United States Patent

Zahoransky

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[54] BRUSH-MAKING MACHINE

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **300/3**, 300/11

[51] **Int. Cl.** **A46d 3/06**

[58] **Field of Search** 300/3, 10, 11

[56] **References Cited**

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[57] **ABSTRACT**

A brush-making machine comprising at least one rotatably mounted carrier member for chucking devices located on diametrically opposite sides of said carrier member, and possibly a depth compensating mechanism, said carrier member substantially having the form of a two-armed lever which carries the chucking devices at the ends of its arms.

5 Claims, 10 Drawing Figures

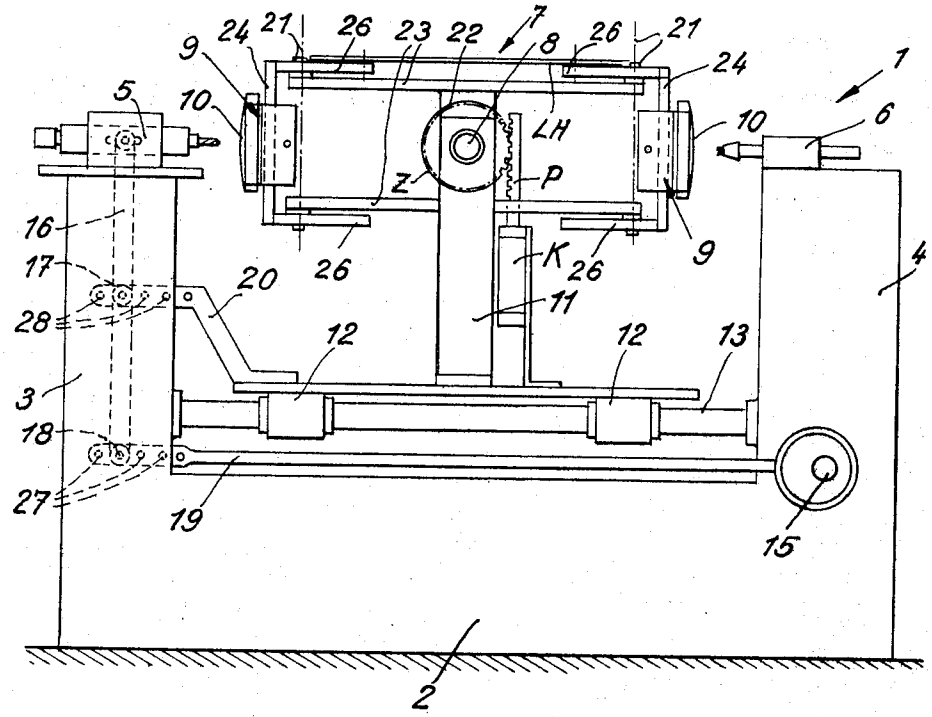

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Fig. 1

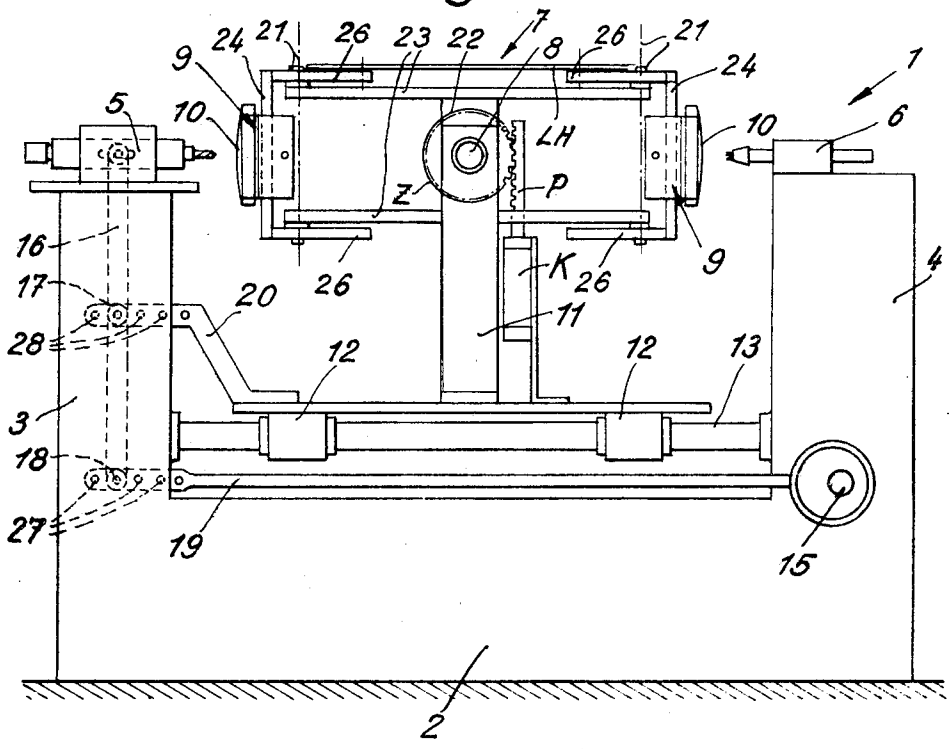

Fig. 2

