are slipped on to the tube and united to form a unit, preferably by pressing them against one another without leaving any gaps between them. Such rollers with tubular cores are also very resistant to acids and are light in weight. It is, however, also possible to use as a roller a steel tube, of rustless steel to obtain the resistance to acids for example, without a coating. It is, however, advantageous to groove the roller surface or to roughen it in some other way. By employing tubes as rollers, preferably rollers with hollow cores, it is possible to use main rollers of comparatively large diameter. Thus it is possible to use, as main rollers, rollers of considerably greater diameter than has

hitherto been usual for fulling machines. To give an example, rollers of a diameter of from 150 to 300 millimetres may be employed as main rollers, and rollers of a diameter of from 50 to 150 millimetres as secondary rollers.

What I claim is:

1. A fulling and planking machine comprising a plurality of main rollers adapted for both rotary and vibratory movements, a group of secondary rollers greater than two and of smaller diameter than the main rollers mounted in substantially tangential relation to each of said main rollers at acute angular distances therearound, and independent driving means for the main rollers and for the groups of secondary rollers.

2. A fulling and planking machine according to claim 1, characterized in that the machine has means for conveying the work to be acted upon from one main roller to another.

3. A fulling and planking machine according to claim 1, characterized in that the machine has means for conveying the work to be acted upon from one main roller to another, the main rollers being parallelly disposed and each rotatable in a direction opposite to that of the preceding one, the succeeding main rollers having the group of secondary rollers so disposed in relation to the surfaces of the main rollers that the workpiece will be treated on its opposite sides on successive main rollers.

4. A fulling and planking machine comprising a main roller adapted for both rotary and vibratory movements, a group of secondary rollers greater than two and of smaller diameter than the main roller mounted in substantially tangential relation to said main roller at acute angular distances therearound, and independent driving means for the main roller and for the group of secondary rollers, the main roller being relatively long in comparison to the secondary rollers and the secondary rollers being arranged in separate groups in different longitudinal sections of the main roller.

5. A fulling and planking machine according to claim 4, characterized in that one group of the secondary rollers is disposed below the axis and the other group is disposed above the axis of the main roller.

6. A fulling and planking machine according to claim 1, characterized in that each of the main rollers is relatively long in comparison to the secondary rollers, and in that the secondary rollers are arranged in separate groups in different longitudinal sections of the main rollers and each main roller having the groups of secondary rollers in cooperation therewith angularly displaced in relation to each other.

7. A fulling and planking machine comprising a main roller adapted for both rotary and vibratory movements, a number of secondary rollers greater than two and of smaller diameter than the main roller mounted in substantially tangential relation to said main roller at acute angular distances therearound so as to enable the work-piece to enter and to leave the said group of secondary rollers at different quarters of the surface of the main roller, the secondary rollers being divided into two groups disposed on diametrically opposite sides of a plane passing through the axis of the main roller and independent driving means for the main roller and for the group of secondary rollers.

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