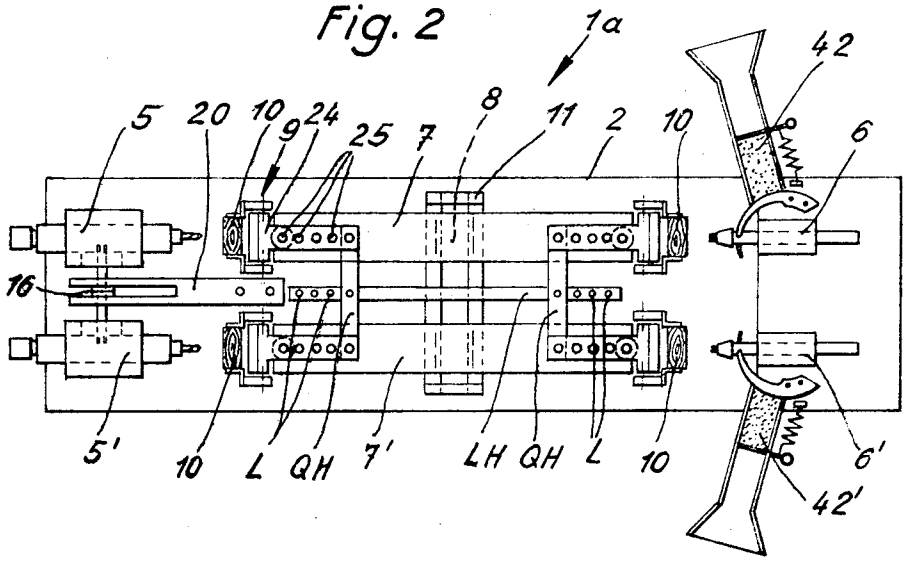

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Fig. 3

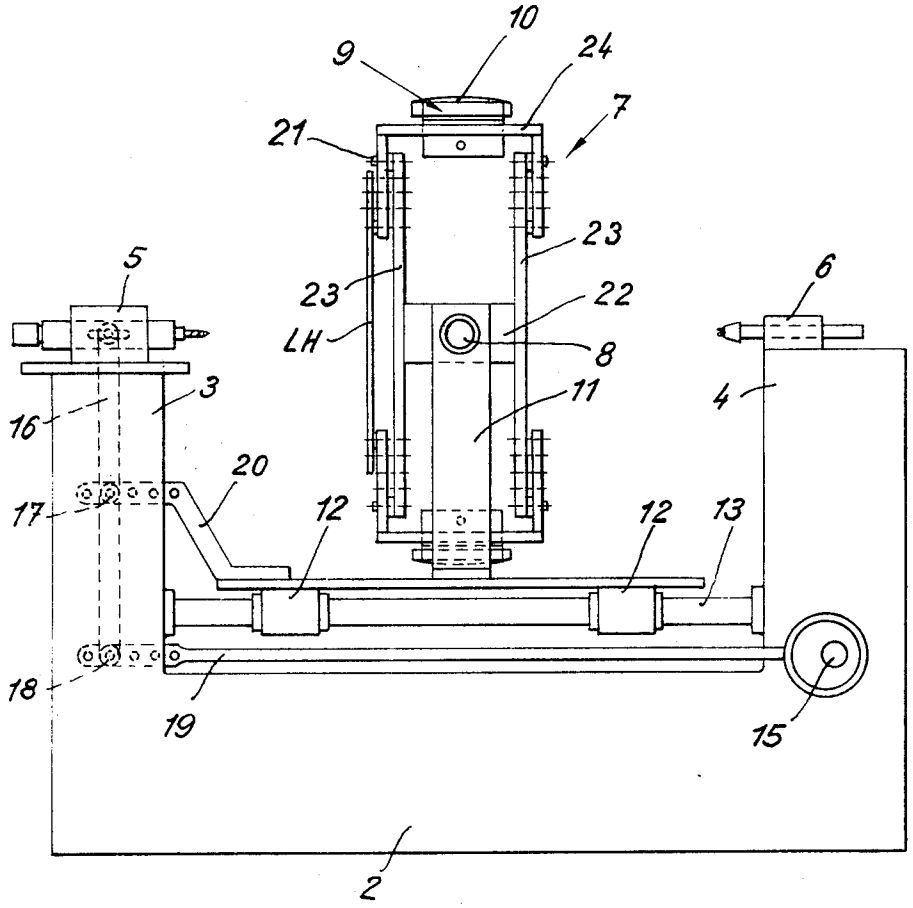

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Fig. 4

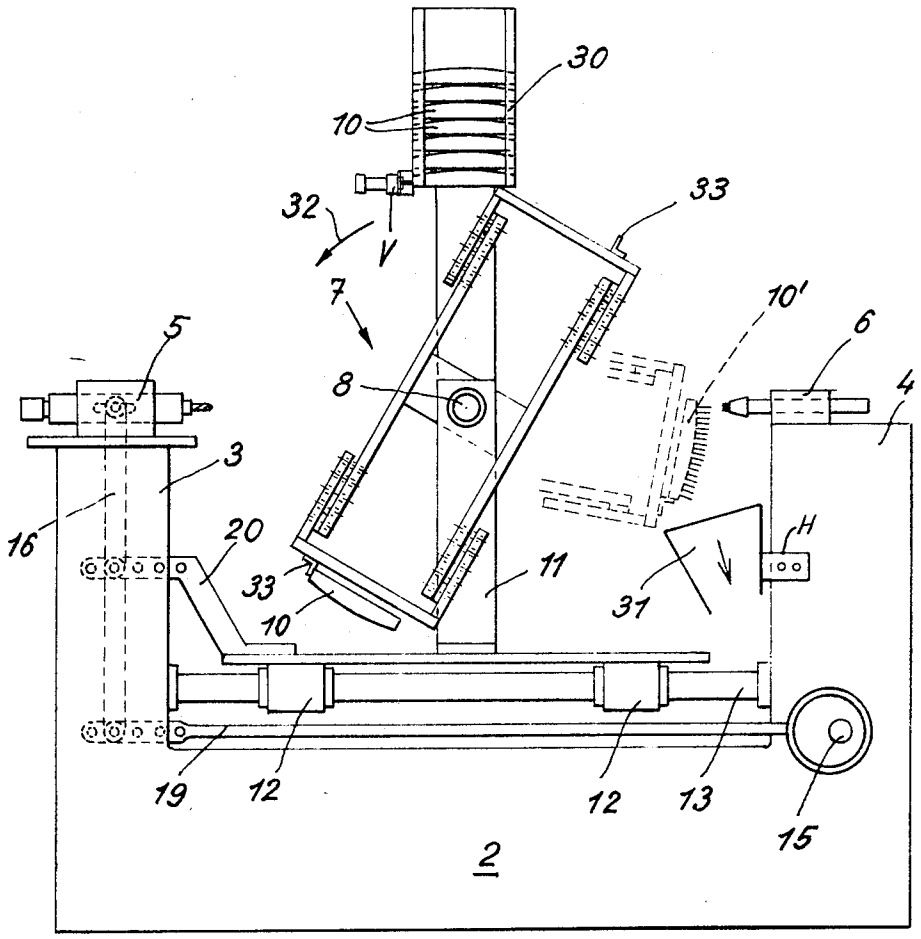

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Fig. 5

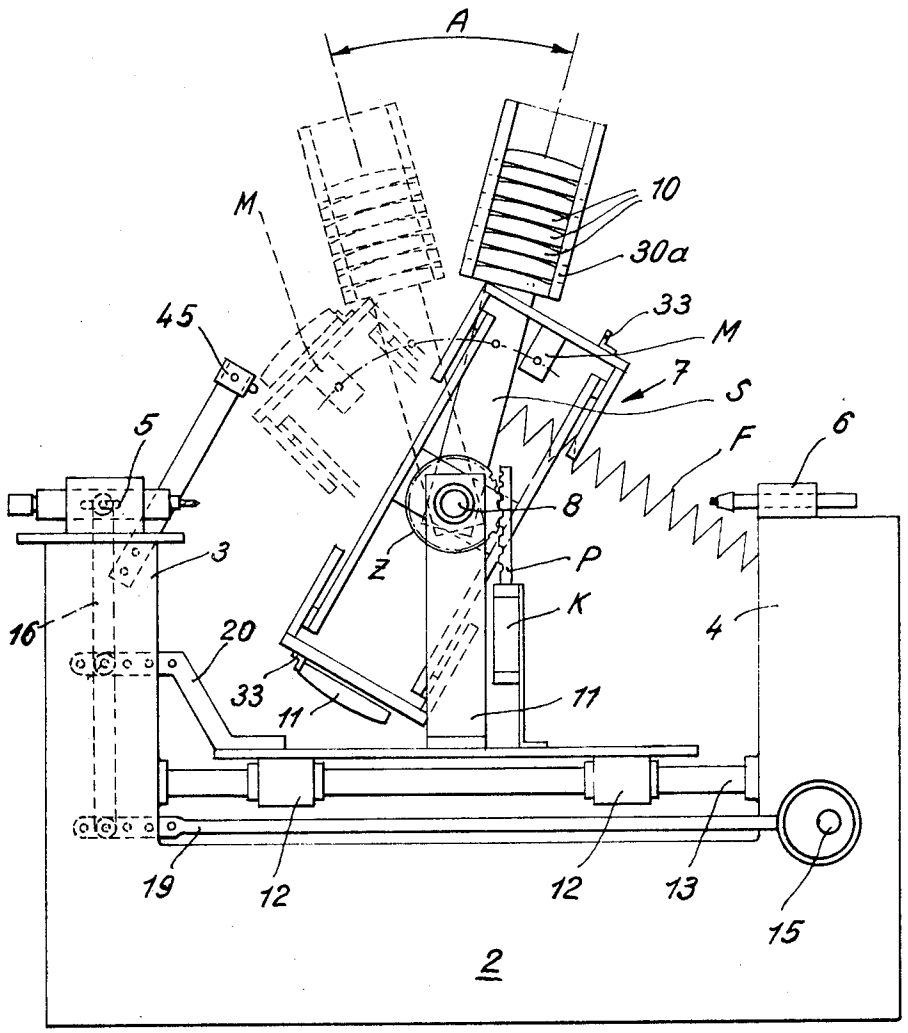

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Fig. 6

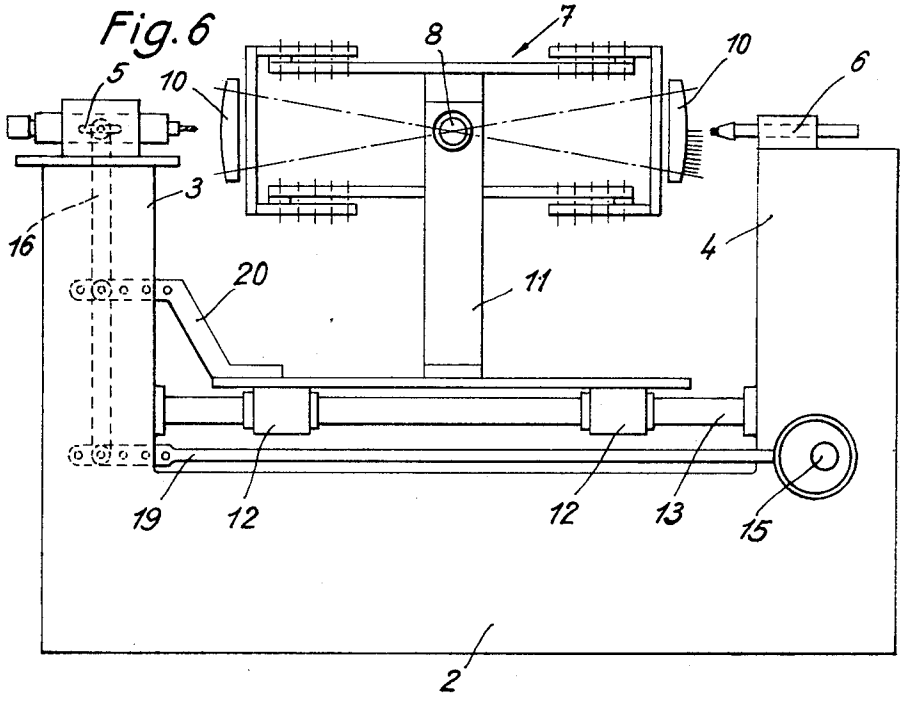

Fig. 7

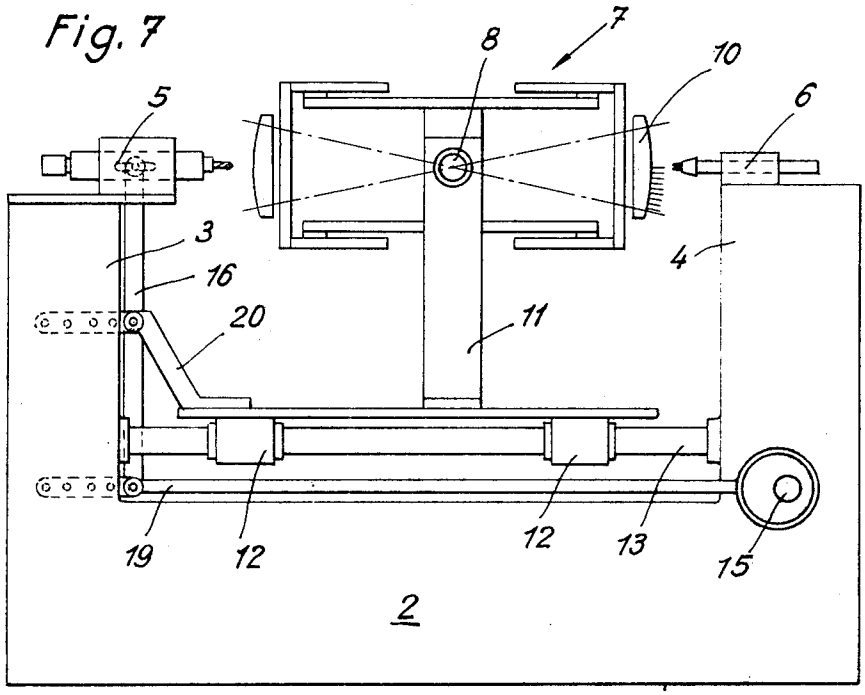

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Fig. 8

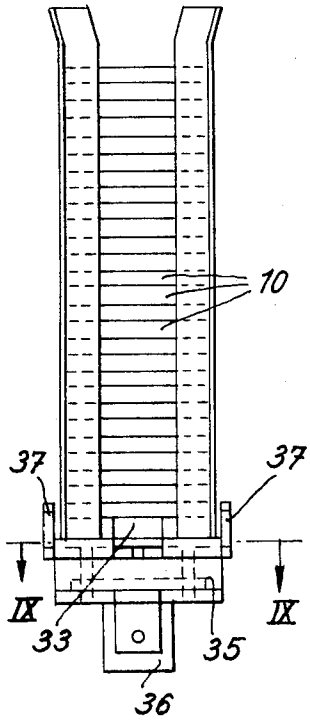


Fig. 9

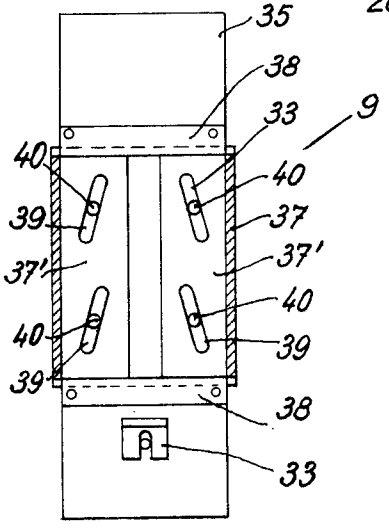
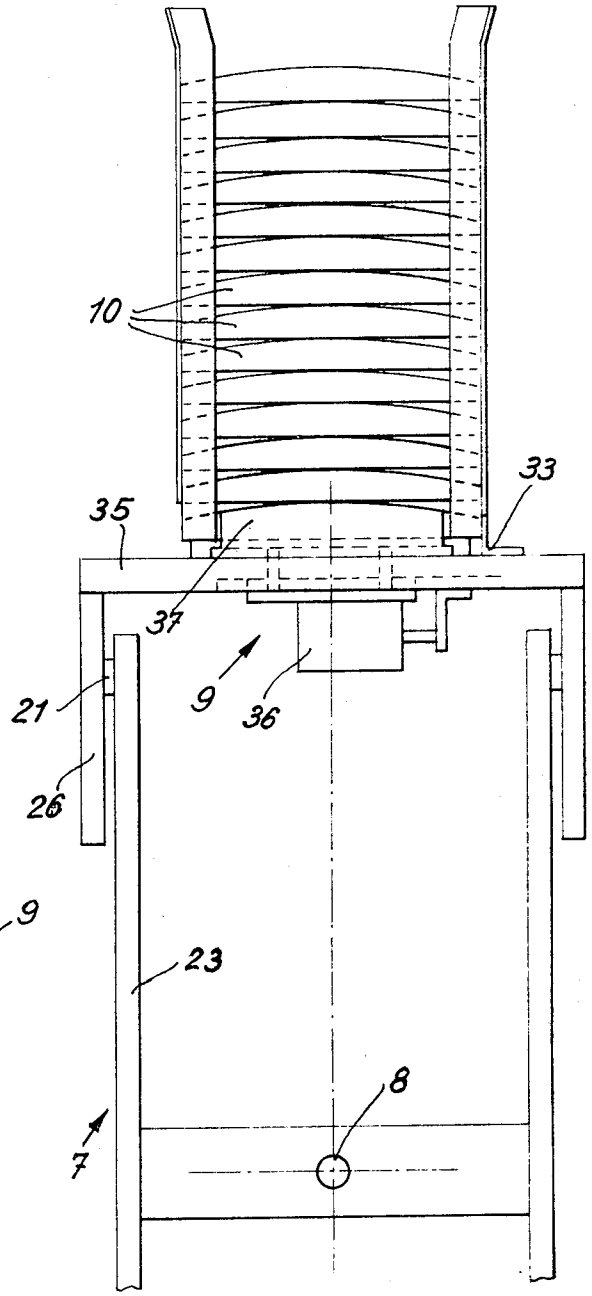


Fig. 10



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BRUSH-MAKING MACHINE

BACKGROUND OF THE INVENTION

The present invention relates to a brush-making machine comprising at least one rotatably mounted carrier member for chucking devices cooperating with a boring station and a brush filling station, preferably located on diametrically opposite sides of said rotatable carrier member, and possibly a depth compensating mechanism.

In a brush-making machine already known in the art a drum-shaped carrier member is provided with chucking devices usually disposed on the drum in quadrature. This arrangement is open to the objection that indexing of the chucking devices from one working station to the next involves accelerating and braking relatively heavy weights, particularly in machines in which the described arrangement is duplicated, possibly several times. The great weight of such arrangements is due to the fact that the chucking devices are necessarily rather large structures because they must be capable of swiveling in at least two directions to permit the bristles to be set in the backs of the brushes so that they diverge in two relatively perpendicular planes. Another drawback of machines of this kind is that even in the simplest forms at least four chucking devices require replacement whenever the type and size of the brush backs that are to be bored and filled is changed.

SUMMARY OF THE INVENTION

It is the object of the present invention to provide a brush-making machine in which the aforedescribed drawbacks are avoided.

To attain this object the present invention provides a brush-making machine comprising at least one rotatably mounted carrier member for chucking devices located on diametrically opposite sides of said carrier member, and a depth compensating mechanism, wherein said carrier member substantially has the form of a two-armed lever which carries the chucking devices at the ends of its arms.

Such a carrier member in the form of a two-armed lever is cheap to provide, its weight can be low and it can therefore be indexed at high speed from station to station. Since in a simple machine such a lever carries only two chucking devices the machine is convenient and easy to readjust for the production of a different kind of brush.

In a preferred embodiment of the invention the lengths of the lever arms are adjustable, preferably from a fulcrum which is also the center of the arc from which the bristles are intended perpendicularly to project. By thus bringing the center of this arc and the fulcrum of the two-armed lever into coincidence the general construction and disposition of the chucking devices is substantially simplified. Another advantage derives from the fact that no special drive means are needed for swiveling the chucking devices.

Preferably readjustment of the machine to a different kind of brush by readjusting the working stations on diametrically opposite sides of the path of rotation of the two-armed lever to the changed length of the lever arms may be effected by first moving the axis of the lever to adjust the same to one of the working stations and then readjusting the other of the two stations, preferably the boring station. This method of adjustment is convenient because it means that the filling station and its associated magazine for bristles and its dividing mechanism can be permanently fixed. According to another feature of the invention a collecting means for the finished brushes may be provided below the point of brush release in a position which in machines comprising a horizontal lever axis may preferably be below the horizontal plane containing said lever axis. When the chucking devices release the brushes these can then drop by gravity for instance into a hopper which delivers them to an associated conveyor means. The final position of the chucking device at the end of the filling operation is preferably also the position of release. This can be achieved by so choosing the starting position for filling that the filling operation will be completed in the desired final position.

Moreover, in a preferred embodiment of the proposed brush making machine a loading station for presenting the brush backs to the chucking devices may operatively precede the boring station at a distance from the axis of the two-armed lever which is adjustable to the length of the lever arms. This assists in substantially improving the production capacity of the machine, principally because a loading station of such a kind may also comprise a magazine and the chucking device may be directly loaded, i.e., without the assistance of an intermediate member, such as a transferring gripper arm. In a machine in which the two-armed lever rotates about a horizontal axis it is most convenient for the loading station to be located above the upper arc of the path of rotation of the lever ends, since the brush backs can then be delivered to the chucking devices by gravity. Another useful feature consists in locating the loading station in the first quadrant traversed by the lever arm after leaving the filling station. This feature likewise facilitates the insertion of the brush backs into the chucking devices and their safe retention therein. Moreover, in a preferred embodiment the loading station may participate in the motion of the chucking device within a limited angle of rotation of the two-armed lever during its indexing motion between the working stations. When this is the case the speed of the indexing motion can be still further increased.

Finally, in order to prevent the machine from running accidentally empty or to prevent faults due to any cause whatsoever, monitoring means may be provided at least in a position preceding the first working station, and adapted to stop the machine in case of need.

BRIEF DESCRIPTION OF THE DRAWINGS

Illustrative embodiments of a brush-making machine according to the invention will now be more particularly described by way of example and with reference to the accompanying drawings, in which:

FIG. 1 is a side elevational view of a machine according to the invention;

FIG. 2 is a view from above of a duplex brush-making machine according to the invention;

FIG. 3 is a side elevational view of the machine according to FIG. 1 after the lever carrying the chucking devices has been rotated through an angle of 90°,

FIG. 4 is a side elevational view of a brush-making machine comprising a vertical loading station and a collecting device for the finished brushes below the filling station;

FIG. 5 is a side elevational view of a brush making machine according to FIG. 4 in which the loading station participates within a given angular range in the rotary motion of the lever arm carrying an empty chucking device;

FIG. 6 and FIG. 7 are each a side view of a brush-making machine showing the lever arms carrying the chucking devices adjusted to different lengths;

FIG. 8 is a view of a loading station and magazine seen in the direction of rotation of the lever arms carrying the chucking devices;

FIG. 9 is a part sectional plan view of a chucking device, the section being taken on the line IX—IX of FIG. 8 and

FIG. 10 is a side elevational view of a loading station and magazine cooperating with a chucking device according to FIG. 8.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to the drawings a brush-making machine 1 substantially consists of a U-shaped frame 2 which carries a boring station 5 on one and a filling station 6 on the other of two upright columns 3 and 4. Between the boring station 5 and the filling station 6 a member carrying chucking devices, which will be hereinafter briefly referred to as the "lever 7," is mounted for rotation about an axis 8. At the end of each of its arms this lever carries a chucking device 9 for holding the back 10 of a brush. One of these devices 9 is shown in greater detail in Figs. 8 to 10.

A shaft forming the axis 8 about which the lever 7 is adapted to rotate is mounted in a bearing support 11 which stands on slipper elements 12 slidably embracing horizontal guide bars 13. The distance between the filling station 6 mounted on the upper end of the column 4 of the machine frame 2 and the axis of rotation 8 is thus adjustable. At the same time this arrangement permits the bearing support 11 to perform a depth-compensating motion. The drive means for generating this depth-compensating motion by reference to templates are not shown in the drawings for the sake of clearness.

The drive for generating the infeed of the boring station 5 is derived from an eccentric 15 through a lever transmission. The boring station 5 is coupled to one end of a two-armed lever 16 which is fulcrumed at 17 and which at its other end is articulatedly connected by a hinge 18 to a rod 19 actuated by the eccentric 15. The fulcrum 17 of the lever 16 which has two arms of equal length is on an arm 20 which is connected to the bearing support 11, and which thus introduces the depth-compensating motion. The described arrangement has the effect of infeeding the boring station 5 to bore a hole of prescribed size into the back 10 of a brush in the course of each revolution of the eccentric. At the same time the arm 20 transmits the depth-compensating motion to the boring station 5 and in view of the transmission ratio provided by the two-armed lever 16 the magnitude of the displacement of the boring station will be twice that of the depth-compensating motion. This is necessary because the back 10 of the brush facing the boring station 5 and the lever 7 themselves participate in the depth-compensating motion towards the filling station 6.

For setting the bundles of bristles to the required angles in the longitudinal and transverse directions the chucking devices 9 must be deflectable in two directions in relation to the boring station 5 and the filling station 6. For this reason the chucking devices 9 are mounted to swing about an axis 21 for achieving the angular set in the transverse direction, whereas the angular set along the length of the brush is produced by the rotary motion of the lever 7 itself.

Moreover, to permit the machine 1 to work on brush backs 10 of different sizes and to vary the angle of divergence to which the bristles are set, the length of the arm of the lever 7 and the position of the axis 21 for generating the transverse angular set must be adjustable. This can be achieved in a simple way while at the same time keeping the inertial weight of the lever 7 as low as possible by constructing the lever 7 in the form of a kind of frame comprising a center portion 22 mounted on the shaft about which the lever rotates and fitted with two carriers 23 which determine the length of the lever 7 and which at their ends are each hingeably connected to a substantially U-shaped frame portion 24 which carries the chucking device 9. The hinge of this latter connection constitutes the axis 21 which is thus normal to the shaft 8. A row of holes 25 in the shanks 26 of the U-shaped frame members 24 and in the carriers 23 permit the position of the axis 21 to be varied by selectably inserting pins into one of the holes in the rows. The radius of angular set in the crosswise direction is thereby adjustable. Adjustment of the lever 7 to the radius of angular set lengthwise of the back of the brush is likewise quite simple and can be readily effected by exchanging the carriers 23 for carriers of different lengths.

An alternative possibility of adjusting the machine 1 to different shapes and sizes of brush consists in exchanging the entire lever 7. This may be a useful facility when the same machine 1 is to be used for consecutively making widely different brushes.

Adjustment of the opposed working stations to the change in length of the lever arms can be effected by first adjusting the bearing support 11 to the filling station 6 and by then shifting the position of the boring station 5. This can be done by moving the two-armed lever 16 in the desired direction parallel to itself. For this purpose both the rod 19 and the arm 20 are each provided with a row of holes 27 respectively 28 for selectably connecting the lever 16 to these elements in the position required.

The manner in which the described machine functions will now be described with reference to Fig. 4. The machine illustrated in Fig. 4 comprises a loading station 30 disposed above the center of the upper arc of the path of rotation of the lever 7. At this station 30 a stack of brush backs 10 is held in a magazine by a gate V. The distance of this station from the axis of rotation 8 of the lever 7 can be adjusted to the length of the lever arms of the lever 7. When the required holes have been bored into the back 10 of a brush at the boring station 5 and at the same time the bores in another back 10' have been filled at the filling station 6, the chucking device 9 at the filling station releases the filled back 10' which therefore drops by gravity into a hopper-shaped bin 31 attached to the machine column 4 by a bracket H below the filling station 6. The lever 7 is then rotated in the direction of arrow 32 until its position is reversed. During this rotary motion the empty chucking device 9 traverses the loading station 30. A striker 33 attached to the chucking device pushes a brush back 10 which is released by the gate V out of the magazine and in a manner yet to be described this is gripped by the chucking device 9 and carried to the boring station 5. At the same time the previously bored back 10 is carried to the filling station 6 on the other side of the machine. The boring and filling operations then proceed and the necessary movements of the brush backs in the lengthwise direction of the backs is effected by a stepwise indexing motion of the lever 7 about its axis 8, whereas the necessary transverse motions are generated by swinging the chucking devices 9 about their respective axes 21 by means of an indexing mechanism indicated more particularly in Fig. 2 and comprising a longitudinal lever LH and cross levers QH attached to the shanks 26 of the frame portions 24, this mechanism being operated for instance by a working cylinder or a cam disc not shown in the drawings. The arrangement must naturally be such that the completely filled brush back 10' at the end of the filling operation will be in its lower end position facing the filling station 6, as indicated in Fig. 4 in discontinuous lines. From this position the filled brush back 10' can be very conveniently dropped into the collecting bin 31.

Fig. 5 illustrates a loading station 30*a* which participates in the rotary motion of the lever 7 within an angular range A against the resistance of a restoring spring F and thus permits the lever 7 to be rotated into reverse position at high speed. The relative speed between the loading station 30*a* and the chucking device 9 can thus be sufficiently reduced to ensure that a fresh brush back 10 will be reliably held and gripped. For this purpose the lever 7 carries an entraining element M which strikes the swing arm S carrying the loading station 30*a*, and which releases the arm when this has been deflected through the angle A.

Figs. 8-10 show details of a chucking device 9 and illustrate the manner in which this functions. Substantially the chucking device 9 comprises a baseplate 35 which on the side facing the shaft 8 of the lever carries an actuator cylinder 36 which opens and closes the chucking device 9. The upper face of the baseplate 35 carries transversely slidable angle-shaped gripping jaws 37 which cooperate with the longitudinal sides of the brush backs 10. The flanges 37' of the gripping jaws 37 rest flat on the top of the baseplate 35 and they are slidably guided between rails 38. Moreover, these flanges 37' are provided with obliquely placed slots 39 which are slidably engaged by pins 40 connected to the ram of the actuator cylinder 36. The actuator cylinder 36 operates to shift the pins 40 longitudinally and thus pulls the jaws symmetrically together against the sides of the brush backs 10. Fig. 2 is a plan view of a multilever machine 1*a*, more particularly a duplex machine comprising twin levers 7 and 7' which are both mounted on a common shaft 8, a filling station 6 respectively 6' as well as a boring station 5 respectively 5' being associated with each lever. The infeed as well as the depth compensating motions of the boring stations 5 and 5' are transmitted by a common lever 16. Moreover the drawing shows the common longitudinal lever LH and the cross levers QH which can be connected

thereto by using selected pairs of holes L for jointly deflecting the brush back about the axis 21.

Furthermore, Fig. 2 also shows magazines 42 for the bristles and the dividing means associated with the filling stations 6 and 6' which in the other Figures have been omitted for the sake of clarity of representation.

For monitoring the correct reception and chucking up of the brush backs and possibly also for the purpose of preventing the machine from accidentally running empty, a monitoring element 45 may be affixed to the frame 2 of the machine, as indicated in Fig. 5, said element responding only to the presence of a correctly gripped brush back 10 and otherwise stopping the machine 1.

The principal advantage afforded by the above-described brush-making machine 1 is that its lightweight lever 7 carrying the chucking device is capable of being quickly rotated so that high production rates can be achieved, and that the machine is easily and cheaply readjustable to making brushes of different sizes, since the entire lever 7 is easily and quickly exchangable. Another advantage is the simple, clean and rugged construction of the machine 1 and its convenient design in which the coincidence of the center of the divergent set in the longitudinal direction of the brush with the fulcrum of the lever 7 permits the construction and disposition of the chucking devices 9 and of the drive means for effecting the required angular movements to be substantially simplified.

It should also be mentioned that the lever 7 carrying the chucking devices in the proposed brush-making machine 1 can be arranged to rotate either about a horizontal axis, as in the aforedescribed embodiment, or about a vertical axis. In the latter case a collecting bin 31 may likewise be provided below the point where the finished brushes are released whereas the loading station 30 will be located in the deflection path of the lever preceding the first working station. Both arrangements are extremely suitable for multiple machines fitted with two, three or more chucking arms.

For generating the rotary movements of the lever 7 a piston type machine K with a reciprocable rack P may be provided. The rack P engages a pinion Z mounted on the shaft 8 which it is adapted to drive through a one-way coupling, pawls or the like to impart positive intermittent rotation to the lever 7 in the required hand of rotation, the pinion releasing the shaft 8 during the return stroke of the rack P. Alternatively the rack P may be arranged to be lifted out of engagement with the pinion Z during its return stroke, for instance by an associated actuator cylinder. Moreover, rotary motion may also be generated by a driving motor and transmitted to the pinion Z through a worm gear.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive.

I claim:

1. A brush-making machine for boring brush backs and for stuffing bored brush backs with bristles comprising support means; stuffing tool means fixedly mounted on said support means; boring tool means mounted on said support means spaced from and opposite said stuffing tool means; carrier between said tool means and comprising a two armed lever having opposite free ends; means mounting said carrier and said support means turnably about a turning axis intermediate said opposite ends of said lever and extending substantially normal to the same; means supporting said mounting means movable toward and away from said boring tool means; a pair of chucking means respectively mounted on said free ends of said lever for clamping brush backs thereon; first drive means connected to said lever for turning the same about said turning axis; second drive means connected to said mounting means for moving the latter and said carrier mounted thereon toward and away from said boring tool means; a magazine for brush backs to be loaded into said chucking means, said magazine preceding said boring tool means in the direction of rotation of said carrier means and having a delivery end, said magazine being mounted for swinging movement about said turning axis between a rest position and an angularly displaced position; retrainment means for moving said magazine from said rest to said displaced position; and spring means for returning said magazine from said displaced to said rest position.

2. A brush-making machine for boring brush backs and for stuffing bored brush backs with bristles, comprising support means; stuffing tool means fixedly mounted on said support means; boring tool means mounted on said support means spaced from and opposite said stuffing tool means; a carrier between said tool means and comprising a two armed lever having opposite free ends; means mounting said carrier on said support means turnably about a turning axis intermediate said opposite ends of said lever and extending substantially normal to the same; means supporting said mounting means movable toward and away from said boring tool means; a pair of chucking means respectively mounted on said free ends of said lever for clamping brush backs thereon; first drive means connected to said lever for turning the same about said turning axis; second drive means connected to said mounting means for moving the latter and said carrier mounted thereon toward and away from said boring tool means; a magazine for brush backs to be loaded into said chucking means, said magazines preceding said boring tool means in the direction of rotation of said carrier means and having a delivery end; and sensing means downstream of said magazine in the path of rotation of said chucking means for sensing the presence or absence of a brush back in the respective chucking means.

3. A brush-making machine as defined in claim 1, and including means mounting each of said chucking means on the respective free end of said two armed lever tiltable about a first tilting axis substantially parallel to said turning axis and a second tilting axis substantially normal to said turning axis.

4. A brush-making machine as defined in claim 1, and including means for adjusting the length of the arms of said two-armed lever.

5. A brush-making machine as defined in claim 1, and including means for adjusting the distance between said boring tool means and said brushing tool means.

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